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Reflections on the Dignity and Welfare of Horses and other Equids

Pathways to Enhanced Protection

Masthead

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AHO	Ordinance of 31 October 2012 on Animal Husbandry (cf. OE)
AI	Artificial insemination
AMA	Agence mondiale antidopage (World Anti-Doping Agency WAMA)
AniWA	Animal Welfare Act of 16 December 2005; RS 455 (cf LPA)
AniWO	Animal Welfare Ordinance of 23 April 2008; RS 455.1 (cf. OPAn)
AORC	Association of Official Racing Chemists
ARCI	Association of Racing Commissioners International
ARE	Office fédéral du développement territorial, Federal Office for Spatial Development
ATD	Animal Tracing Database (BDTA)
BDTA	Banque de données sur le trafic des animaux (Animal Tracing Database ATD)
BLUP	Best linear unbiased predictions - reliable and robust method of estimating breeding values
CAS	Court of Arbitration for Sport (Tribunal arbitral du sport TAS)
CF	Conseil fédéral (Swiss Federal Council SFC)
COFICHEV	The Swiss Horse Industry Council and Administration
EADCMP	Equine Anti-Doping and Controlled Medication Programme (FEI)
ET	Embryo transfer
EU	European Union
EzDo	Epizootic Diseases Ordinance
FAO	Food and Agriculture Organization
FECH	Swiss Federation of Sport Horse Breeders (Fédération d'élevage du cheval de sport CH)
FEI	International Equestrian Federation (Fédération Équestre Internationale)
FOAG	Federal Office for Agriculture (OFAG)
FOEN	Federal Office for the Environment (OFEV)
FSC	Fédération suisse des courses (Swiss Racing Federation)
FSFM	Fédération suisse du franches-montagnes
FSSE	Fédération suisse des sports équestres (new: Swiss Equestrian SE)
FSVO	Federal Food Safety and Veterinary Office (Office fédéral de la sécurité alimentaire et des affaires vétérinaires OSAV)
GnRH	Gonadotropin releasing hormone
HISA	Horseracing Integrity and Safety Act
IABRW	International Agreement on Breeding, Racing and Wagering
IATA	International Air Transport Association
IFCE	French Horse and Riding Institute
IFHA	International Federation of Horseracing Authorities
IGSRV	International Group of Specialist Racing Veterinarians
IHSC	International Horse Sports Confederation
IMHC	IMHC International Movement of Horses
LPA	Loi sur la protection des animaux (Animal Welfare Act, AniWA)
MCP	Medication Control Program
NRHA	National Reining Horse Association
OAbCV	Ordonnance du 16 décembre 2016 concernant l'abattage d'animaux et le contrôle des viandes (Ordinance of 16 December 2016 on the Slaughter of Animals and Meat Inspection SMIO)
OE	Ordonnance sur l'élevage du 31 octobre 2012 ; RS 916.310 (Ordinance on Animal Husbandry AHO)
OFAG	Office fédéral de l'agriculture (Federal Office for Agriculture FOAG)
OFE	Ordonnance sur les épizooties (Epizootic Diseases Ordinance (EzDO))
OFEV	Office federal de environment (Federal Office for the Environment FOEN)
OPAn	Ordonnance sur la protection des animaux (OPAn) ; RS 455.1 (Animal Welfare Ordinance, AniWO)
OSAV	Office fédéral de la sécurité alimentaire et des affaires vétérinaires (Federal Food Safety and Veterinary Office FSVO)
OTerm	Ordonnance sur la terminologie agricole (Ordinance on Agricultural Terminology of December 7, 1998; RS 910.91)
OVMP	Ordinance on Veterinary Medicinal Products (ordonnance sur les médicaments vétérinaires OMédV)
PSA	Protection suisse des animaux (Swiss Animal Protection, PSA)
PR	Person responsible (personne responsable)
SAP	Swiss Animal Protection (PSA)
SCO	Swiss Code of Obligations (CO - code des obligations)
SE	Swiss Equestrian (former FSSE Fédération suisse des sports équestres, Swiss Equestrian Federation)
SFC	Swiss Federal Council (CF - Conseil Féderal Suisse)
SHV	Swiss Hoof Care Association (Schweizerischer Hufpflege Verband)
SMIO	Ordinance of 16 December 2016 on the Slaughter of Animals and Meat Inspection (Ordonnance du 16 décembre 2016 concernant l'abattage d'animaux et le contrôle des viands OAbCV)
SPA	Spacial Planning Act: Federal Law of June 22, 1979; RS 700 (LAT)
SPO	Spacial Planning Ordinance of June 8, 2000; RS 700.1 (OAT)

TAS	Tribunal arbitral du sport (Court of Arbitration for Sport CAS)
TF	Tribunal fédéral de la Confédération suisse (Federal Supreme Court of Switzerland)
TIR	Tier im Recht (The Animal in the Law)
UELN	Universal Equine Life Number
UET	European Trotting Union
VMPO	Ordinance of 18 August 2004 on Veterinary Medicinal Products (OMédV)
VSHO	Association of Swiss Hoof Orthopedists (Verband Schweizer Huforthopäden)
VSKT	Swiss Cantonal Veterinary Officers (ASVC)
WADA	World Anti-Doping Agency (Agence mondiale antidopage AMA)
WOAH	World Organisation for Animal Health, formerly Office International des Epizooties (OIE)

Notes for English readers

This comprehensive translation of content and structure has been undertaken to facilitate the wider dissemination of ethical principles aimed at safeguarding the dignity and well-being of equids employed in various contexts, particularly in Switzerland and neighbouring countries. It is based on the 2022 edition.

However, we have maintained the original names of institutions referenced in the text and listed in the bibliography. A table of abbreviations has been provided to aid readers in understanding their significance. Institutions' names are translated into English only if the institution has an official translation available. If not, the name and title are translated and enclosed in square brackets []. The bibliography also includes English texts with a legislative focus when the author has published and translated the original text.

Indices from the original French edition have been omitted in the English version. The authors recommend that readers utilize text search tools.

Notes on the Text

The notion of ethics undoubtedly plays an important role in our society. It evolves and differs according to the sensitivity of the sociocultural environment but does not adopt and combine virtuous principles aimed at an ideal and absolute harmony, as this is impossible to achieve. Even so, it behoves us – and it is our moral responsibility – to question the choices we make through our freedom to do right or wrong. Moreover, legislation evolves along with the morals of a society and are not, themselves, moral in character. Should we therefore only apply the laws of the moment and consider that anything that is not forbidden remains implicitly allowed? Or, on the contrary, are we capable of going beyond mere legality and asking ourselves: if we want to do what is right, or avoid doing what is wrong, how can we adjust our behaviour? If we know what consequences a decision may have on the interests of those around us (humans and equids), what should we do or not do? Is it worse to not do what is right, than to knowingly do what is wrong?

The Swiss Horse Industry Council and Administration COFICHEV (formerly the Swiss Horse Industry Administration OFIChev) initiated a discussion concerning the most essential ethical requirements. These discussions led to the realisation that there was a significant need for information and communication on this subject. For this reason, the COFICHEV analysed a number of current ethical issues and published an initial status overview as well as future perspectives (Poncet et al., 2011a, 2011b). Ten years later, that report has now been updated, taking into account the most recent relevant scientific publications (Poncet et al, 2022a, 2022b, 2022c). This document is a translation of the original French. The legislation, unless otherwise specified, is referring to Swiss legislation. Throughout the document, numerous examples are given for a topic in brackets – these are not meant to be an exhaustive list.

In general, the editors use the term “horse” to refer to the various breeds and types of domestic horses and ponies belonging to the species *Equus caballus*. The terms equid and equine refer to all modern, domestic members of the genus *Equus*, including horses, donkeys, and hybrids.

The Summary Report appears separately in French, German and English (Poncet et al., 2022a, 2022b, 2022c). It covers the structure of the report and the most important points. To facilitate ease of reading, the editors do not mention the sources of each statement. Those interested in more in-depth knowledge are invited to read the original version (or a translation thereof) and to delve into the details of the conclusions and recommendations.

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1 A paradigm shift

1.1 Preamble

The role of the horse, in the broadest sense of the term, has been transformed in contemporary society over the last few decades. The recognition of equids as sentient beings has greatly increased in all circles that observe the equine sector or participate in its activities. However, this context is characterised by several facets. The first is the numerous uses of the modern equid: breeding, various disciplines and practices, the various stages of training as well as the education of people (that work with horses). The second facet encompasses all of the elements constituting the daily care of horses (grooming, feeding, infrastructure, equipment), farriery and hoof care, sales of services and equipment, the organisation of events, the media, social networks and other areas. In addition, horses can be kept in a variety of conditions including extensive living (pasture or in the wild), stabled or a combination of these, either individually or as part of a herd.

This second aspect also concerns the diversity of those who work with equids. The level and extent of the skills of each enthusiast or specialist are the result of various motivations brought about by divergent or, in some cases, irreconcilable socio-cultural, historical, economic and professional situations. It is therefore not surprising that equestrianism has developed differently in different cultures, often coupled with a strong sense of identity, for example emblematic patches or accessories such as those used in western riding equipment or military uniforms.

The equestrian sector is also influenced by a number of other elements. Although not an exhaustive list, the following examples show the great diversity of the industry, starting with the large number of breeds of domesticated equids (800 breeds of horses and ponies and 170 breeds of donkeys). In addition, there are also the issues of legislation, conflicting views of animal nature, anthropomorphism, gender issues, persistent preconceptions, incompetence, dogmatism, perfectionism, and a lack of responsibility or self-criticism in ethical matters. Furthermore, several practices and manoeuvres, such as the use of certain equipment or tack - delicately called auxiliary equipment - are commented on in the media and peremptorily declared abusive, although they are traditional and indispensable to others. Finally, modern humans have a complex relationship with the death of equids. Some people see the end of their lives as the normal end of a cycle, while others admit to difficulties or object to the prospect of having to part with an animal. The closer one is to an animal, the greater the empathy. Therefore, the horse-riding population, with the exception of countries such as China, Kazakhstan, Italy, France, Northern Spain and a few others, rejects hippophagy.

In summary, the vast majority of people working in the sector recognise the need to protect the inherent value (animal dignity) and the natural needs of this sentient being. At the same time, they argue that its capacities and its use fulfil desires for personal development and entertainment during leisure time or competition. The serious dilemma and consequences of these conflicting views are immediately apparent. There is a demand for strict enforcement or even an increase in legal standards or, on the other side, fierce opposition. There are also anthropocentric attitudes, or those beliefs centred on the living being and its inviolability, which, at the other extreme, go so far as to consider animal and human dignity equivalent.

A paradigm shift

In Switzerland, as in all of Europe and North America, the role of the horse in society has been transformed in recent decades. As an agricultural income producer and a virile military symbol, the horse was a social and economic driving force, mainly used for agricultural work, transport and military operations. Today, the horse has conquered the female and urban environment, thus becoming a pet and faithful companion, as well as a leisure and sport companion with whom one converses and to whom one accords feelings[1]. Its dignity and natural needs receive due attention, but its use must, at the same time, fulfil the aspirations of its owners during leisure time and competitions (Hughes & Duncan, 1988).

In the face of this paradigm shift, the plurality of responses - backward-looking denial, legalism, anthropocentrism, anthropomorphism[2], practical wisdom, idealism - shows how disorienting a transformation of morals is. Faced with the fact that legal rules (not always moral) evolve with habits, the question is raised of whether current law should be applied (i.e. what is not forbidden remains implicitly authorised) or if it is better to go beyond the letter of the law and address the ethical question. How can we adjust our conduct to do the right thing? Is not doing what is right less abusive than doing what is wrong? Ethics is not a collection of moral principles but rather evolves and differs according to the sensitivity of the sociocultural environment. However, it is everyone's duty to question the choices they make and use their individual freedom of choice to do right or wrong.

Today, the most varied audiences benefit from almost unlimited access to the latest knowledge on equids (ethology, genetics). The use of new information technologies has given society great independence to seek information. The industry is very diverse, and it is not surprising to see the growing importance of ethics in relation to the horse (Bornemark, 2019).

Multiple stakeholders with different interests

The majority of the equestrian and racing industry recognises that the welfare of the equine population is a condition for its sustainability. However, it does not consider this as a key factor. It too often adopts a market and growth-oriented anthropocentrism,

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[1] 4.2 Equids: livestock or companion animals?, p. 41
[2] 2.4.1.3.2 Anthropomorphism, p. 29

which marginalises the animal world. As for the so-called leisure riders, this branch oscillates between defending its own direct interests and taking the animal cause into account.

Protectionist circles, on the other hand, pay more attention to welfare but at the same time are very uncomfortable with the idea of linking it to the sustainability of equestrian activities (racing, sporting events, sales). The replacement of anthropocentrism with a biocentric approach undeniably opens the door to achieving a certain degree of sustainability. Therefore, it is high time to encourage the understanding of a correlated notion of the sustainability of animal welfare and responsibility without assigning the leading role to any one party. This approach would promote the sustainability of an interspecies relationship, a concept that includes both human and animal interests. Such a change would be beneficial for equestrian sports and racing (Bergmann, 2015, 2019). These are social activities used for entertainment and sporting activities that are of high cultural importance. At the same time, these sectors are increasingly confronted with negative public attitudes. Two examples are the events that transpired during the modern pentathlon at the Olympic Games in Tokyo in 2021 or with the proposal to ban Thoroughbred racing in California (Lesté-Lasserre, 2019) due to a high mortality of racehorses and the lack of significant improvements made by racetrack owners to rectify the issue[3].

Numerous and complex ethical issues

Contemporary aspects of equine-human encounters face a number of complex ethical questions (Fenner, 2021; Krupa et al., 2022). These questions affect an equestrian culture in transition, often destabilised, and the field of scientific research that must reorient its projects, for example in ethology, equine sciences and social sciences. The Swiss Horse Industry Council and Administration, COFICHEV, has identified an increased need for information and opened a dialogue on ethical issues in a first report published in 2011 (Poncet et al., 2011 a, 2011b). A decade later, this update (Poncet et al., 2022) provides a new contribution that accompanies the transition to sustainability including addressing contemporary human-equine relationships. For this, the COFICHEV relies in particular on the evolution of the level of sensitivity in society as well as on the social and life sciences, for example bioethics (Beauchamp & Childress, 2019; Beauchamp & Frey, 2011; Crabbe, 2020).

1.2 Legislative and regulatory developments in Europe

Societal demand for animal welfare protection has grown rapidly, to an extent that was unimaginable not long ago. A number of practices are no longer deemed acceptable. According to a May 2021 Eurobarometer survey on animal welfare 82% of Europeans surveyed said that the welfare of farm animals should be better protected than it is now (data.europa.eu, 2021).

Animals are sentient beings - a widely accepted concept

The *Lisbon Treaty* adopted in 2009 recognises that animals are sentient beings and paved the way for the *Strategy on the Protection and Welfare of Animals* (European Parliament, 2012). The report *Removing the Blinkers: The Health and Welfare of European Equidae* in 2015 commissioned by the European Commission (World horse welfare & Eurogroup for animals, 2015) highlights the versatility of equids and their variable status – the latter reflected in a lack of consistency in their legislative treatment. Several welfare issues persist including stabling, transport, training, uses, working horses and slaughterhouses. In 2017, the European Parliament broadened the scope of its reflections and adopted a report on responsible ownership and care of equids (European Parliament, 2017). The report proposes that the discussion of welfare issues should be part of all equine activities. In order to better understand the legal issues, the French Horse and Riding Institute (IFCE), in association with the European Horse Network EHN, compared legislation and regulations in the EU and published a summary in 2017 (Engelsen, 2017).

1.3 Developments in Switzerland

New legal and regulatory requirements

Swiss legislation has imposed several new formal requirements since 2014. These provisions place Swiss animal protection legislation, including equids, in an international leadership role (Lesté-Lasserre, 2015).

The AniWO, Animal Welfare Ordinance (CF, 2020) prohibits tethering/standing stalls and requires group stabling of young horses, providing horses with access to turnout (outdoor paddocks or pastures), with a minimum size of turnout areas and the keeping of an exercise log tracking the amount of turnout. Equids that are not in work must be turned out for at least two hours each day. Rollkur (neck hyperflexion) (Art. 21 AniWO) and barbed wire fencing are prohibited (Art. 63 AniWO). Equids over 30 months of age must remain tied during transport but not by a bridle or rope halter (Art. 160 AniWO). In addition, people who treat hooves (farriers and barefoot trimmers) for profit must have a cantonal license and specific training (Art. 101, 101c and 102 AniWO). Finally, the Ordinance of the FSVO on Animal Welfare in Breeding aims to reduce the number of animals with hereditary diseases or physical characteristics that have a deleterious effect on the wellbeing of the horse (OSAV, 2015). It should be noted that the Swiss legal framework only imposes a minimum threshold of animal protection. Adopting additional measures - such as optimising living and management conditions as well as regulating specific situations that the legislation does not address - remains the responsibility of the individual and the organisations concerned.

The Swiss Equestrian SE (former FSSE Fédération suisse des sports équestres, Swiss Equestrian Federation) has also adapted its regulations accordingly. In addition, it has developed principles and reflections in a Code of Ethics (FSSE, 2018a, 2018b) and

[3] 4.4.1.3.2 Improvements in horse racing, p. 59

published a brochure *Un cœur pour le cheval* [*A Heart for the Horse*] which addresses ethical aspects (FSSE, 2018c). These texts aim to raise awareness. For its part, the Swiss Racing Federation (FSC) have issued stricter regulations, in particular concerning the equipment and protection of athletes (horses), the veterinary service on racecourses, the use of medication and the fight against doping during racing, qualifying events and training (FSC, 2021a, 2021b).

1.4 Societal developments

Equestrian practices often called into question

Awareness of human-animal interactions is taking on new dimensions. In this day and age, it is difficult to ignore the multitude of information available through books, press articles, social media publications and surveys that report on the opinions and various currents of interest regarding the animal condition. Moral, economic, political, legal, scientific and societal considerations are all mixed up together. In short, certain activities with animals are being questioned and there are even advocates for their abolition - for example the equestrian acts in the circus (Kündig & Bernet, 2019). Critics often use impassioned language and focus on two main points: the suffering caused to the animal through exploitation and the environmental damage caused by the use of animals (Annaheim et al., 2019a, 2019b). The use of the term exploitation, at first glance easily understood, implies that any sentient being would be dominated and abused. Moreover, they would experience suffering in all the situations described above, regardless of cognitive abilities or the species to which they belong. It should be noted that the idea of suffering is very ambiguous and, in its most pessimistic context, always represents the animal world inside the human sphere as dire. The term suffering, physical or psychological, covers a very long list of types and intensities[4].

The challenges are considerable. Even if the practices of the equine industry are not among the preferred targets of animal rights activists, they are regularly called into question. Before distinguishing between acceptable and unjustified practices, it is appropriate to give a brief overview of the trends that have developed over the past few decades. However, this report does not attempt to comment on, compare or detail them. They constitute a heterogeneous composition of diverse practices that are difficult to gather under a single label. Furthermore, to challenge the simplifications and insidious generalisations (*the false good ideas*) would require analysis and exposition that goes beyond the initial objectives of this paper.

A pragmatic or idealistic ethical approach?

When examining the current ethical questioning of the relationships that humans maintain and develop with equids, two fundamentally opposed approaches emerge. Both seek to define why and how should be treated animals and to clarify humans' obligations and rights towards them, but the approaches are divergent. One calls for improvements in the way animals are used and in their welfare. The other, opposed to the idea of using them at all, demands the abolition of all use. Using Max Weber's model (Weber, 1921), the ethics of responsibility can be differentiated from the ethics of conviction.

The ethics of responsibility

Animal protection belongs to the type of ethics known as responsibility ethics, as it focuses on actions taken by an individual or a group to improve the living conditions and use of contemporary equids. It has a pragmatic and reformist character; it takes into consideration the asymmetrical and evolving relationships that arise from the irredeemable status of domesticated equids. It is based on respect for the intrinsic value of living beings (dignity), as well as benevolence towards equids, which are vulnerable beings because of their capacity to feel emotions and pain (Bekoff, 2010).

This reasoned approach examines the causes and justification for imposed strain to be reduced from a moral perspective, as well as the intensity and extent of the needs and interests of both parties (humans, animals). Basically, therefore, it does not question the legal principles that authorise the use of equids, their trade (they belong to the sphere of goods) or their death. This approach does not oppose the use of what animals produce after processing the sustenance provided by nature or humans. This applies in particular to foodstuffs (eggs, milk, meat), physical and mental abilities (strength, speed) and the ability to interact with humans (companionship, sports partners). This current of thought, which is largely dominant in Switzerland and other Western countries, remains realistic, as long as it considers that even the smallest progress constitutes a step in the right direction and progress.

The ethics of conviction

In recent decades, a sensitivity towards animals has developed in society that is both an absolute philosophical doctrine and a political struggle. This new moral approach often appears under the term animalism. Adherents of these radical paradigms advocate the abolition of all forms of animal use. Animalists are uncompromisingly opposed to animal welfare movements that promote regulation and improvement of the keeping and use of animals. This approach constitutes the ethics of conviction and is by definition idealistic in nature. As a fundamental imperative, proponents are often not concerned with the immediate and practical consequences of their dogma on the welfare of the equids living today, although some adherents undoubtedly respect horses. However, this view of the relationship between humans and equids ignores their common destiny and the diversity of their relationships. (Deneux-Le Barh, 2020; Régnier & Deneux-Le Barh, 2020).

Peter Singer's book (Singer, 1990), published in 1975 under the title *Animal Liberation*, initially popularised the term *anti-speciesism* - as opposed to *speciesism* - by creating an analogy to racism and sexism. This current of thought consists of considering

[4] 2.3.1 Pain, suffering and harm, p. 21

and treating all living beings equally, regardless of the species to which they belong. Another philosopher, Tom Regan (Regan, 1983), also plays a decisive role in the development of anti-speciesism. He argues that animals - which he and others call *non-human animals* - have rights because each one has its own value (animal dignity) distinct from the utility it may have for humans. In the same Anglo-Saxon spirit, the theory of *animal rights*, developed primarily by Gary Francione (Francione, 2008; Francione & Garner, 2010), is based on the refusal to consider animals as commodities and things that serve as resources under the pretext that they belong to mankind. According to Francione, each animal is a subject of its own life (Regan's concept of *subjects-of-a-life*) to which one could attribute a legal personality subject to a non-human physical person regime. A completely vegan diet (*veganism*) is the immediate and logical application of abolitionism. While the main motivation is ethical, the proponents also put forward arguments encompassing the protection of animals, human health and the environment (Mathieu & Dorard, 2021).

For simplicity, some authors group all these concepts under the term animalism (Celka, 2012). However, the issue of animal rights is much more complex than the various movements suggest. Recently, Canadian philosophers (Donaldson and Kymlicka, 2011) have realistically noted that the situation of animals has not improved and that radical solutions have been a dead end since the question of humans' relationship with animals was first raised in ancient times. While supporting abolitionism, their positions are based on a precise analysis of animal nature, its needs and its links to a responsible humanity. Their political approach to the animal cause consists primarily in establishing differentiated statuses according to the types of interactions between living beings. *Different relationships generate different duties*, they argue. Domestic animals share space with humans; therefore, the environment needs to be adjusted to their biological requirements, just as they are forced to adapt to the environment provided. According to this classification, domesticated animals and pets should be granted citizen status (they live with humans) and wild animals should be granted sovereignty (they have a territory). Animals that live close to humans without forming a bond with them (birds or rodents) should be awarded permanent resident status. This original *zoopolitical* path implies not only that animals have rights but also, quite rightly, that humans assume obligations towards them. The proposed new legal and moral framework goes far beyond the principled positions held to date.

The debate is not yet over, because equids will not disappear overnight. Those who are alive today have a value and a life of their own to respect. How should their appropriate use be managed? Will it be enough to refrain from cruel behaviour and to abolish some practices? How could they survive if, by chance, these normative proposals were to be applied? Would that result in a dystopian world without domestic species?

1.5 The positioning of the COFICHEV

As the representative body of the Swiss equine industry, the COFICHEV considers the principle of domestication and the resulting use of equids as ethically acceptable, as long as this use fulfils animal welfare requirements. It also accepts the anthropological premise that humans enjoy an asymmetry in their relationship with animals. This is manifested, in particular, by the fact that the exercise of authority and pressure remains concomitant with the keeping and use of livestock and companion animals. Thus, humans are never completely disinterested in their dealings with animals and it is the responsibility of all to recognise this bias. The following pages will present the interests humans have in keeping and using equids as livestock and companion animals in several activities[5]. In the broadest sense, it is always about protecting what humans use - even the benefits of keeping pets can be understood in this context (Laforest, 2015). It is also a matter of dignity to refrain from abuse and to take the imbalance between humans and animals into account, showing generosity towards vulnerable beings. To this end, as is shown below, any strain must be justified by overriding interests. This means that human interests are only of relative importance, but never of absolute priority in the weighing of interests[6].

That said, what is ethically relevant is how to keep and use equids; to identify the nature of the stresses on them, weigh the various interests and reduce strain and restrictions where possible. In other words, the fundamental ethical issue is not whether to use an equid or not, but not to hold them in unacceptable conditions or justify certain actions for the sole reason that humans have a financial interest. In this way, horse riding, among other equestrian activities, can be justified. This means that all practices must respect overriding standards of welfare in the daily management of the animal, in equestrian activities and training, in the amount of weight an equid can carry or pull, during transport and in end-of-life decision making. If an individual does not observe these requirements, riding becomes unjustified. In order to gauge the moment when what is being asked of an equid becomes abusive, the assessment of the risks by the responsible persons plays a decisive role. Problems arise, for example, when appropriate steps to minimise hazards have not been taken, when strain could have been avoided, if interested parties decide to do less than the best possible under the circumstances, or if there is not an objective identification of involved interests (those of humans and equids). In other words, when humans undermine equine dignity.

Above all, it is a question of human responsibility and obligation

The COFICHEV's position is in line with that of the World Organisation for Animal Health (the new name for the Office International des Epizooties OIE). In 2016, the WOAH integrated animal welfare into its Terrestrial Animal Health Code (WOAH, 2018); personal engagement and obligation should dominate the discourse. The COFICHEV therefore bases its reflections and explanations on the

[5] 4.2 Equids: livestock or companion animals?, p. 41

[6] 2.7 Weighing the interests, p. 30

principles of an ethics of responsibility and reciprocity – it is reasonable to ask a lot from equids, as long as they are given a lot in return. Furthermore, the COFICHEV does not focus its approach on suffering, welfare and prohibitions. Without questioning these points of view (they remain major), this report attempts to move beyond this narrow vision towards equids. More positive solutions are proposed, to improve living conditions by stimulating equine interests for a dignified life in a rich environment (Lestel, 2010). In other words, taking action, the dimensions of which favour the animals' feelings, positive perceptions and their search for satisfaction.

Thus, the COFICHEV's objective is to focus its efforts on improving the living conditions and use of contemporary equids, not only with regard to the species, but also to the individual. Now that equids have the status of sentient and social living beings with intrinsic value, the COFICHEV wants to ensure that their animality is recognised and guaranteed.

In addition, the COFICHEV promotes respectful, non-anthropomorphic relationships between humans and equids based on scientific evidence in several disciplines. It thus expects researchers to verify the hypotheses developed intuitively, at times alluring, but usually generated on an emotional basis. The COFICHEV would like to see an objective characterisation of the biological, physical, behavioural and adaptive functions and capacities of the equine species. In terms of welfare, this means the characterisation of those temporary or lasting factors that affect equine health such as pain, harm and anxiety[7] (Art. 3 AniPA). Furthermore, for the COFICHEV, the successful response to the considerable challenges to be met will necessarily involve taking into account not only the philosophical, legal and societal (e.g., cultural) parameters, but also the technological, economic and regulatory contexts. In the immediate future, it proposes concrete measures, as this is the most effective way to achieve a consistent improvement in the plight of equids in the short and mid-term.

1.6 Who are the recommendations are intended for?

This document deals with concrete and practical issues related to equids, their dignity and welfare. After an analysis and synthesis of numerous scientific publications, the COFICHEV has developed recommendations in the form of a code of conduct and an ethical framework. Alerts also aim to raise the awareness of society, in particular the equine sector, to stimulate their reflection on future issues. These statements do not challenge the minimum requirements of the legislation and do not address in detail the professional ethics specific to each profession. Moreover, several topics that are necessary to understand the profound motivation of humans in their relationship with equids, remain on the sidelines. The COFICHEV leaves it to specialists in anthropology, ethology, philosophy and history to explore the socio-cultural aspects of these themes.

After the state of play of a decade ago, this revised edition is addressed to every person and every organisation concerned. The goal is to enable interested parties to place themselves in a position of vigilant and critical reflection in specific situations. They will be able to make responsible decisions that will advance respect for the dignity of the equid and to reduce inadequacy. There is an additional benefit for those who have communication obligations, or plan to contribute to public debates on these topics. They will be better equipped to make the most of everything they do in order to improve the welfare of their animals. They will be able to share their knowledge with pride and confidence, instead of becoming defensive and settling for the weak argument that *we have nothing to hide*.

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2 Terminology and definitions

In each specific field, specialised communication, including the exchange or transmission of knowledge, requires the use of a set of rigorously defined terms. These specify the designation of frequently used, but often academic concepts.

2.1 Ethics

Ethics is defined as a practical and normative philosophical discipline in the sense that it deals with the question of how something should be and not with describing how it is. It indicates the way in which humans should best behave towards each other and towards what surrounds them. Ethical principles are structured by the system of the prevailing culture, while allowing for the questioning of existing values and rules. As societies become less and less isolated, the scope of ethics cannot be limited to one country. However, each region of the world has developed an equestrian culture that has distinctive characteristics and is at the same time attractive to other countries. The legal norms of each state necessarily remain influenced by the corresponding moral principles that belong to it. The reflections and recommendations of this report focus on Switzerland and its neighbours. The ethical approach is therefore based on systemic deliberation with the aim of recognising what is right and just. It is through this understanding that the skills for questioning the status quo and searching for contextually appropriate answers can be developed.

2.1.1 Legal requirements

The Swiss Constitution (Art. 120 Swiss Constitution) states that the Confederation is responsible for legislation on the use of the germ-line and genetic heritage of animals, plants and other organisms (Swiss Confederation, 2020). In doing so, it respects the integrity (dignity) of living beings, the safety of humans, animals and the environment and protects the genetic diversity of animal and plant species. The Swiss Animal Welfare Act (AniWA) specifies concepts that describe human perceptions and thoughts, such as dignity, self-worth (animal dignity), strain, degradation or instrumentalisation (FA, 2017). The following paragraphs discuss the terms of general application (OSAV, 2017a, 2017b) in the order of their appearance in the AniWA (FA, 2017).

2.2 Dignity

The AniWA (Art. 3, Letter a) defines the concept of dignity: the inherent value (animal dignity) of the animal, which must be respected by those who care for it. The dignity of an animal is disregarded when the strain imposed on it cannot be justified by overriding interests; strain occurs in particular when pain, suffering or harm is inflicted upon the animal, when a situation causes it to be in a state of anxiety or degraded, when it is subjected to interventions that profoundly alter its phenotype or capabilities or when it is excessively instrumentalised.

Thus, within the meaning of the AniWA, strain always affects dignity[8]. When it is justified by overriding interests it respects the dignity of the animal. When there is no overriding interest to justify a specific strain on an animal, its dignity is violated. Respect for the dignity of equids is therefore an obligation of human beings in their relations with them, for example their use.

2.2.1 The inherent value (animal dignity) of the animal

The notion of inherent value (animal dignity) is based on the concept that every living organism has value simply due to the fact that it is alive, irrespective of whether it is beneficial to humans or other living beings. This value does not derive from an organism's instrumental utility, nor its market, sentimental or patrimonial value. Respecting the inherent value (animal dignity) of an equid means (AniWA Art. 3, Letter a) that it must be morally valued in its own right, regardless of the impressions, opinions or experiences of humans (Burgat, 2002; CENH, 2001).

2.3 Strain

In everyday language, strain is defined as excessive physical or psychological tension, including a force, influence, or action being exerted by one human being onto another in order to obtain a benefit. Strain can also refer to the inconvenience associated with an action performed against the will of the other party. Article 3 of the AniWA specifies a number of conditions that impose strain on animals, including when an action:

- Causes pain, suffering or harm[9]
- Puts them in a state of fear or anxiety[10]
- Degrades them[11]
- Involves an intervention that profoundly alters the animals phenotype[12] or abilities[13] or

[8] 2.3 Strain, p. 20

[9] 2.3.1 Pain, suffering and harm, p. 21

[10] 2.3.2 Anxiety, p. 22

[11] 2.3.3 Degradation, p. 23

[12] The set of observed characteristics of an individual resulting from the combined actions of its genotype and environment. These characteristics may be of a physical or behavioural nature.

[13] 2.3.4 Interventions that profoundly alter the phenotype, p. 23, 2.3.5 Examples of interventions that profoundly alter capacity, p. 24

- Instrumentalizes them in an excessive way[14].

Furthermore, in accordance with Article 4, any person caring for animals must take their needs into account[15] as much as possible and ensure their welfare in so far as the purpose of their use permits. They may not unjustifiably cause animals pain, suffering or harm, cause them to be in a state of anxiety or otherwise violate their dignity.

In short, the AniWA stipulates that it is forbidden to impose strain on animals without reason. Implicit in the law is a requirement to weigh the interests of the parties involved (humans, animals, environment). As noted above, if the weight of the strain imposed on the animal outweighs the interests of the other parties, the strain is abusive and therefore amounts to a disregard for the animal's dignity. These definitions serve as a basis for the assessment of strains and their justification in the cases presented in the following chapters.

2.3.1 Pain, suffering and harm

The concepts of pain and suffering are complex and difficult to understand through behavioural observation, in part because of their similar meanings. Furthermore, there is little known about how to identify pain receptors in animals. On the other hand, relying only on known human experiences of pain poses the risk of anthropomorphising[16] the experience when assessing an unpleasant situation.

The appropriate approach is to consider equids as sentient beings, aware of their environment and capable of feeling pain and experiencing negative and positive emotions. Recent advancements in ethology and neurobiology support the objective of improving animal welfare by promoting positive emotions and not inflicting pain, suffering or harm. Research shows that domesticated species of the genus Equus (donkeys and horses) have cognitive functions to sense pain. By learning and storing information, they can therefore perceive painful experiences, for example due to strains from which they cannot escape (restriction of their freedom of movement, poor living conditions). They then express negative emotions, such as physical and psychological discomfort, aversion or anxiety.

2.3.1.1 Nociception

Nociception is a defensive process that the body uses to detect potentially harmful stimuli. Nociceptors are sensory neurons located all over the body, including in the skin, muscles, joints and organs. Nociception constitutes the first line of defence against possible dangers. In an equid, it is expressed by a reflex of sharp withdrawal of a body part or avoidance, for example when touching an electric fence or a prickly object. In terms of significance, this immediate response does not necessarily involve pain, but a stinging or unpleasant sensation that allows the animal to avoid the aggression to its integrity. The flight response is therefore often difficult to interpret, particularly because of the differences between individuals.

2.3.1.2 Pain

Unlike the previous mechanism, pain is an unpleasant sensory and emotional experience associated with tissue damage (IASP, 2018). It can also have a psychological component. Acute (short-term) or chronic pain are common problems in veterinary medicine. In the case of lameness or colic, horses display acute, sharp pain in a way that is very noticeable to the attentive person. In contrast, chronic or acute signs of low intensity are much less visible. Not all equids, donkeys for example, have the ability to communicate explicitly to humans. The absence of clinical signs is therefore not a reliable indicator of the non-existence of pain.

2.3.1.3 Suffering

Suffering includes all restrictions of welfare that have not been interpreted as severe pain. They result from moderate to severe strain, extend beyond mere inconvenience or annoyance and continue for a significant period of time. These include chronic pain, suffering, anxiety and pruritus. The animal perceives a negative emotion that is detrimental to its own nature and well-being and goes against its instincts (Pollmann & Tschanz, 2006). Quality of life is particularly affected when deprivations prevent the animal from exhibiting normal behaviour and satisfying its needs or when the adaptive capacities of their vital functions are excessively strained.

Discomfort in an equid is manifested by negative emotions (behavioural changes, body expressions, mimics). The interpretation of discomfort is delicate and can vary according to the context, the species (horses, donkeys and hybrids), the breed and the *coping style* of each individual (Koolhaas et al., 1999; Budzyńska, 2014, Sauer et al., 2019). In fact, the animal may attempt to deal with problems (proactive style), resulting in increased motor activity and aggression or attempts to escape or it may become immobilised, expressing withdrawal and self-preservation behaviour (reactive style). This reactive behaviour is particularly observed in donkeys and hybrids. All of these behaviours are indicative of a deterioration of the welfare of the animal and the sudden or progressive alteration of physical or cognitive functions as a result of the imposed strain.

[14] 2.3.6 Excessive instrumentalisation, p. 25

[15] Underlined by the Authors

[16] 2.4.1.3.2 Anthropomorphism, p. 29

2.3.1.4 Harm

In an equid, nociception is a pain signal indicating that a tissue has suffered, is suffering or is about to suffer damage or harm that may affect its health and welfare. This harm is manifested as a general condition affected to a greater or lesser degree depending on the loss of functionality or species-specific behavioural problems. Deviations in the animal's development may also be observed, which disrupt its performance/capabilities or limit its responsiveness to external stimuli. These losses cause the animal to suffer. In order to ensure that the welfare of an equid can be guaranteed and its dignity respected, those who keep or use equids must take appropriate measures. These shall be aimed at preventing, stopping or reducing harm that impairs an equid's bodily functions and behaviour or places excessive demands on its ability to cope with its environment.

2.3.1.5 Suffering

Swiss law does not define and hardly ever uses the French term *souffrance*, presumably because of its moral and emotional connotations and the fact that it is too vague. It appears only twice in Articles 178 and 178a of the AniWO (CF, 2020), which deal with the mandatory stunning of animals before slaughter. In both articles, the German version (BR, 2020) uses the term *Leiden*, which is also widely used as a translation of the verb to suffer including the definition of welfare in the AniWO and the AniWA (BR, 2017; Bundesversammlung, 2017). The notion of suffering is closely linked to the concepts of enduring sentience and consciousness and is thus similar to the use of the term "suffering" in Article 3 of the Animal Welfare Act (Federal Assembly, 2017). This complex approach will be addressed only briefly here in the context of human responsibility for embryos[17].

2.3.2 Anxiety

Anxiety is not the same as fear or phobia[18]. It is characterised by sporadic or long-lasting negative emotion, caused by a reduction of self-control and a decrease in the ability to adapt to environmental changes. This heightened state of alertness increases the likelihood of triggering adverse reactions. Anxiety is considered a strain because it causes stress and discomfort that affects welfare. Anxiety affects different individuals, breeds and species in different ways. Equids with a very reactive and sensitive temperament ("hot-blooded") tend to be more anxious than their calmer, less sensitive counterparts.

Anxiety may be expressed intermittently in anxiety-provoking and stressful conditions such as transport, road traffic, participation in a sporting event[19], farrier care or in constraining and painful situations. It is permanently manifested in unsuitable lifestyles, especially in the stable. Behavioural disorders (stereotypies, dejection) can be seen as a response to anxiety. Anxiety can turn into fear in a sometimes sudden and dangerous way in unexpected and unfamiliar environments. By taking appropriate measures to strengthen the horse's ability to adapt, anxiety is reduced through habituation (desensitisation or conditioning).

The absence of fear and anxiety is included in the criteria to be met by those who keep or use equids, as it is a major component of welfare and its evaluation. The conditions of care and exercise must therefore ensure that equids remain free from psychological strain as provided for in the legislation (Art. 3 and 4 AniWA). To this end, the person in charge of the animal must assess the risk factors for strain and take the necessary measures to avoid them.

2.3.2.1 Fear, fright, phobia

2.3.2.1.1 Fear

Fear is a natural means of defence for the horse that has no direct impact on its welfare. The animal first perceives a stimulus from a distance (through sight, smell, hearing) and reacts with a brief emotion to an unknown element. If the stimulus is seen as a threat, the animal retreats or flees to increase the distance between itself and the unknown element. Retreat is often accompanied by blowing - a non-vocal signal characterised by an intense exhalation through the dilated nostrils that emits a sound without vibration. Generally, the horse stops and then turns around to observe. If the object no longer provokes fear, it explores it by circling around to get closer and then waits for a reaction from the object before sniffing it. Through learning, the horse becomes accustomed to this element and the fear disappears when the element becomes part of the horse's usual environment. If it remembers a threat, it remains vigilant and keeps its distance in fear of trouble or discomfort. It is known, for example, that horses keep their distance from electric fencing because they remember the electric shock.

2.3.2.1.2 Fright and phobia

The horse experiences fright in the presence of an object or event detected or anticipated as an immediate danger or threat. It is characterised by an intense and sudden emotion unlike anxiety and fear. From a certain proximity, this alarm system triggers defensive or avoidance behaviour e.g. aggression or flight. In its natural environment, this behaviour (conservation instinct) allows the animal to survive.

The horse possesses cognitive abilities. Therefore, a reaction can progress to a phobia in the event of a specific stimulus that the animal recognises. A phobia is different from fear or fright in that it always occurs in anticipation, often in a disproportionate manner. If the animal develops a mechanism of perpetual vigilance, it has a phobic reaction to experienced stimuli that it associates with or anticipates being a precursor of a triggering factor. The horse becomes hypersensitive and the duration and force of its

[17] 6.5.1.3 Do embryos suffer?, p. 241

[18] 2.3.2.1.2 Fright and phobia, p. 23

[19] 4.4.1.4.2 Stress factors that affect the physical condition and performance of a sport horse, p. 62

response to the stimulus intensifies. The horse's distrust may remain high while the responsible stimulus remains present or if it is repeated several times. The horse's agitation persists because many elements in its environment remind it of the cause of its aversion. The phobia becomes anxiety.

Phobia can occur at any age and is associated with typical signs. Some examples of these signs are: being easily startled, avoidance behaviour, flight or aggression, increased muscular tension, dilated nostrils, vocalisations such as snorting or blowing as well as an increased heart rate. The cause may be a specific situation, place or object related to an accident or a traumatic event (painful veterinary care, an accident, a brutal act or painful experience, separation from the group, claustrophobia). In this case, the horse's adaptive capacity is exceeded. It can then become difficult to handle. The horse needs more time to calm down, sometimes to the point of exhaustion.

In the domestic environment, the animal activates its adaptive capacity. Habituation allows it to react appropriately. It learns to control its response to the phobogenic stimulus (trigger) and to manage its reactivity which, as a result, will gradually decrease.

2.3.2.1.3 Donkeys

Donkeys behave more placidly than horses and express their fear in a different way. They tend to make fewer brisk movements and gradually slow down to a standstill. A lack of reaction to a perceived danger does not mean that they are not afraid. This characteristic, which is less frightening for humans, can lead to a misinterpretation of factors that may affect the donkey's welfare.

2.3.3 Degradation

Degradation (OSAV & OFEV, 2017) is the result when a process meets one of the following criteria:

- Mechanisation of the animal: it is solely used as a machine
- Ridiculing an animal (e.g. Figure 1)
- Representing the animal as a lifeless thing or as an object
- Measures constituting a total loss of control (cyborg).

An animal is degraded when it is considered and treated in a way that completely denies its moral status as a living being and no longer respects its right to self-determination. A degrading practice may relate to an individual subject or to the animal as an abstraction, species, or breed. Certain demeaning practices (e.g. some breeding objectives) can affect an individual as well as a group.

The facts will be examined independently of whether the animal is aware of its degradation, as it is impossible to definitively determine if an animal has the capacity to feel degraded. Therefore, the term degradation means that animals are not seen for what they are.

Figure 1 Is the horse ridiculed and debased even when it does not realise that the FC Basel logo is clipped onto its croup? When it is only used as an advertising medium, the horse is no longer seen for what it is (Photo: Swiss National Stud)

2.3.4 Interventions that profoundly alter the phenotype

An intervention profoundly alters the phenotype (OSAV & OFEV, 2017) if it meets one of the following criteria:

- The modification leads to a loss of functionality (causing a profound loss of capacity); the animal thus becomes permanently debased
- The animal's aesthetic perception is disturbed (e.g. naked dogs and dished noses in Arabian horses as shown in Figure 2)
- When it proves permanent or even irreversible (docking the ears or tail).

The breeding objective of some breeds is to achieve extreme phenotypic changes that can meet this definition. This can be illustrated by the skull (nasal bone) deformation of certain lines of purebred Arabians which, in extreme cases, make the head resemble a seahorse (Figure 2). These horses are distinguished by an overly elongated nose, large, flared nostrils, a constricted muzzle and bulging eyes. According to breed experts, these deformities make it close to perfection (BMJ Publishing Group, 2017). There is certainly concern that this phenotype could cause breathing difficulties during intense exercise, as well as result in undue stress and unjustifiable changes in ability. But there is also another totally unjustified strain; all the tactile hairs (vibrissae or whiskers) on the lips, nose and eyes have been shaved in the horse in Figure 2 for cosmetic reasons. In short, these modifications do not fulfil any functional purpose. Therefore, this horse is also being degraded and excessively instrumentalised solely for aesthetic and commercial value. Clearly, form has prevailed over function.

Figure 2 Purebred Arabian (Source: Horsearabians https://upload.wikimedia.org/wikipedia/commons/8/8a/Tfcolours.jpg, CC BY-SA 3.0 Unported license)

Breeding organisations also strive to achieve other phenotypical changes, but they do not always take the resulting negative consequences into consideration, despite the fact that they can cause significant strain. For example, the breeding objective of the Quarter Horse and Paint Horse line is primarily aimed at their conformation and gaits (halter classes). The result is a grotesque type of horse with hypertrophied muscle mass and dainty legs (Figure 3). Furthermore, a majority of them (56.4%, Tryon, 2009) carry a gene mutation that manifests in an incurable hereditary disease of disrupted muscle metabolism (Hyperkalemic periodic paralysis, HYPP). HYPP is manifested by muscle hypertrophy and unpredictable episodes of muscle weakness and tremors that impede all uses and exertion (a profound loss of functionality and capacity).

2.3.5 Examples of interventions that profoundly alter capacity

Figure 3 Quarter Horses and Paint Horses of halter lineage whose conformation is characterised by an extreme muscular hypertrophy (Source: http://theperfecthorse.blogspot.com/2009/09/world-class-halter-horses.html)

An intervention that profoundly alters the capacity of an animal (OSAV & OFEV, 2017a) can take several forms:

- Physical harm: affecting the ability to move (locomotion, lying down, standing up) or to eat (dentition)
- Behavioural restrictions: reproductive capacity, communication, satisfaction of needs
- Impaired coping skills (social environment, thermoregulation)
- Deviations from the species' own development (behaviour, growth)
- Restrictions in the animal's ability to react to external stimuli (altered senses, how they are kept).

Some breeding goals target extreme traits (Figure 2, Figure 3) or promote the occurrence of hereditary diseases that affect ability (COFICHEV, 2018). The Naked Foal Syndrome (NFS) observed in the Akhal-Teke breed alters the adaptive capacities of the newborn foal to temperature variations. Congenital stationary night blindness (CSNB), linked to the leopard pattern (found in Appaloosas, Miniature Horses and Knabstruppers for example) (homozygous state[20]) restricts visual adaptation to changing light conditions including at night[21] (Figure 4).

Figure 4 Horses with a leopard coat (Appaloosa, Miniature Horse, Knabstrupper) are at risk for CSNB (congenital stationary night blindness) (Source: Leonie Schop pema, https://cdn.pixabay.com/photo/2015/09/23/13/40/animal-953731_960_720.jpg, license pixabay)

Other practices profoundly alter the capabilities of the equid. Their justification will be evaluated by assessing the interests of the animal and humans[22]. Castration for example, completely deprives the animal of its reproductive capacity but can be justified by the overriding interests that will be developed later on in this text[23]. Other procedures remove a sensitive or functional part of the body. The caudectomy (tail-docking) severely limits if not prevents the horse from being able to use its tail (prohibited by Art. 21 AniWO), a neurectomy (partial removal of a nerve) deprives the horse of sensation in the affected region (commonly in the distal limb). The clipping of the coat, mane, or whiskers can disrupt thermoregulation, severely limit tactile sensation (vibrissae: Figure 40) or reduce the animals' means of defence.

2.3.6 Excessive instrumentalisation

Any coercive practice that aims to make an animal solely an instrument in human hands meets the definition of excessive instrumentalisation. Every use (sport, leisure, work) of an animal leads to a certain instrumentalisation, but it is only unjustified if it is all-encompassing and/or excessive. This is the case when a horse is used no matter what the circumstances are, for example when it is ill, poorly trained, convalescing or under the influence of medication. In other words, if it is used without any consideration given to its physical and psychological state and specific needs (OSAV & OFEV, 2017a).

[20] A gene is always composed of two parts called alleles. One allele comes from the individual's father, the other from his mother. They can be identical (homozygous state) or different (heterozygous state).

[21] 6.2.1.1.1 The leopard coat and congenital non-progressive night blindness, p. 220

[22] 2.7 Weighing the interests, p. 31

[23] 5.2 Castration, p. 97

The production of the hormone eCG (equine chorionic gonadotropin), used in veterinary medicine to manipulate the cycle of females of several animal species (pigs, cattle) can also be qualified as excessive instrumentalisation or cruel practice. This is particularly the case if brood mares are used exclusively as lucrative donors of massive amounts of blood and the foals suffer from malnutrition due to the exhaustion and emaciation of the dams or risks (stress, injuries) during collection. The production of eCG remains prohibited in Switzerland, but eCG products can be imported. Veterinarians should refrain from using them.

2.4 Welfare

The AniWA (Art. 3, Letter b) defines the concept of well-being: the well-being of animals exists if:

1. *husbandry and feeding are such that their bodily functions and their behaviour are not disturbed and excessive demands are not made on their capacity to adapt*,
2. *species-specific behaviour within the limits of their biological capacity to adapt is guaranteed,*
3. *they are clinically healthy*,
4. *pain, suffering, harm*[24] *and anxiety*[25] *are avoided*.

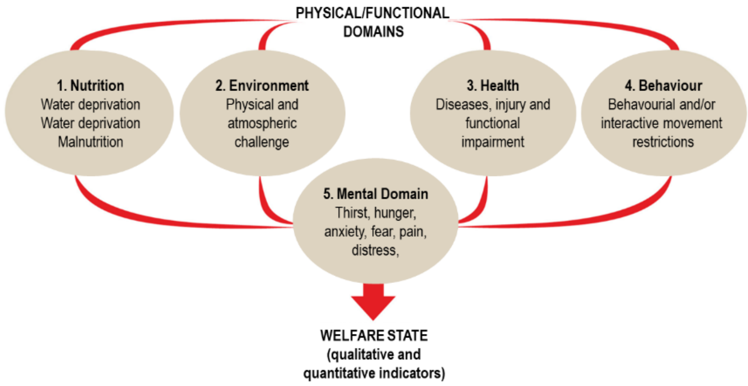

Figure 5 Representation of the state of welfare according to Mellor's five domains (based on Mellor et al., 2020, CC BY 4.0)

Thus, the welfare of an animal is identified as a sustainable state in which it does not subjectively feel negative sensations (pain, suffering) and does not suffer from having species specific needs remaining unsatisfied. Instead, it experiences an internal physical and psychological harmony with its environment that does not overtax its capacity to adapt (Figure 5). Therefore, any assessment of welfare will primarily focus on these issues.

2.4.1 Approaches to defining and assessing welfare

2.4.1.1 Introduction

The welfare of animals results from the way in which they experience and interact with their environment. It has long been recognised that these factors influence the state of welfare as well as how it is assessed (Broom, 1991, 1998; Broom & Fraser, 2007; Fraser, 2008; Lesimple et al, 2016; Mellor et al, 2020; Visser et al, 2003a, 2003b, 2003c; Zeitler-Feicht & Baumgartner, 2016). Furthermore, the definition of equine welfare, its assessment and the identification of strains that cause impairment are rapidly evolving with scientific knowledge and societal demands. The latter differ according to the equestrian culture of the populations concerned (breeding, stabling, use), as each group has developed its own perception of the horse and the notion of welfare. In this context, the major difficulty encountered by the people and institutions of the sector is to target the main problems in a timely manner and then to focus interventions (research, education, regulation) on the most urgent issues.

Several concepts have been developed

The Delphi method seems promising in this respect. It brings together a panel of experts and collects, evaluates and ranks opinions, views, judgements and knowledge from a variety of backgrounds. Its use in the UK (Rioja-Lang et al., 2020) has identified several major welfare issues (Table 1). The systemic (holistic) approach to the multidimensional nature of welfare takes into account the totality of the animal's environment and does not seek to reduce a problem to a single cause of strain that produces a single effect. It allows complex problems to be studied in an interdisciplinary manner, for example the wide range of interactions between horses and humans. Scientific research has explored this topic from various perspectives and compiled a large amount of knowledge (Boissy et al., 2007; Broom, 1991, 1998, 2011; Bruckner, 2019; Hall et al., 2018; Luke et al., 2022; Špinka, 2006; Yeates, 2018).

A second approach is to intuitively consider that welfare is linked closely to the emotional situation experienced by the animal. Negative emotions (pain, discomfort, hunger, frustration, fear, anxiety, exertion, work) are detrimental to the animal, whereas positive states benefit it (security, satisfaction, comfort, rest, abundant food). This view of welfare corresponds to the binary hedonism - pleasure (good for humans) and suffering (bad). Scientists (ethologists, biologists, veterinarians) counter that welfare can be mediocre to poor, with or without negative emotion; a sick or injured animal may not feel pain if it has been given medication. Therefore, the approach employed here associates welfare with perfect health, physiological biological functioning and the ability to cope with environmental changes (*coping style*). As for negative emotions, they are the consequences of biological mechanisms.

A third approach uses an animals natural (without human intervention) and feral habitat (environment, behaviour, the freedom to act according to instinct) as a reference for assessing welfare. Some scientists and practitioners idealise these conditions and believe that they can be transposed and applied in full to domestic husbandry (see the reflections of Yeates, 2018). At first, they

[24] 2.3.1 Pain, suffering and harm, p. 21
[25] 2.3.2 Anxiety, p. 22

appear very difficult to define, as they are flexible and variable according to circumstances. Aggression and flight instinct may also be particularly inappropriate in a domestic setting. However, it can be said that the freedom to show positive emotions and the ability to adapt remain key indicators of welfare and guides to improving existing systems. Today, animal welfare specialists are developing a pluralistic and interdisciplinary viewpoint with several approaches: positive emotions, good physical and psychological health, physiological biological functioning and species-appropriate behaviour. The five freedoms system is currently the best known.

Rank	Horse population (perceived prevalence)	Individual horses (severity, duration)
1	Lack of biosecurity and disease surveillance	Deferred euthanasia decisions
2	Deferred euthanasia decisions	Lack of recognition of behavioural signs of pain
3	Lack of understanding of the welfare needs of horses by the owner/caregivers	High parasite load
4	Fear, stress, or frustration during professional, sport or leisure use	Obesity
5	Obesity	Diet unsuited to equine behaviour
6	Indiscriminate or inappropriate breeding	Malnourishment
7	Poorly fitting and restrictive harnessing	Inability to establish normal social interaction
8	Unstable social groups	Negative emotional states
9	Diets unsuited to equine behaviour	Overwork
10	Poor weaning methods	Overweight riders

Table 1 Equine welfare issues in the UK, prioritised according to the severity and duration of welfare-reducing strains (as judged by experts) (perceived prevalence) (Source : Rioja-Lang et al., 2020; Creative Commons Attribution (CC BY) license)

2.4.1.2 Scientific principles of evaluation and perspectives

2.4.1.2.1 The five freedoms

As early as 1965, the Farm Animal Welfare Council (FAWC), a government body in the UK (Brambell, 1965), developed the first principles for assessing animal welfare. The Five Freedoms system followed in 1979:

- Free from thirst and hunger, with access to a suitable diet
- Free from physical and thermal discomfort
- Free from pain, injury and disease
- Free from fear and chronic stress
- Free to express normal behaviour.

However, these parameters reflect a perfect, theoretical state of welfare (Webster, 2005) characterised, ideally, by the absence of negative signs. On the other hand, the conditions essential for welfare and the sustainability of expected improvements are missing. Thus, this method is not sufficient to qualify if an animal welfare situation achieves a minimally acceptable, good or excellent level of wellbeing in practical situations (McCulloch, 2013). However, the impact of these broad principles has proved to be decisive. In Anglo-Saxon countries, it drove developments in veterinary medicine and animal sciences, and was instrumental in the adaptation of animal protection legislation in European countries, including Switzerland. Breeding and equestrian sports organisations subsequently drafted and implemented charters and codes of conduct.

2.4.1.2.2 Welfare is complex to understand in practice

Many aspects of welfare remain complex. The absence of negative feelings is no longer considered to be sufficient in defining welfare. An animal has expectations and must be able to feel positive emotions to ensure its welfare (ANSES, 2018; Boissy et al, 2007; Briant, 2017a, 2017b, 2017c, 2017d; Briefer et al, 2015, 2017; Hall et al, 2011, 2018; Henry et al, 2016; Lansade et al, 2018; Minero et al, 2018; Stomp et al 2018a, 2018b). However, positive emotions remain very difficult to assess. An example of when horses are considered to experience positive emotions is when they develop reciprocal and friendly affinities such as play.

2.4.1.2.3 The search for measurable, reliable and validated indicators

A large number of publications offer reliable indicators of animal behaviour, physiology (cardiovascular system, endocrinology, immunology) and environment, which make it possible to evaluate the animal's level of stress and its state of welfare. Examples of these indicators are body condition score, hydration status, equine-specific behavioural traits, signs of stress (blood cortisol levels and heart rate), pain and emotion, stable hygiene, signs of good or poor health, thermography, sleep (decubitus, a lack of recumbent sleep), recording of vocalisations or an electroencephalogram (Ashley et al., 2005; Bartolome et al, 2013; Briant, 2017c, 2017d; Briant et al, 2017; Briant & Genoux, 2018a, 2018b; Briefer et al, 2015, 2017; Cousillas et al, 2017, 2019; Dai et al, 2015; Dalla Costa et al, 2014, 2016, 2018; de Camp et al, 2020; Delattre & Touzot-Jourde, 2016; Doyle, 2019; Fenner et al, 2016; Gleerup & Lindegaard, 2016; Hall et al, 2011; Hintze et al, 2016; Kelemen, 2021; Lesimple, 2016; Maigrot et al, 2018; Maśko et al, 2019a, 2019b; McGreevy et al, 2012; Redaelli et al, 2019; Schanz et al, 2019; Stomp et al, 2018a, 2018b, 2019, 2021; Torcivia & McDonnell, 2021a, 2021b; Trindade et al, 2020; Van Loon et al, 2018, 2019, 2020; Wathan et al, 2015).

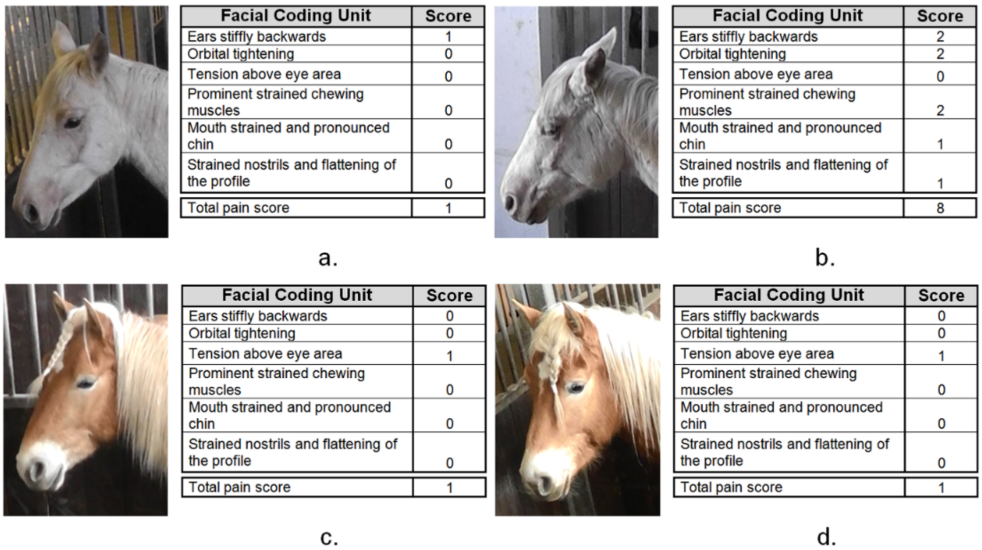

Figure 6 Illustrations of the 0-2 facial grimace scale for assessing pain levels (Source: Dalla Costa E et al., 2014, https://doi.org/10.1371/journal.pone.0092281.g003, Creative Commons Attribution License)

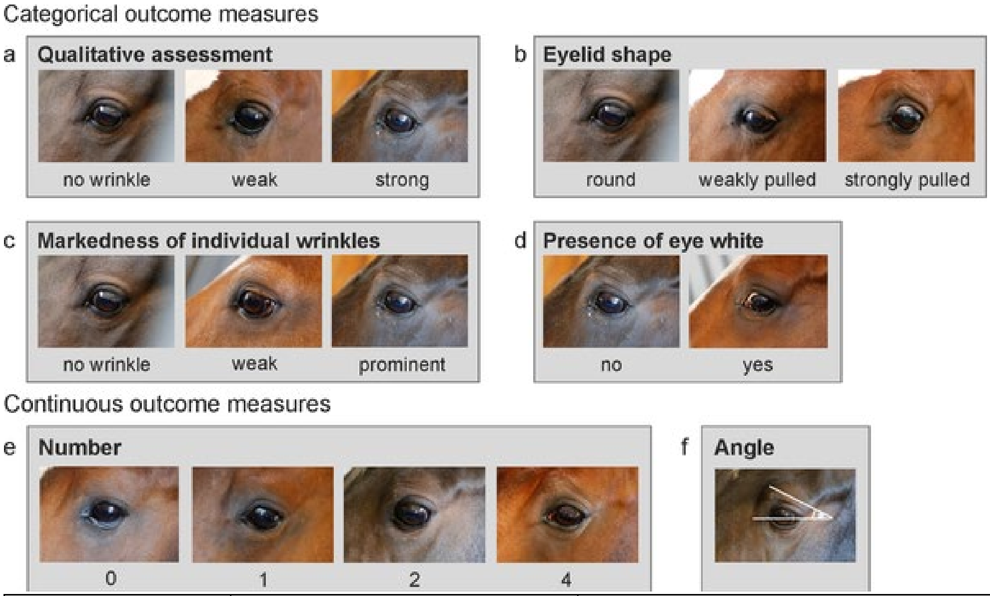

Figure 7 Illustrations of the assessment of emotional levels using changes in the eye wrinkle (Source: Hintze S et al., 2016, https://doi.org/10.1371/journal.pone.0164017.g001, Creative Commons Attribution License)

Principles of Wellness	Welfare criteria	Welfare indicators
Appropriate nutrition	Adapted nutrition	Body condition score
	Lack of prolonged thirst	Skin Fold Test Water availability + cleanliness
Appropriate accommodation	Comfort at rest	Quantity + cleanliness of bedding
		Dimensions of the stall
	Thermal comfort	Signs of heat stress (only for horses in pasture)
	Ease of travel	Frequency and duration of exercise
Good health	No injuries	Skin and mucous membrane lesions, swollen joints, lameness, prolapse
	Absence of diseases	Coat condition, discharge (eyes, nostrils, vulva), faecal soiling, consistency of manure, abnormal breathing, coughing, body temperature, heart rate
	Absence of pain	Facial grimace scale (ears, eyes, eyelids, contraction of jaw and mouth, nostrils), hoof condition, lesions at corners of the mouth, branding
Appropriate behaviour	Expression of social behaviour	Opportunities for social interaction
	Expression of other behaviours	Stereotypies, fear/fright tests
	Good human-animal relationship	Testing the human-animal relationship
	Positive emotional state	Qualitative assessment of behaviour

Table 2 The four main principles, 12 criteria and 31 indicators of the AWIN protocol for the evaluation of horse care conditions (Sources: Briant, 2017c, 2017d; Briant et al., 2018a, 2018b; Dany et al., 2017)

In terms of health, veterinarians and careful observers know what indicators to look for: coat condition, mucous membrane colour, rectal temperature, respiratory and heart rate, quality of droppings, behavioural changes, attention to the environment, posture and facial expressions, especially of the eyes (blinking and eyelid contraction), ears, gaskets, nostrils, lips and mouth (Figure 6, Figure 7).

2.4.1.2.4 The AWIN protocol

The AWIN (Animal Welfare Indicators) protocol is used by the owner or barn manager to assess the welfare status using both quantitative and qualitative indicators. The latter relate to the animal's environment, health and behaviour (Table 2). Scientific studies have demonstrated its consistency (Briant et al., 2017; Czycholl et al., 2018, 2019, 2021; Dalla Costa et al., 2016; de Souza Farias et al., 2021; Minero et al., 2015a, 2015b). An application available for smartphone users with an Android 4.0 operating system allows AWIN to be simply and practically put to use in horses (AWIN Italy, 2021) and donkeys (AWIN Italy, 2019).

Several criteria are not included, in particular certain legal requirements in Switzerland detailed in the manual for animal welfare monitoring (OSAV, 2018). It could be expanded to include these (minimum dimensions of housing and exit areas, lighting of stables, air hygiene, structuring for group housing, how much time they spend out on pasture, occupation of horses in work, distribution and duration of meals). In addition, there is a need to understand the welfare status of equids in their different environments, e.g. equestrian riding (Luke et al., 2022a, 2022b; Raw et al., 2020; Ruet A et al., 2021).

2.4.1.2.5 Latest developments

New technologies will certainly lead to substantial practical advances in welfare determination (AWIN Italy, 2019, 2021). Recent studies have increased our understanding of the role of facial expressions in assessing signs of poor welfare. They involve, for example, the automatic recognition of mimics on videos (Andersen et al., 2018, 2021; Lelláková et al., 2021; Lencioni et al., 2021; Li et al., 2021; Merkies et al., 2019). Since 2005, the International Society for Equitation Science (ISES, https://equitation-science.com/) is an international non-profit society that provides scientific and objective information on training, use and competition as well as on the harmonious relationship between humans and equids. Its aim is to support research into practices that either lead to or avoid strains that are detrimental to the welfare and dignity of horses. The behaviour of horses showing signs of pain under saddle is currently the subject of very promising publications. The pain ethogram (RHpE Ridden Horse Pain Ethogram) recently developed (Dyson S, 2021; Dyson & Pollard, 2020, 2021; Dyson & Thomson, 2021) appears to be a powerful tool for the assessment of musculoskeletal pain. In addition, it provides a tool for client education and a diplomatic way of communicating equine discomfort related to certain deficiencies (saddle fit, height, weight, the rider's position in the saddle and their ability to maintain a balanced seat).

Researchers have recently suggested that a horse's state of welfare could influence its brain activity profile in a calm situation. Initial results (Stomp, 2019, 2021) show that leisure horses kept in stable groups in the pasture all year round showed significantly less impaired welfare than horses living in more restricted conditions (individual box stalls, higher proportion of grain fed, low levels of turnout). In addition, distinct EEG profiles were observed corresponding to the welfare status of each subject, characterised either by the production of primarily slow (theta), or fast waves (beta/gamma).

2.4.1.3 Empathetic and anthropomorphic momentum

2.4.1.3.1 Erroneous views on ethology

With the shift to equids being regarded as companion animals, there has been a significant rise in empathetic concerns. Carried away by an anthropomorphic zeal[26], many people imagine that they can feel the emotions of these animals; they rely on their personal experiences. Inadequate knowledge can lead some people to let their own emotions take over.

Yet each species, regional variety, breed or individual has intrinsic characteristics (anatomical, biological, behavioural). In fact, these specificities constitute precisely their dignity. These characteristics cannot be ignored by arguing that there is a shared ability to feel emotions and pain, or by claiming that there is a small difference (or lack of it) between humans and animals.

As for the welfare of an animal, it essentially depends on how the animal experiences the situation in which it finds itself, and on the effort it has to make to adjust to it (coping). Its success is thus largely derived from its ability to adapt. Consequently, the behavioural response observed in this context is directly derived from animal perception. It is understandable why humans cannot assess the welfare status of an equid on the basis of what they deem is appropriate to ensure good living conditions for the animal. Instead of looking at the circumstances from the point of view of the horse and its needs, the human tends to impose his perspective onto the animal (I am cold, the temperature has dropped to 15°C, I am putting on a jumper, therefore I must blanket my horse as well). In this way, compassionate impulses, otherwise respectable emotions, turn out to be inadequate. This discrepancy in the way animal welfare is perceived is one of the difficulties to be overcome when discussing the various situations that may be encountered. Education can overcome these problems, particularly by learning not to place one's own needs and desires onto the horse, but rather to understand the perspective from which the animal views its environment.

The question today is how some socially or professionally credible people can collectively hold erroneous views on ethology with excellent intentions (the pursuit of animal welfare). Misconceptions may arise from extrapolations based on personal experience and used in situations to which they cannot be applied. They can also be explained by the intrinsic complexity of the situations observed or an imperfect command of scientific knowledge that leads to overestimating or misinterpreting certain behavioural traits. Finally, more prosaically, human beings do not always think clearly, they often reason too little, superficially or completely misguided. Humans also make mistakes out of laziness, a lack of interest or rigour, opportunism, or even bad faith (Michel, 2018).

[26] 2.4.1.3.2 Anthropomorphism, p. 29

2.4.1.3.2 Anthropomorphism

Equids are made up of features (anatomy, physiology, behaviour) that are very different from those of humans. Anthropomorphism consists of attributing attitudes, needs, reasoning or feelings to animals according to human criteria. Without thinking and instead of considering their animality and what they actually represent (their own value (animal dignity)), anthropomorphists refer to an animal's happiness instead of talking about its welfare. Anthropomorphism attributes typically human postures, intentions and singularities (jealousy, love, avarice, generosity) to animals. This attitude is inappropriate for assessing strain, as it does not consider the natural and fundamental needs of equids. In order to respect them, it is necessary to take into account their unique characteristics, i.e., the differences between two realities that are distinct on several levels, animality and humanity. This drift constitutes an obstacle to animal welfare which can lead, for example, to errors of understanding and assessment, overfeeding or unintentional mistreatment.

However, scientists also point out that in some cases (ethology, genetics), a trait observed in humans and mammals can be compared (comparative anatomy, physiology, ethology, genetics) and a homology postulated (aggressiveness, communication, genes). Nevertheless, it is up to science to critically question this approach. In order to correct initial errors made using intuition, researchers explore the differences, specificities, boundaries and similarities between species and explain the reasons for them. As much as possible, the pitfalls of anthropomorphism and, on the other hand, those of zoomorphism (attributing animal characteristics to humans) are avoided.

2.5 Natural needs

2.5.1 The notions of need and necessity

Figure 8 A horse chewing on a plastic bag at a landfill in Nigeria (Source: Videvo, https://www.videvo.net/video/horse-on-rubbish-pile-nigeria-04/458487/, Videvo Attribution License)

The satisfaction of physiological and behavioural needs is an essential element of welfare. It contributes to the definition of animal welfare and the five freedoms[27]. Need is a feeling or impression - an appetite - that instinctively demands to fill a perceived or objective deprivation. For example, equids have water requirements that they must fulfil by drinking water. They therefore have a need to find water. Their biological objective is to satisfy their need for water. This is known as thirst.

Necessity therefore consists of the animal's search for measurable and concrete goods that are indispensable for its successful development, maintenance and reproduction; thirst, for example. Needs motivate an animal to respond to necessities and to avoid harm; they drive vital behavioural traits (drinking). They are therefore of great importance because of their essential biological character.

The drive to satisfy needs can have harmful consequences and impair welfare. Not all needs are natural, especially when they do not correspond to biological requirements. For example, if a horse had the opportunity, it could satisfy its appetite for oats to the point of illness. As this grain is not found in large quantities in its natural environment, the steppes, no biological need arises under these conditions. The need to chew can also cause problems. When a green area is overgrazed and forage is scarce, the horse may start to graze on repulsive and previously neglected vegetation, even poisonous plants such as Ragwort (*senecio jacobea*) or Buttercup (*ranunculus acris*). In times of food shortage, free-ranging equids may also eat dried poisonous plants or plastic waste from rubbish dumps (Figure 8).

2.5.2 The natural needs of horses

Swiss legislation does not explicitly define the concept of natural needs of animals, but the AniWA (Art. 3, Letter b) summarises the conditions necessary in order for animal welfare to be achieved. These largely relate to natural needs, including food, species-specific behaviour and biological adaptability. The AniWO (Chapter 1 General Provisions, 2 Manners of keeping and handling animals and 3, Section 7 concerning equids) specifies several points. In short, to avoid strain, feeding and care should meet the needs of equids as judged by experience and knowledge of physiology, ethology and hygiene:

- Freedom of movement, including the prohibition (with some exceptions) of permanent tethering
- Social interactions between equids, in particular visual, auditory and olfactory contacts
- A forage- or grass-based diet or hay or straw to keep them busy
- Hoof care (correct hoof conformation and disease prevention)
- Turn out: safely, daily and in all weather conditions.

[27] 2.4.1.2.1 The five freedoms, p. 27

2.6 The various interests

When weighing up interests[28] (2.7 p. 30), the strain imposed on an animal is compared with the interests of the parties involved. The procedure is conducted under consideration of the dignity of the animals, as it is an ethical consideration. This means that strain imposed on an animal, which is considered to be morally relevant, can only be weighed against morally significant benefits. These are referred to as interests worthy of protection or overriding interests. The FSVO working group (OSAV & OFEV, 2017a; OSAV, 2017b) for animal dignity proposes that several interests must be taken into account. A few examples can be given that concern equids:

- Human and animal health
- Social compatibility between horses and the need to avoid risks (injuries, stress, anxiety)
- The practices required for particular uses of the horse in the absence of an alternative that provides the same result, but with less strain
- Improving knowledge
- Conservation and improvement of ecological conditions
- Protection against infringement of fundamental constitutional rights such as economic freedom or freedom of property.

Spatial planning, landscape protection and crop rotation areas are among the list of overriding interests[29]. In contrast, specific private interests are not considered when weighing the interests of the animals in terms of their dignity.

2.7 Weighing the interests

Animal protection legislation does not guarantee the dignity of animals in an absolute way. Humans can therefore subject them to strain but overriding interests must justify them. This legitimisation takes place within the framework of a weighing of interests. In short, the most morally significant values and interests are weighed against each other. These values do not only pertain to strain, but also interests. Therefore, not all interests are taken into account. A distinction is made between the most important benefits that morally justify strain, and those that do not; for example, private interests in the sense of specific individual interests. Those interests that are retained in the decision-making process must bring a significant benefit to society as a whole in economic, social or ecological terms, or be considered a fundamental right as protected by the Constitution (economic freedom, freedom of ownership). Human interests cannot therefore be considered more important than those of animals from the outset.

This procedure has a normative aspect that deals with the ethical question of how something should be, not how it is. It is a necessary element in order to be able to make provisions for cases where the legal requirements (minimum requirements) do not regulate all the details (exceptions, events, uses). However, the legislative authority established a list of prohibited practices (Art. 21 AniWO). These strains are considered unjustifiable (OSAV & OFEV, 2017a) and do not respect animal dignity (docking the tail, removing the whiskers, application of a tongue tie, rapping/poling, neck hyperflexion). A subsequent weighing of interests is therefore superfluous in those cases.

As a matter of principle, the weighing of interests consists of a detailed assessment of the situation in question. In one case, an intervention may be strain-related, but not in another. Knowledge of biology (anatomy, ethology, physiology) plays a decisive role in identifying the effects of a particular strain on the ability of an individual to lead a species-specific life. This knowledge must also be accompanied by the necessary skills (expertise, ability, experience, aptitude, knowledge) to be able to decide on the moral point of view in each particular context of the caring for and use of equids by humans. These points require the continued development of consistent ethical frameworks.

The process of weighing up the interests in a particular case consists of several steps of questioning and verification (OSAV, 2017b):

- How can the situation be accurately described: Proposed action (intervention, procedure, etc.), reasons, objectives, persons and animals concerned, circumstances, nature of strain, risks, legislation, observed trends?
- What scientific knowledge is required to assess the strain on the one hand and overriding interests on the other?
- What results does the stress assessment provide? What type and degree of severity does the animal have to endure (pain, injury, harm, anxiety, debasement, profoundly phenotypic or ability-altering intervention or abilities, excessive instrumentalization)?
- Is the dignity of the animal and/or its welfare affected?
- Is the intervention irreplaceable in achieving the goal, or can the goal be achieved with another intervention that subjects the animal to less strain? However, the possible alternatives should not result in a disproportionate additional strain (time, money)
- What conclusions does the balancing of interests lead to? Are there overriding interests that justify the coercive practice? In short, the usefulness of an action is not sufficient to legitimise strain. The intervention must be strictly necessary and there must be no other means of achieving the objective.

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[28] 2.7 Weighing the interests, p. 31

[29] 4.3.3.2 Spatial planning and environmental protection, p. 53

When considering the interests of equids, it is not appropriate to look at the situation too holistically. What is important is to consider the various individual animals. The advantages and disadvantages vary significantly depending on the breed, age, sex, conditions of care and use, and the dimensions of each animal's behavioural profile (sensitivity, reactivity, emotionality, gregariousness, musculoskeletal activity).

Finally, the result of a weighing of interests is not to make a judgement that represents a single, definitive truth. Another analysis, new scientific knowledge or a change in legislation may lead to a different conclusion.

2.8 The risks

A risk is defined as a subjective human perception of the probability that an individual (human or animal) or a group (organisation, society) will suffer, in the course of a given activity, harm of varying intensity that may negatively affect its interests temporarily or permanently. This harm may be physical, psychological, social or economic in nature or affect the environment of the individual or group. In semantic terms, a distinction is made between the meaning of the word danger (accident) and that of the term harm (injury).

Risk assessment is an essential step in ethical questioning. In theory, the probability of harm occurring is inversely proportional to its intensity. In other words, the probability of serious harm occurring is low, while that of minor harm is high. Depending on the probability and intensity of the damage, the risk varies between negligible and catastrophic. Finally, a third variable is the subjective perception of the level of risk associated with an activity. It may vary from one individual to another, for example depending on their ability to anticipate a consequence or an event.

2.9 The threshold at which the risk is unacceptable

Animals are considered unfit to consent to a risk arising from an applied strain (children as well by analogy). It is therefore up to humans to define the threshold of acceptability. This threshold depends on a few parameters:

- The benefit that can reasonably be expected in relation to the risk of harm incurred and its intensity
- The possibility of repairing the damage (irreversibility of the damage)
- The level of knowledge and perception needed to assess the likelihood of a risk occurring (e.g. experience)
- The existence (or not) of a less harmful solution as an alternative to the risky activity
- The ability to mitigate risk through appropriate measures

The process of risk reduction includes important steps such as objectively identifying the risks and their causes (risk factors), taking into account the visibility of the proposed intervention and public or media perception, studying the means to limit the amount of risk, implementing risk reduction measures, identifying the objectives to be achieved and monitoring the results (reporting).

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3 General ethical principles

Understanding the interactions between humans and equids is a key factor in optimising welfare. It allows the definition of broad ethical principles that take into account the requirements of respectful attitudes (Hemsworth et al., 2015, 2021; Kelly et al., 2021; Merkies & Franzin, 2021).

First, each individual who devotes himself to an animal of the equine species must assume a clear personal responsibility for its care and use (Art. 4 AniWA). This responsibility is expressed in the respect of the species' own needs (food, health, freedom of movement, social contact, occupation, feeling secure/safe, welfare, dignity) and a harmonious relationship with the animal based on mutual trust. Every human being must consider the principles of his relationship with equids as historically determined and therefore, over the course of time, subject to evolution, improvement and maturation.

A individual's commitments are manifested at key moments:

- Acquire recent and extensive knowledge about the horse as well as social sensibilities: natural needs, health, behaviour, biomechanics, appropriate use, intrinsic (animal dignity) socio-cultural and heritage value
- Remain alert to the dangers that equids may encounter, develop the ability to comprehend reality from an equine point of view - without attributing human characteristics and feelings to it. Remain aware that neither an affective regard nor an anthropomorphic view provides an adequate response in terms of respect for animal dignity
- Do not let ambition and economic self-interest take precedence over the demands of welfare and the dignity of equids, nor over those relating to their physical health. These points should be given paramount importance irrespective of breed, age, sex and use of the horse
- Base the use of an equid on a constant respect of its natural abilities and aptitudes, current capacity and its physical and psychological constitution. This should be done without the use of chemical substances, e.g., medication or unsuitable aids
- Objectively consider whether a sick animal can be expected to recover from an injury or illness (age, veterinary diagnosis, needs, general condition). If this is not possible, decide without delay to have the animal spared from further pain and discomfort caused by ailments or irreparable disorders, and have it put down by slaughter or euthanasia (Art. 5 AniWO). Appropriate disposal of the animal's remains is also a matter of ethical responsibility.

This attitude requires individuals and members of associations to cultivate a respectful, critical, honest and courageous approach to their relationships with equids and with one another.

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4 General ethical issues

4.1 The premise of these reflections

Since their domestication over 5,000 years ago (Librado P et al., 2021; MacHugh, 2017), horses and donkeys have provided us with food and drink, fertiliser (manure), the ability to transport merchants and troops, strength, speed and, incidentally, horn, leather and hair for a variety of common uses. Humans have taken advantage of their natural sociability to forge enduring bonds of interdependence and attachment. It can even be said that humanity as we know it would not have survived without this reciprocity. Equids have left their mark on our collective imagination.

The main expectations of equids continue to be endurance coupled with power, as a draught or pack animal, or their speed in activities such as riding, racing or driving[30]). They are also useful companions, therapists, mediators, coaches or partners due to their docility. Humans sometimes stay on foot to communicate with them, for example during ground work exercises. This gives the impression, false in some cases, that they are under less strain. The production of food, leather or hair remains discrete, even in countries where they are traditionally established[31].

The strains affecting equids are often a direct consequence of the domestication process: restriction of freedom of movement (stables, pens, tethering), a more or less severe limitation of social behaviour, acceptance of human authority, irreversible modifications of the phenotype through the selection of certain interesting characteristics (docility, strength, speed, hereditary diseases). In return, equids enjoy a dependable food supply, protection from predators, shelter and care. The domestication and use of animals is justified on the one hand by the advantages they enjoy, insofar as these outweigh the strains, and on the other hand by the benefits to society (contribution to psychological balance and development, recreation, various services), provided that the essential principles of animal welfare and protection are respected.

Domestication has not changed the original behaviour of the steppe horse and its biological needs. Even today, when humans allow it, a horse moves around grazing on high-fibre forage for two-thirds of the day and its social instincts motivate it to gather in a herd. Stable or pasture management and use that does not meet these needs can compromise their welfare and encourage the development of adverse reactions or stereotypies. In contrast, domestication has significantly reduced the level of flight and aggression, as docility benefits interactions with humans and improves safety.

Until the last quarter of the 20th century, military culture was mainly used as a reference to promote a high level of equestrian art and academic training of horses and riders (Weibel, 2011), which were essentially male activities. Thanks to the favourable socio-economic context and the feminisation of the sector, several disciplines developed beginning at the end of the 20th century, for example trail riding, vaulting (gymnastics on horseback), American riding (Western), Icelandic riding (5 gaits) and equestrian therapy.

4.1.1 Current reasons and motivations for owning and using a horse

How to understand this complex fascination that humans have for horses? In a great affective proximity, humans have revealed themselves to be sensitive to the emotional, cognitive and physical capacities of the horse, are attached to its aesthetics and frequently attribute a personality to certain animals. Unfortunately, advancements in knowledge of animal behaviour does not automatically equate to improvements in animal welfare. However talented humans may be in certain respects, man's authority over the animal remains limited. Because of this fact, humans often resort to trying to subdue (dominate or even force) horses in order to take advantage of their strength, speed and endurance. To avoid the discomfort of cognitive dissonance (two hardly compatible options: substantial empathy and consistent use), some horse owners give up riding and driving altogether. It is not possible in the context of this report to delve into the personal motivations that lead each person to choose how they orient themselves in the equine world. Among the very wide range of possibilities, the reasons and motives are likely psychological (rational and irrational passions, appropriation, domination, narcissistic needs, ambition), as well as relating to the degree of animal compassion, the socio-cultural situation and environment, the attraction of one of the multiple uses, the search for identification and social ties or the gender of the person (Digard, 1999).

Today, the horse and equestrian practices appeal to young women of urban or rural origin. In Switzerland, 67.8 % of horse owners are women (Identitas, 2021c). In rural areas, they seek recreational and pleasurable encounters with nature and animals - either alone or in small groups - and horses are the perfect answer to this need. If in the past the utilitarian relationship dominated (animals used to serve man), we are now witnessing a reconciliation between humans and the domestic horse[32]. Some people are even inclined to treat a horse as their equal. In the hierarchy of animals in the modern West, the horse has thus risen to the rank of companion alongside the cat and the dog (Tourre-Malen, 2003). For example, women very willingly add an aesthetic touch to the technical contingencies of equestrian practices during grooming (plaiting, shampooing) and tacking (enhancement of tack with for example sheepskin or bling, leather care, a varied arsenal of ointments and lotions, aestheticism).

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[30] 4.4 The use of equids in sport, p. 55

[31] 5.12 Meat production and hippophagy, p. 213

[32] 4.2 Equids: livestock or companion animals?, p. 42

In addition, there are significant gender differences in the way animals are treated, bonded, involved in animal welfare, kept, hunted and abused (Anzulewicz et al., 2021; Herzog, 2007; Herzog et al., 1991). Feminine orientation is positively correlated with welfare concern and empathy. There are many possible explanations as to why the female sex is generally more sensitive to this issue. Socio-cultural (upbringing), biological (maternal instinct) and moral reasons are suggested. Answers can also be found in the nature of equids. Several studies reveal that horses are receptive to intentions and facial expressions, the acoustic characteristics of a person's voice (baby talk), and to the valence of human emotions (Alterisio A et al., 2018; Lansade L et al., 2021; Malavasi R & Huber L, 2016; Proops L et al., 2013; Trösch M et al., 2019a, 2019b, 2020a, 2020b; Trösch M & Lansade L, 2018, 2019, 2020). This sensitivity has also been demonstrated in dogs (Jeannin et al., 2017).

Despite the increasing attention paid to the horse, education focuses on the technical aspects of riding and driving. The fundamentals of behaviour (body language, social nature) and the natural needs of horses in their relationship with humans are often in the background. For these reasons, the COFICHEV has carried out an analysis of the situation and weighed the interests in particular in the main areas of keeping, using and breeding equids.

4.1.2 A new look at equids

The way we have looked at equids in recent decades has been transformed[33]. There is no doubt that society's expectations have increased, as they now occupy a high position in the hierarchy of domestic animals. As we will see in the following chapters, the issues of their welfare and dignity are becoming more and more important in the thinking of authorities, organisations and individuals. This lifelong ethical and legal responsibility for an equid is shared by many people in the industry. It begins at conception and birth and must be considered in all aspects of breeding (reproduction, feeding, weaning, foals, mares, stallions). It continues during training and education for the various disciplines and for the elite includes the horse's competitive career. This responsibility also extends to retirement after the animal's career has ended and continues until the end of life. The person in charge chooses the most appropriate way to retire the equid (exit from training, sale, retraining, care of physical condition, respect of natural needs). On many occasions, the responsible person transfers this obligation to a third party. Although these decisions are solely the responsibility of the owner, the burden should be shared with the beneficiaries of the horse, e.g. organisations.

The guidelines of the federations regulate the safety and aim to protect the welfare of equids in competition or performing in other public events (folklore, shows). These provisions have a positive effect on the risks and welfare of registered equids only if they meet minimum (ideally optimum) requirements in relevant areas. These include infrastructure (temporary or permanent stabling, grounds, crowd access, animal traffic), equipment (tack, shoeing), the nature of the animals (age, physical condition), veterinary services (prevention, monitoring, routine and emergency care) and the prevention of abuse (brutality, use of drugs, doping). These regulations vary according to the type of event and the country.

4.1.3 The links between ethics and law

Ethics and law are related disciplines, as they aim at the binding regulation of actions. However, they differ in one decisive respect: ethics only has the persuasive force of a better argument, which is why it always depends on voluntary application. In contrast, the legislative system can impose regulations thanks to its democratic legitimacy and the monopoly of state power. While the law is always based on ethical premises, it only establishes binding values that reach a minimum level of consensus, such as the concept of animal dignity. In a pluralistic society, differing moral convictions circulate. Each person has the freedom to express their personal convictions regardless of whether they align with the consensus, provided that they do not violate untouchable principles.

In the case of equids, there are many issues that the legal system does not address. These can be discussed from the perspective of animal dignity, especially in the absence of binding standards. The idea of self-worth (animal dignity) serves, so to speak, as a guide to a more equitable attitude.

4.1.4 A brief portrait of the Swiss equine industry

The number of equids has more than doubled in the last 40 years. The number of equids in Switzerland increased from 55,000 in 1978 (Poncet et al., 2007) to almost 130,000 in 2021 as registered in the Animal Tracing Database (ATD). Of the 130,000 currently registered equids, 17,000 are housed outside of Switzerland for various reasons (Identitas, 2021a). Almost three quarters are kept on farms (Ackermann et al., 2017). Roughly half of all equids (49%) have companion animal status (Identitas, 2021b). This negates the necessity of keeping a treatment log and allows the administration of drugs that are prohibited for use in livestock[34]. Only a small proportion of equids (27%) are listed in the sport horse registry of the Swiss Equestrian Federation (FSSE, 2021). A distinction is made between various uses - in the broadest sense of the term - of equids:

- Productive work such as pulling and ploughing in agriculture or forestry
- Sport: for the purpose of physical and intellectual activity for the human athlete, this can be either competitive or non-competitive/recreational
- The keeping of equids that remain unused in a conventional way (young and old horses, broodmares and stallions at stud, ponies and miniature horses, donkeys).

[33] 1.1 Preamble, p. 13

[34] 4.2.3.1 Swiss legislation, p. 45

The concept of sport is characterised, among other things, by various physical and mental activities or challenges practised by athletes (human and equine) in the form of individual or collective games as professionals or amateurs[35].

While today the box stall and group housing have fortunately largely replaced the standing stall and tethering, the pasture and turnout conditions have not yet caught up. The exercise needs of the horse are not yet fully met. An equid should be able to move freely outside for a sufficient period of time, deciding on its own direction, speed and gait (walk, trot and canter) without a bridle or harness (Lesimple et al., 2020). In addition, the current sport and recreational use (a few hours per week) follows the use of equids in military, agricultural and economic settings (many hours per day) up until the early 20th century.

At the same time, feed manufacturers regularly put products on the market that do not always respect the basic needs of equids. For example, grain or pellets, if they replace hay as the main part of the ration, significantly reduce the number of times a horse chews per day (chew time) because of their low fibre (especially long-stem fibre) content. This necessitates more frequent preventive and therapeutic dental intervention (Bonin, 2007).

Finally, scientific research has brought new techniques and knowledge into the field of reproduction. These include artificial insemination, embryo transfer, cloning and genome deciphering. Equestrian sciences (ISES, 2021), ethology and welfare indicators[36] have also benefited from advances in equine research as exemplified by the aforementioned adaptation of the Swiss animal protection legislation[37].

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[35] 4.4 The use of equids in sport, p. 55

[36] 2.4.1 Approaches to defining and assessing welfare, p. 26

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4.2 Equids: livestock or companion animals?

4.2.1 Introduction

An increasing proportion of equids (48.7%) are registered as companion animals (Figure 9). A brief analysis of the data provided by Identitas AG shows that this trend is still very dominated (>55-70%) by Warmbloods, Thoroughbreds and breeds with a prestige culture (bourgeoisie, nobility, history of European courts). Draught horses, donkeys and hybrids are affected by this trend to a lesser extent (<35%) and the proportion of these equids registered as companion animals remains stable (Identitas AG, 2021a).

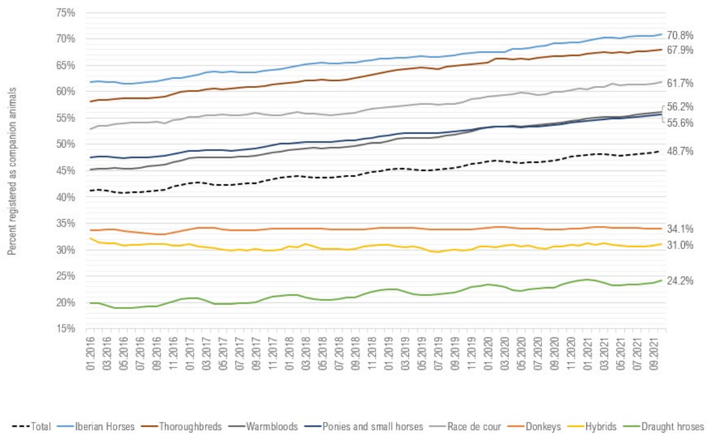

Figure 9 Evolution of the proportion of equids registered as companion animals in total and by breed/species (Source: Identitas AG, 2021a)

Today, equids registered in Switzerland are caught in a field of tension between the legal status of a livestock animal and the socio-cultural perception of a companion. Clearly, the equestrian population has very different views on their use. From a semantic perspective, the utilitarian nature of horses for sport and other purposes should classify them as livestock, but this is far from being the case. The various economic, legal and socio-cultural factors that are driving this development and the consequences of this recent trend need to be closely examined. Some of the salient aspects of recent socio-cultural relations between humans and equids have already been discussed above[38].

4.2.1.1 Stakeholder concerns

The question of whether an equid is registered as a livestock or companion animal concerns, in various ways, many circles: owners, the horse-riding public (sport, purchase, sale), professional circles (veterinarians, the food sector, boarding facilities, sales, training), sport and breeding associations and animal protection organisations. Those primarily interested in the use of equids wish to manage them freely with a minimum of restrictions to their freedom of movement. On the other hand, they also make substantial demands on the conditions of boarding and veterinary care. The priorities they set vary from one area to another and while there are no firm boundaries, major trends can be identified.

The owners of livestock

With regard to the use of equids for production, the question of their valuation versus potential loss of resources (finances, genetic heritage, pulling power, speed) remains a concern of high priority. The economic importance of meat products in the eyes of the owners makes it possible to generate a small profit which can offset the loss of resources. In addition, livestock owners wish to retain the widest possible choice of methods for end-of-life decisions[39].

The owners of companion animal equids

In principle, owners give companion equids a high and privileged status by claiming a very close emotional relationship similar to a family member. To ensure their health and welfare, owners are willing to make significant financial sacrifices and sometimes resort to advanced or even unnecessary veterinary treatment. On social networks, the appearance of participatory financing platforms (crowdfunding) can also be observed. The desire to keep a companion animal alive as long as possible, or even to replicate it through cloning in case of loss[40] reflects the richness of this emotional field.

Owners are still forced to address the end-of-life issue[41]. As a matter of principle, slaughter is considered a condemnable form of violence against a partner. Registering an equid as a companion animal also negates the need for certain administrative obligations (treatment log). This refusal to reify an animal (the animal is not a thing) runs the risk of treating it, in every sense of the word, in the same way as a human, or even of idolising it. If owners favour euthanasia, they are still confronted with the strains of this method, the negative impacts on the environment (Ahern et al., 2006) with cremation (energy, emissions) and the wasting of resources, particularly by foregoing the use of a valuable source of protein. The use of horse meat for the production of pet food opens up another area of tension (Figure 10). There would be great economic, social and ecological consequences of replacing horse meat with other protein sources, especially from a sustainability perspective (Vale, 2009).

Figure 10 Advertising horse meat as dog food (Source: www.fressnapf.ch, Retrieved 11.12.2023)

Owners are also seeking to distinguish their horse from the traditional production horse, which is reduced to the role of a processor of nutrients into good and services. In their eyes, the animal has been reduced to a kind of living machine, a victim of human domination, in reference to the production model of intensive and industrial breeding or to equestrian sports practices considered abusive by some. Their perception can go so far as to strongly condemn the use of companion animals, who they wrongly believe to be benevolent and harmless. However, despite good intentions, these beliefs can lead to equine inactivity, over-care (clipping, blanketing, over-feeding and inappropriate use of supplements, obesity), disrespect for their natural needs[42] and the neglect of equine interests. In order to understand the dilemmas of equine owners, the terms 'livestock' and 'companion animals' need to be addressed from a socio-cultural and legal perspective.

4.2.2 The socio-cultural issue

A polarisation between violence and benevolence

The above-mentioned polarisation shows a dichotomised distance between humans and animals: extensive with livestock and very close with companions. The representation that society has of equids conditions their socio-cultural importance (Figure 12). The quality and intensity of the relationships that humans have with equids depends above all on the interests they have in them (economic, sporting, relational).

[38] 4.1 The premise of these reflections, p. 39

[39] 5.12 Meat production and hippophagy, p. 213

[40] 6.6 Reproductive cloning, p. 245

[41] 5.11 The end of life of horses: euthanasia or retirement?, p. 207

[42] 2.5 Natural needs, p. 30

The concept of livestock originates from animal science[43]. Animal science was the first to emerge, as it has long been concerned with the use and improvement of types and breeds (Figure 11). Some believe that the domestication of all livestock is in essence a commodification or brutal exploitation, as claimed by anti-speciesists[44]. However, a nuanced approach is needed, as contemporary practices vary greatly between livestock species. The difference is enormous if one compares, for example, a poultry operation that keeps ten or more chickens per m^2 in a building of more than 1,000 m^2 to a farm with a couple of mares, a riding school with a few dozen horses or a pair of equids kept for leisure and a genuine interest in horses. In short, not all horse ownership or use is based on a production model.

Figure 11 Would she ever consider eating her horse? (Photo: Martin Rindlisbacher)

In addition, the socio-cultural status of equids is directly related to the use of the different species (horses, donkeys, hybrids) and breeds (Thoroughbred, sport horse, leisure horse, draft horse) determined by the historical context and local traditions. These various uses (Figure 11; Figure 13) do not allow an equid to be automatically attributed a specific status. Like the dog (herding, rescue, defence), it can fulfil different functions in sport, equestrian therapy or as a companion. Different points of view can thus clash; the use of horses in competition in a professional setting is fundamentally different from the emotional relationships in their leisure time. For hobby equid owners, there is no real reason to register their animal as livestock. This fact is confirmed in a survey (Erb, 2018), which shows that almost two thirds of the surveyed population (N=179/277; 64.6%) answered that they had registered their equid as a companion animal without considering the alternative.

Different meanings in different languages

Figure 12 Traditional use of the horse as a livestock animal. The horse is still very much part of the collective world view (Photo: National Stud)

In the socio-cultural context, the concept of livestock differs in different languages. In French the notion of *rente*, in Italian *animale da reddito* and in English *livestock* clearly refers to the use of the animal for economic benefit, even if other services can be expected from the animal. In contrast, the German term *Nutztier* (*nutzen*: to make use of, to use, to exploit), which can be translated as utility animal, emphasises function. Animals in this category are often grouped under the term livestock (*bétail* in French, *Vieh* in German and *bestiame* in Italian). As language also conveys culture, this nuance of meaning (livestock vs. utility animal) promotes unequal perceptions in the language groups. This discrepancy becomes even more pronounced when the root "*nutz*" is equated with exploitation and misuse, with a view only to the benefits that can be obtained, a definition that has negative connotations.

These views on the equine animal for production will only be consistent if an unequivocal definition can be agreed upon in several languages. The Foundation for the Animal in the Law (TIR, 2021a) offers a perspective that sheds light on this issue. *"Livestock are those animals from which humans expect, in their own interest, the provision of a specific service without it being aimed at an ideal goal. The field of activity of a livestock animal is very broad."*

Thus, in socio-cultural terms, a livestock animal in the broadest sense could be understood as being any species that is useful to human beings, whatever its use. At the extreme, wild animals in a zoo could be considered to be livestock, because of the educational benefit expected from them. The same would apply to laboratory animals for medical research. If this definition is taken in its broadest sense, the generic term "pet" would become almost obsolete or reserved only for animals that serve exclusively as companions. However, given the intensity of the relationships that humans have with such animals, one can legitimately imagine that everyone expects a sign of affection in return!

Figure 13 Using the horse as a co-therapist for people with disabilities (Photo: Swiss National Stud)

The TIR Foundation confirms this (TIR, 2021b): pets are "animals kept as companions in close proximity to humans not for economic interests, but for emotional intentions." The term has different meanings in different languages. Translated into German as *Heimtier* (*Heim* = home, house, home), it refers to animals living in the immediate vicinity of human beings, or even in their homes, such as dogs and cats. In English, the term pet refers to an animal that can be stroked. The

[43] Sciences and techniques of reproduction, selection and breeding of equids for the production of services or products (foodstuffs, leather, hair, but also strength and speed for work, sport or leisure)

[44] 1.4 Societal developments, p. 15

expression companion animal is also found in English and Italian - *animale da compagnia*. These expressions clearly reveal the main function of such animals.

Finally, many of the original livestock are now kept as pets or considered as such. These include horses, but also certain ruminants (dwarf goats) camelids and rabbits. Recently, the term exotic pets has been used to describe wild animals kept in households. These include mammals (rats, mice, hamsters, guinea pigs, ferrets, foxes), tortoises, snakes, lizards and birds other than poultry.

Fluctuating notions

Societal demands and socio-cultural representations show that companion animals are still used to provide services or pursue economic objectives. However, the fluctuating concepts of livestock and companion animals shape the entire legal system, particularly in the areas of animal protection and the legal personality of animals. These topics are even the subject of legal theses (Donaldson & Kymlicka, 2011; Flint & Woolliams, 2008; Francione, 2008; Francione & Garner, 2010; Holcomb et al., 2010).

4.2.3 Legal definitions

EU and Swiss legislation pursue equivalent objectives in the field of traceability and identification of equids. At birth, every equid is by default intended for food production. The owner may choose to exclude it from the food chain, in which case he or she must register this status change (to companion animal), which is irreversible. In contrast to European legislation, Swiss law differentiates between animals for production (intended for slaughter) and companion animals excluded from this sector. As discussed below, the EU differentiates between equids for slaughter for the purpose of human consumption, and on the other hand, equids for breeding and production, as well as those that are registered or permitted to be registered in a stud book (European Commission, 2015). The EU does not recognise the concept of companion animals.

4.2.3.1 Swiss legislation

Switzerland has chosen to differentiate between the concept of livestock and companion animals. These terms appear in several legal texts, notably the AniWO (CF, 2020c) and the Ordinance on Veterinary Medicinal Products OVMP (CF, 2020b). It should be noted that the provisions of the AniWO on the keeping and treatment of equids do not discriminate between equids classified as livestock or companion animals. This is an essential fact for ethical considerations.

Equids for production

For the AniWO (Art. 2, Para. 2, Letter a) livestock (French: *les animaux de rente*; German: *Nutztiere*; Italian: *animali da reddito*) are those species that are kept directly or indirectly for the production of food or for the provision of another specific service, or that are intended to be used for these purposes. Since 2004, the OVMP (Art. 3, Para. 1, Letter a) restricts the definition of the AniWO: livestock and bees are included in the species authorised for food production. This wording is restrictive, as it only adopts the direct link to food supply from AniWO. In this way, it excludes the use of livestock kept to provide other services. Furthermore, each equid is deemed to be a livestock animal from its birth (Art. 15, Para. 1 OVMP). The aim of the OVMP is to guarantee the traceability of medication administration to equids used for production purposes. Several measures protect against the presence of undesirable residues in foodstuffs. First, the production animal must be designated as a companion animal as soon as it is no longer intended for the production of food (Art. 15, Para. 2 OVMP). The change of status from livestock to companion animal is irreversible. Second, it is prohibited to administer a number of predefined substances and medications to livestock (Art. 10c, Section 2 and Annex 4 OVMP). People that keep and manage equids for production are subject to a number of administrative requirements (Chapters 3 and 4 OVMP). In particular, they have to keep a very precise treatment log for each equid and record the status of the stock of medication received. In the event of a change of stable (the equid moves to another farm), written confirmation is required that the animal has not been ill or injured during the last ten days and that all withdrawal periods following the administration of medication have elapsed. For their part, veterinarians must ensure the traceability of the substances prescribed to production horses (Chapter 4 OVMP). This definition focusing on animal food safety has become a necessity in the equine sector considering the ever-decreasing proportion of production horses in the Animal Tracing Database (ATD) (Figure 9).

Companion equids (pets)

The AniWO (Art. 2, Para. 2, Letter b) grants the status of companion animal to those animals that are kept for the interest of the animal or as a companion in one's own household or intended for such use. The OVMP (Art. 3, Para. 1, Letter b OVMP) applies this definition and adds the condition that companion animals are not used for food production. In the OVMP, the question of what status should be accorded to equids that provide a service other than food remains completely open, unless it is inferred by exclusion.

It is questionable what the exact parameters of the term *interest in the animal* are, as used in the definition of companion animals. There is no ambiguity in the case of cats, because apart from hunting mice, they serve primarily as companions. But for equids, is it man's interest in their physical and mental abilities that allow them to be ridden and harnessed, or is it the interest in the animal itself, a living being with no proprietary or gainful purpose, but whose emotional value exceeds an otherwise low market value? The answer remains to be found.

Consequences for the end of life of equids

The management of equids at the end of their lives is of concern to all those who keep equids. This was noted in the introduction[45]; a slaughterhouse is often seen as a brutal and inappropriate method for equids. This is why so many owners register their equids as companion animals and thus favour euthanasia by lethal injection[46]. Until 2017, access to slaughterhouses was strictly limited to livestock. In 2017, and again in 2020 (CF, 2020a), the Ordinance on the Slaughter of Animals and Meat Inspection (SMIO) introduced two changes that eased the regulations in this respect:

- The SMIO permits the slaughter of companion animals in low-capacity slaughterhouses (<1,500 slaughters/year or <60,000 kg meat/year), but they must be eliminated from the food chain (Art. 15, Para. 2 OVMP). This is facilitated by the fact that this type of small establishment allows the organisation of a more respectful and targeted killing for a particular equid
- SMIO allows on-farm slaughter of equids for meat production. The cantonal authority grants the authorisation and imposes requirements to ensure that it is carried out properly and hygienically.

Furthermore, it is emphasised that the owner of a companion equid can choose the method of death of their equid. In addition to killing in a small slaughterhouse, a competent person may stun the equid using a captive bolt followed by immediate exsanguination (bleeding out) or choose chemical euthanasia. In all cases, the disposal of the remains is the responsibility of the owner.

Other aspects of terminology

Article 27 of the Ordinance on Agricultural Terminology and the Recognition of Forms of Farming OTerm (CF, 2019) classifies equids as livestock for which coefficients are applied in the calculation of livestock units (LU) and forage-consuming livestock units (FCLU). These factors are used in particular to determine direct payments. The definition of livestock is thus of existential importance for farmers.

Finally, Article 641a of the Swiss Civil Code (SCC), enacted on April 1st, 2003, states that animals are not objects, but unless otherwise specified, the clauses applying to objects also apply to animals (FA, 2021). The status of an animal living in a domestic environment (Ger: *Tiere im häuslichen Bereich*; Fr: *un animal vivant en milieu domestique*; It. *animali domestici*), however, becomes relevant during the division of goods, for example in cases of separation or inheritance (SCC Art. 651a). The wording resembles that of a companion animal. It appears in other provisions amended at the same time, notably the Code of Obligations (Art. 42 Para. 3 and Art. 43 Para. 1bis CO). Together, these codes deal with property, succession, divorce and civil liability, but do not apply to animals kept for financial gain or commercial purposes (including livestock). As soon as an animal fulfils these conditions, the judge awards sole ownership to the party who is best able and willing to care for the animal.

However, there is still some doubt as to the exact species of animals that fall under these parameters, as there is not yet sufficient case law to the Author's knowledge. Companion equids could be included in this classification. The legal debate is likely to focus on the nuances between the French and German terms meaning domestic environment (Fr: *milieu domestique*; Ger: *im häuslichen Bereich*), which could centre on the geographical proximity of the animal. To date, the Federal Court of Switzerland has not clarified the scope of application of these new standards (Müller, 2017).

4.2.3.2 European Union legislation

The European Union has set up a system that fulfils the same objectives as the OVMP. The traceability and unambiguous identification of all equids is ensured by mandatory equine passports (with a medication follow-up form), electronic microchips (syn. Microchip transponders), a unique identification number (UELN, Universal Equine Life Number) as well as a central database for every country[47]. Once the horse has been identified, the owner can choose if their equid can be used for meat production at the end of their life or not. By default, all equids are considered to be potentially destined for the meat industry. Exclusion from this channel remains irreversible and must be registered.

European terminology

The designation of the status of equids in the EU differs from that used in Switzerland. The Commission implementing Regulation (EU) 2015/262 of February 17, 2015 (European Commission, 2015, 2018) established rules in accordance with Council Directives 90/427/EEC and 2009/156/EC. It provides for two different statuses in Article 27:

1) The status of the equid with regard to its eligibility for slaughter for human consumption
2) The status of the animal as a registered equid or equid for breeding and production.

The categories are further defined in other texts, Council Directives 90/427/EEC (Council of the European Communities, 1990) and 2009/156/EC (Council of the European Union, 2009):

a) *Equidae for slaughter*: equidae intended for slaughter, either directly or after passing through an approved assembly centre
b) *Registered equidae*: any equidae registered or registrable in a stud book, and identified by means of the identification document (equine passport)

[45] 4.2.1.1 Stakeholder concerns, p. 43
[46] 5.11.1.2 The strains of euthanasia: chemical euthanasia or slaughter, p. 209
[47] 5.4 Identification and branding of equids, p. 110

c) *Equidae for breeding and production*: equidae other than those mentioned in (a) and (b). This includes equids that are not registered in any stud book (unregistered origin) and have only one identification document.

Understandably, EU legislation does not define the legal status of an equid on the basis of socio-cultural perception. For reasons of food hygiene, it is based solely on its identity as recorded in an equine passport and the declaration of its owner whether or not it is intended for human consumption.

4.2.4 Conclusions and recommendations

4.2.4.1 The impacts of the equivocal definition of equids

The definitions of livestock and companion animal are neither clear nor harmonised in the AniWO and OVMP. The terms do not correspond to the most widespread socio-cultural perception, as companion equids provide services. Aware of the lack of legislative consistency, the FSVO responded to the question of what the different statuses signify (OSAV, 2021). *"Equids kept for leisure purposes are considered as companion animals in the Animal Protection Ordinance, those kept for recreation are also considered companion animals in the Animal Protection Ordinance, but in the Animal Tracing Database they can be declared as livestock or as companion animals."* Furthermore, by explaining that only equids registered as production animals can be slaughtered, it neglects the possibility offered to companion equids to be put down in a small slaughterhouse.

There are therefore many areas of tension between the protagonists of the equine sector regarding the socio-economic efficiency of the various branches (sport, leisure, breeding, social roles). On the one hand, the perceived difference between companion animals and livestock may be too great to allow ethical criticism. This can sometimes lead to abuse caused by instrumentalisation for economic reasons. On the other hand, in an animal-centred dynamic, feelings of affection, even love, are often nourished to the detriment of recognition of the animality, and therefore intrinsic value (animal dignity) of the animal. It should be noted that these affectionate relationships develop very similarly with equids as they do with other companion animals such as dogs and cats.

A distortion of the socio-cultural perception of equids

The socio-cultural position of equids has recently been skewed and polarised by the simple but clear-cut legal definition of the OVMP: livestock are allowed in the food chain and companion animals are excluded from it. Both categories are the result of their history. Without denying that there are intermediary pragmatic approaches, this binarism is characterised on the one hand by the attachment of the traditional (anthropocentric and masculine) equestrian world to utilitarian equids (breeding, sport, work and other services) versus those intended for slaughter. The followers of this rather conservative approach clash with people who perceive this treatment as outdated and prefer to participate in much more contemporary activities, as they orient their behaviour around the animal ("pet") and its welfare.

The focus on companion animals (according to the OVMP) offers opponents of hippophagy the opportunity to assert their ethical values and their opposition to practices they disapprove of. This culminates in the creation of an artificial hierarchy of equine types and breeds and a tendency to award companion animals being awarded a status of superior dignity and protection by exclusion from the meat market. In this way, they belong to an animal elite. This socio-cultural model could become progressively hegemonic and invasive, especially if it rejects traditional rural merits, which are much less glamorous or prestigious, or if it considers a different cultural environment that accepts the consumption of horse meat as having less moral grandeur. Such a perspective may well undermine the place of equids and push them into the sphere of luxurious and futile entertainment.

Finally, the valorisation of equids as companions to humans could lead the public to believe that their under-use or non-use represents an ideal. The risk, in the long run, is that the exclusion of equids from the food chain will be seen as a decisive step in favour of their welfare especially as recreational use is often mistakenly seen as benign and harmless.

Excessive care

More generally, the attitude towards companion animals, despite good intentions, can lead to phenomena that are even excessive in certain economic and socio-cultural contexts (Ahern et al., 2006; Holcomb et al., 2010; Thompson, 2019). For some people, it may even go so far as to accord their pets at least as much importance as their human counterparts (animal rights versus human rights). This tendency to overprotect and overvalue equids is particularly evident in the overabundance of industrial products and supplements, as well as in the way they are overly cared for. There is nothing inherently wrong with a healthy, horse-specific diet. However, in most cases, this is provided by forage without the addition of manufactured feeds, the making of which uses costly resources and competitive food sources. This raises questions about the necessity of such feeds and our relationship with non-renewable resources (Vale, 2009). A forage-based approach is all the more justified as equids, by consuming hay, directly value green surfaces, unlike humans (non-competitive food source). In the field of medical care, similar questions arise: how far can we go? In practice, what limit should be set, and how should it be justified? These points are discussed in Chapter 5[48].

The food chain and its taboos

Food taboos and ethical objections to horse farming are becoming increasingly important and play a central role in the decision to keep a horse either as a livestock or companion animal. (Legendre V et al., 2017). For owners of a companion horse the refusal to put it down in a slaughterhouse versus recognising it as an animal commodity are among the most decisive motivations. For

[48] 5.5 Excessive or inadequate care of equids, p. 113

half of the respondents (N=139/277, 50.2%), a horse should not be slaughtered, but chemically euthanised. For a third (N=99/277; 35.7%), the meat of their own horse should not be eaten (Erb, 2018). These ethical issues are discussed in the Chapter 5 on the end-of-life of horses[49] and the consumption of horse meat[50].

The ageing of the equine population and a decrease in the number of slaughtered equids are the first consequences of these ethical objections. For example, the proportion of equids over 15 years of age has increased from 34.9% in 2016 to 42.2% at the beginning of 2021, which corresponds to an increase of 20.9%. During a similar period (2016-2020), the number of slaughtered equids fell from 2,331 to 1,646, a loss of 29.4% (Identitas, 2021b, 2021c). This compares to approximately 5,000 equids in 2002 (Poncet et al., 2011; Schmidlin et al., 2013). The number of slaughtered equids has therefore decreased by 66.9% in almost 20 years. The decline in the quantity of domestic meat favours imports despite the exceedingly poor international transport conditions for horses destined for slaughter (driven by the government) being well known.

4.2.4.2 Conclusions

It has been observed that the perception of equids for production or companionship vary in discussions of their management conditions (breeding, stabling, use) and welfare status (Wallace, 2019). When justifying their various destinations, several ethical issues emerge due to conflicts of interest. These issues arise firstly from the availability of animals and the leeway claimed by the horse-riding population and secondly, the legal and societal demands for equine dignity and welfare. Each parameter will therefore be addressed in a detailed weighing of interests. A significant example of a dilemma faced by the owner of a livestock equid is the rare situation where the animal has an illness or has had an accident and requires medication prohibited for use in livestock. In such a case, if there is no viable alternative medication, the owner is forced to choose between retaining the animal's livestock status and having to slaughter it to avoid unbearable pain and harm without treatment or registering it as a companion animal to be able to treat it.

At this stage, it can already be said that the rudimentary and polarised discourse on two statuses of equids is not able to advance the debate. This shows that the transition between these two notions fluctuates and is largely dependent on the socio-cultural and economic situation. Clearly, definitions are neither clear nor definitive, but rather very complex issues that need to be addressed in a more systemic and holistic way.

In the mid and long term, the increase in the proportion of companion equids will have an impact on the Swiss horse industry. For this reason, the COFICHEV organised a symposium on March 31, 2021, with the theme *"The horse as a livestock or companion animal"* (COFICHEV, 2021; Trolliet et al., 2021). The major conclusion is that equids occupy a very special position among domestic animals. The profitability and usefulness of equids should also be justified when they are intended to provide services in breeding, competition, leisure, hippotherapy or equine mediation.

In the future, many issues will be addressed (social roles, diversification of agricultural activities, direct payments, value received, animal products, land use and planning, legal status, taxation, veterinary medicine, education, equestrian culture). In order to better understand the profound transformations of contemporary relations between humans and equids that await, efforts will be focused on socio-economic and cultural studies.

A few works have already explored these relationships from the perspective of the human and social sciences. The new equestrian codes and symbols associated with leisure equine use still need to be explored. Attention will be paid to other disciplinary fields such as history, sociology and anthropology, which deal more specifically with equestrian activities and gender relations. Indeed, the feminisation, rejuvenation of the equestrian population and the expectations of society are fundamental elements of the new definition of human-equine relations, equestrian practices and representations (Tourre-Malen, 2003; Digard 2007; Roche, 2008; Dashper, 2012, 2018; Adelman & Knijnik, 2013; Hedenborg, 2015; Adelmann & Thompson, 2017; Pickel-Chevalier & Grefe, 2017; Dashper et al., 2018; Pickel-Chevalier, 2021; Anzulewicz et al.) Several of these issues are addressed in the following chapters.

4.2.4.3 Recommendations

Improving communication

The process of changing the status of an equid from livestock to companion animal is still too strongly influenced by the owner's emotions beforehand. They are often guided by misconceptions about the real consequences of their choice or handicapped by a lack of knowledge about the possible alternatives if they remain as livestock. Communication needs to be improved in this respect. Moreover, very often the individual who has declared his animal as a companion equid is no longer the same person who has to decide how to dispose of the animal at the end of its life (slaughter or euthanasia).

Harmonising and improving the reporting process

The boarder of the equid assumes responsibility for maintaining the treatment log, but the owner determines the status of the animal. Therefore, a harmonisation of reporting requirements is desirable.

There is still some doubt about the registration of imported equids in Switzerland. European legislation differentiates between the status of equids admitted for slaughter for human consumption and that of equids for breeding and production. However, to the

[49] 5.11 The end of life of horses: euthanasia or retirement?, p. 208

[50] 5.12 Meat production and hippophagy, p. 213

Authors' knowledge, no consequent verification on this subject is carried out during the declaration in the ATD. The person responsible may be uncertain, particularly because of the discrepancy between his or her socio-cultural perception and the various information and interpretations drawn from the legal texts.

A review of legal definitions

It is essential to harmonise and revise the various legal definitions used to designate the destination or use of an equid in the various situations covered by the texts. The simplest way, in the Authors' view, would be to use clear terminology, in popular parlance *calling a spade a spade*. For equids, the proposal includes the following points:

- Abandon the concept of *livestock* restricted to food production
- Consequently, the term "*pet*" should also be abandoned to refer, by default, to all domestic animals that have left the food chain
- Introduce the term *equine livestock excluded from food production* to take into account other equine-specific utility services.

Some ideas for the future?

If up until now, these equids have been treated as livestock (working equids or equine athletes), then what does this mean for a large proportion of them in the future, as companion animals? There are many signs that the focus will no longer be on the social and legal status of equids but above all on the special relationship humans have with them and on the obligation of care and respect that must be given to their welfare and animality, irrespective of their function and usefulness in society. The position of equids as partners of humans cannot therefore be reduced to the status of what are currently known as *livestock* or *pets*.

This is the most likely focus of public and animal welfare attention. Prescribing rules and assuming that they will be complied with on the basis of individual responsibility and common sense will no longer be sufficient. There will have to be clearer legal definitions and competences. For example:

- Communicating major threats to welfare to the responsible individuals in various situations
- Concrete and effective ways to reduce risks
- Use of the power of authority (supervisory measures and decisions in cases of non-compliance with established and published standards)
- Periodic evaluation and publication of expected impacts (monitoring and reporting).

Socio-cultural data about the position of equids in society is still limited and needs to be developed. Understanding public perception will improve the ability to inform interested parties about equid ownership, uses and practices. Finally, it is essential for the whole equine sector that equids retain their traditional place in agriculture, as their boarding, irrespective of their status, generates an important part of agricultural income.

In summary, the current legislation only allows the choice to declare a horse as either a livestock or companion animal. This restriction of choice does not appear to be useful and the terminology should be adapted to contemporary perceptions.

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4.3 Housing of equids

4.3.1 Introduction

In the mid latitudinal region, domestic horses live in very controlled conditions. The traditional stabling in individual box stalls is still the most common form of housing in Europe. Switzerland is no exception, although group stabling has increased in recent years (Bachmann & Stauffacher, 2002; Hartmann et al., 2012; Knubben et al., 2008; Siegel et al., 2018). The AniWO (CF, 2020) and the FSVO Ordinance on the Husbandry of Farm Animals and Pets (OSAV, 2018) regulate how equids should be kept and treated, as well as the training required to perform these tasks. The FSVO also publishes a number of information and fact sheets explaining the legal basis of these requirements (CF, 2020; OSAV, 2020a, 2020b).

The legislation does not address all issues

The legal provisions fail to precisely regulate certain issues. These are often a matter of personal responsibility and will be dealt with in detail in the following chapters[51, 52]. They will be the subject of a detailed ethical assessment from the point of view of the dignity of the equids[53, 54]. Examples include the keeping of intact male equids, castration, end of life, branding, excessive or inadequate care, under occupation of equids kept in a poor environment as well as auxiliary equipment employed in the boarding and use of equids. This document deals mainly with the domestic horse. Donkeys and hybrids (mules and hinnies) are only discussed on the margins, but have some unique features to consider.

Ethical issues affecting donkeys

Next to the horse, the donkey is the only other domesticated equine species. Together with its hybrids, they account for almost half (49.8%) of the 118 million equids in the world (FAO, 2021). They are vitally important for the transport of people and goods as well as agriculture in many countries in Africa, Central and South America and Asia (The Brooke, 2021a, 2021b). The donkey requires special care and management, as particularly arid regions are its native habitat. The report Species Survival Commission - Equid Specialist Group (Moehlmann et al. 2002) provides information on the eco-ethology[55] of the wild donkey, the living ancestor of our domestic donkey. It highlights the existence of biological differences between the donkey and the horse that are significant for their welfare, particularly in their requirements for boarding and their use in a temperate climate (HNS, 2017, 2018; Verdoux, 2016). This raises the question of the extent to which donkeys and horses can be kept together.

Figure 14 Transporting eucalyptus bundles and wood from the Entoto Hills for sale at the market in Addis Ababa, Ethiopia (Source, Ji-Elle. https://commons.wikimedia.org/wiki/File:Addis_Abeba-Collines_d%27Entoto_(9).jpg, CC BY-SA 3.0)

[51] 5 Specific issues: management and use of equids, p. 91

[52] 6 The use of equids in breeding, p. 219

[53] 2.7 Weighing the interests, p. 31

[54] 4.1.3 The links between ethics and law, p. 40

[55] Eco-ethology (behavioural ecology) is a scientific discipline that studies animal behaviour in its natural environment. See http://www.behavecol.com

Donkeys and hybrid equids are considered to be animals owned by indigent owners (Figure 14) or as frustrated beasts of burden. They do not enjoy the same consideration as the horse, which is commonly perceived as a more noble creature. Every year, with almost total indifference, the trafficking of donkey skins on the African continent costs the lives of four million donkeys for the manufacture of *ejiao*, prized in Chinese medicine (de Greef, 2017). In Europe, the donkey has not lost its position as an oppressed animal in principle, even though it has been irrevocably relegated to the category of companion animal (Kugler, 2008). The lack of knowledge about care requirements for donkeys and hybrids results in abuse, including overwork, poor care and inadequate stabling conditions – for example when they are not fed properly and become obese, or are used as toys for children.

4.3.2 The management of equids in the conflicting field of Swiss legislation

4.3.2.1 Current situation and perspectives

Environmental impact and sustainability

The nature and landscape conservation communities are aware of the considerable impact of keeping horses. The clientele of riding schools leads to a significant increase in motorised traffic in rural areas. The Ordinance on Air Pollution Control (OAPC) requires that livestock facilities be located at minimum distances from residential areas, as odour emissions can be a nuisance for residents (Steiner et al., 2018). These provisions make it difficult to plan in building zones.

One study examined the environmental impact of livestock farming in Switzerland (Annaheim et al., 2019a, 2019b); the larger and heavier the animal, the greater the impact. Horses are expensive in terms of energy, resources and land. This includes the transport of feed and bedding, the amount of water used to maintain riding arenas and the loss of arable land due to equestrian infrastructure. Feed is particularly important in the ecological balance of the equine sector, but its weight would be greater if the feed were consumed by species with a greater impact (dairy and beef cattle or other food animals). The impact of domestic animals only represented about 1.2% of the total environmental pollution caused by Swiss consumption in 2015. Nonetheless, this finding implies the need for the equine sector to adopt a more sustainable and respectful approach. From a long-term perspective, the holistic concept of agroecology (De Cadolle, 2018; Fink, 2019) could improve the environmental, economic and societal performance of the sector. Below is a non-exhaustive list of some of the ecological principles, that should be followed:

- Raising the levels of awareness and training for all those involved in the sector's relationship with the environment
- Reducing the impact of equestrian facilities and practices: resource-sparing management (reversibility, lighting, heating, watering), using ecological materials, recycling manure, emissions reduction (vehicles), fertilisers, phytosanitary products and pesticides; reducing fossil fuel consumption, (electricity, water); increasing the production of renewable energy (photovoltaic, methanisation, heat pump)
- Optimising the use of pesticides to reduce their impact on the environment, limit resistance and reduce costs
- Mixed cattle/equine grazing: limits parasite pressure, enhances plant biodiversity, but difficult to implement (fencing systems)
- Improving the management of grazing plots (rotation, grasslands enriched with leguminous plants, trees, hedges, agroforestry, range management). Effects: reduction of nitrogen fertilisers and concentrates, increase in the value of forage production, enrichment of biodiversity, grasslands, soil and the countryside, carbon storage.

4.3.3 Policy and regulatory context

4.3.3.1 Mandatory training

The AniWO requires boarders of equids to be trained and to prove that they have the necessary knowledge to look after them properly. Persons who board more than five equids must present a certificate of competence obtained after a one-day theoretical course (Art. 31 Para. 4 Letter b and Art. 198 AniWO). Those who board more than eleven equids professionally must follow a specific technical training course independent of their profession (Fr: *FSIFP*, Ger: *FBA*) which includes a theoretical part and a practical training period (Art. 31 Para. 5 and Art. 197 AniWO). Finally, on farms with a total number of more than ten livestock units for equids used for production, the person responsible for their care must have completed an agricultural training course attested by a diploma from a vocational school or university (Art. 194 AniWO). One livestock unit is defined as the amount of feed consumed and total manure produced by an adult cow (650kg). An adult horse is considered to be 0.7 livestock units, whereas a pregnant mare or a mare with a foal at foot is counted as 1 livestock unit (foal included).

In this area, it may be noted that the French Republic requires any boarder of an equid to attest to his knowledge of the specific needs of the species. The law of November 30th, 2021 sets out the requirements with the aim of combating animal abuse and strengthening the bond between animals and humans (RF, 2021).

4.3.3.2 Spatial planning and environmental protection

The average density of equids per km^2 of utilised agricultural area (UAA) has increased in Switzerland. It is estimated to be 12.5 equids/km^2 UAA compared to 8.4/km^2 UAA in 2008 (Poncet et al., 2007, 2009). In order to board and use horses, suitable infrastructure is required. However, public space is overloaded by motorised traffic and public entertainment (dog walking, cycling, hiking, running). The safety of humans and animals is no longer guaranteed.

The environmental community also highlights the high ecological footprint of boarding equids under certain circumstances. In the case of high equine population density, overgrazing is observed with soil compaction and degradation (impoverished botanical flora, weeds, trampled ground).

Responsible and appropriate care and use depends on the infrastructure. On the one hand, animal protection legislation prescribes a number of facilities and practices that are very difficult to achieve in agricultural areas. Additionally, society demands extensive space (stables, turnout areas, pastures) to board horses. For this, the rural setting represents the ideal environment. However, grazing pastures are lacking or remain unusable outside the vegetation period. All-weather paddocks with a structured surface make up for this and allow the animals to be turned out all year round.

Figure 15 Horses living in a residential area (Photo: Swiss National Stud)

Land-use planning legislation has drastically reduced the keeping of sport and leisure horses in agricultural areas for a long time. Agricultural zones, where it is forbidden to build on, reserves good arable land for food production. In 2013, the Spatial Planning Act SPA (FA, 2019) was revised after numerous parliamentary interventions and discussions over almost 10 years (CEATE-N, 2012; CF, 2012). The most recent provisions (Art. 16a^{bis} SPA) came into force on May 1st, 2014 and introduced several relaxations on regulations for the boarding and use of equids in agricultural areas (ARE, 2014; FA, 2019). The Federal Office for Spatial Development (ARE) provides an overview of the new law (ARE, 2015). In particular, the law simplifies the establishment of horse boarding facilities and specifies the criteria for the conformity of buildings and facilities in agricultural zones. However, these simplifications only apply to existing farms[56] that have pasture land and produce the majority of their roughage base requirements[57]. Two or more farms can join together to form a community. If the community reaches the minimum size requirement, it benefits from the same conditions.

More specifically, the SPA legalises new installations and constructions for boarding horses (stables, all-weather turnout areas adjoining the stable, farmyard buildings for working the horses, warehouses, shelters, fences, manure areas, grooming areas, tack rooms, changing rooms). On the other hand, the construction of riding arenas, parking spaces and new residential buildings remains illegal in agricultural zones. Experience has shown that most cantons do not make use of their room to manoeuvre within the legislation and continue to grant only the minimum surface area stipulated in the AniWO. In addition, a draft revision of the SPA, which is currently under review, proposes to further tighten the requirements for rezoning land in agricultural areas and increase the decision-making powers of the cantons (ARE, 2021).

The boarding of horses for leisure purposes has also been relaxed and clarified (Art. 24e SPA). In particular, uninhabited buildings outside the building zone may be used for boarding these horses. The owners must live in the vicinity and the planned conversion work must ensure that the minimum conditions are met.

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[56] Existing agricultural enterprises with a total labour requirement of 1 SLU (standard labour unit). The cantons may lower the limit to 0.6 SLU. As a reminder, 1 LU horse = 0.03 SLU (1 adult horse = 0.021 SLU) and 1 ha of agricultural land = 0.028 SLU.

[57] It is generally assumed that 70% of the fodder must come from the farm and 0.245 ha/horse.

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4.4 The use of equids in sport

Introduction

The involvement of equids in leisure and competition has become the main motivation for owning and boarding them. The population that looks after them (boarding, using, caring for, feeding) numbers nearly 300,000 individuals (Poncet et al., 2007). In addition to the mental and physical health benefits for people who participate in equestrian sports in one form or another, events - especially horse shows and races as well as breeding presentations - are also of interest to society in general, not least due to their entertainment and economic impact. In Switzerland, these events (horses, personnel, infrastructure, material and equipment, events, teaching, various services, pari-mutuel betting) are among the five sports with the highest turnover (Berwert et al., 2007; Stettler et al., 2008). Other European countries have also identified the economic importance of equestrian sport (Deloitte, 2013; World Horse Welfare and Eurogroup for Animals, 2015).

On the other hand, accidents occurring during equestrian sport have a negative social impact. The number of horse related injuries represents 2% of the total reported injuries (416,460 in 2015). The average costs (2012-2016) from equestrian related injuries correspond to 3% of the total costs incurred by all sporting activities. In both number and cost of injuries, equestrian sport, in the broadest sense, is far behind winter and ball sports (Lamprecht & Stamm, 2020). In addition to considering the financial aspects of the sport, the physical and psychological health of equids used for sport must be taken into account (veterinary care, loss of value of the equids).

Other relevant factors include the diversity of the facilities and infrastructure necessary for the practice of the various disciplines (show jumping, dressage, driving, western riding, racing), the importance of dietary errors on digestive system health as well as the disparate skills and ambitions of the people involved (amateur or professional status, sex, age, function, culture, country of residence). There is an extreme wealth of constraining factors that can positively or negatively affect the welfare of the equine population. In this context (from hobby to high level competition), the improvement of the conditions of use of the equids remains a delicate operation to implement. Their relationships with humans are complex and very heterogeneous, particularly due to their multiple roles. For some, equestrian leisure activities represent opportunities for pleasure and entertainment. For others, horses are athletes in demanding competitions and a source of income. After this preamble, some legitimate questions arise:

- Can recreational or competitive use in equestrian sport be detrimental to the welfare and dignity of a horse?
- If so, what measures should be taken to improve the situation?
- How should equestrian authorities and organisations or others in positions of authority ensure that competition horses are not are not subjected to strains that disregard their dignity and that they are provided with optimal living conditions including board, transport and use? Should national and international federations impose, for example, season breaks or a limited number of engagements?

With good reason, the Swiss Equestrian SE (former FSSE Fédération suisse des sports équestres, Swiss Equestrian Federation) questions whether competitive amateur and high-level competitive sports can be reconciled with the welfare of the horse (FSSE, 2020h). Indeed, in the minds of the national federations of equestrian sports and racing the guaranteed welfare and respect for the dignity of equids remain essential factors for the sustainability of the industries. However, some believe that the deep roots of equestrian sport in certain segments of the population contribute significantly to an immunity against threats.

This position may not be sufficient to produce significant advances for equids (Bergmann, 2015, 2019a, 2019b). Indeed, the perception of the concept of welfare is often only translated into regulatory terms of health, biological functionality and a fight against the most blatant violations. For many officials, sport horses retain a primarily utilitarian value (performance, gambling, financial gain, market). As a consequence, these authorities accept that training and competitions at event parks and on the racecourse are part of this model. Thus, the majority focus on productivity, efficiency and the optimisation of economic characteristics to influence the public's perception of the horse industry and the way they view animals. This approach makes horses very vulnerable to unethical treatment. Therefore, it does not always respond to the criticisms and moral questions that emerge from the changing social norms and values of today.

It must be acknowledged that the weighing of interests remains confusing for the governing circles as this procedure aims to judge a moral dimension. In this context, the strain imposed on animals is set against values and benefits that are shown to be morally important and worthy of protection[58]. The answers to welfare issues can be found in the knowledge provided by scientific research (investigative methods, objective assessments and measurements, indicators, surveys). Relevant studies and publications concern equestrian sports, equids (ethology, physiology, biochemistry, health, genetics, pathologies) and the strains imposed on them (disturbances, pain, suffering, discomfort, fear, physical and psychological capacities, doping, medication). They aim to understand the concepts of welfare and dignity, social, economic and environmental aspects, as well as the benefits that recent knowledge in the above-mentioned fields can bring.

The federations are encountering significant resistance to innovations and to the call for the adaptation of behaviours; a logical reflection of the attitude of those active in their various fields (breeding, sport, judging). The results of the studies appear to be inappropriate, inapplicable or hasty. In addition, there are power struggles between the specialists, managers and those working in the field. All these difficulties illustrate the challenges of communication. Scientists use various channels (journals, conferences, popularisation) to disseminate their findings. Today, these resources can be found on digital platforms (most often in English), but subscriptions are expensive. Abstracts and some journal articles are published as open access. Equestrian periodicals and federations popularise these results according to their readership and its sensitivity.

So the main question remains: can competitions involving horses be justified? If so, how can they be adapted to make them ethically and socially acceptable? Recommended areas for examination include equipment (aids), farriery, transport, medication and doping, training of young horses and the use of broodmares in sport. The next two chapters will address these particular aspects in the sections on use[59] and breeding[60].

4.4.1 Description of the current situation, trends, strains and risks

4.4.1.1 Equestrian entertainment practices for amateurs

According to figures published in 2020 by the Swiss Sports Observatory (SPORTOBS), approximately 200,000 adults and children are involved in equestrian sports in Switzerland. This population includes 140,000 people aged 15 or over (Ø 39 years; Ø 80 days/year). They represent 2.0% of this age group (0.2% growth between 2014 and 2020). 73% are young women (Lamprecht et al., 2020; Lamprecht & Stamm, 2020). In addition, SPORTOBS identified around 50,000-85,000 adolescents (<15 years; roughly 93% female) who are learning the basics of horse riding or another equestrian sport (Lamprecht et al., 2008, 2015). Only 24% of those who practice the sport belong to a club (Lamprecht et al., 2015). Income level plays only a minor role in the choice of this sport (Poncet et al., 2009; Lamprecht et al., 2015) and the majority of the Swiss riding population belongs to the middle class, not the affluent.

The activities - recreational and fitness - are complemented by riding lessons and training for participation in competitions excluding high-level competition. The most common exercise is journeying into the countryside with the horses, either individually or in a group, either ridden, in a carriage or on foot, leading the horse. These activities also have a mental training component (concentration, memory, handling skills, endorphins). They are very time-consuming (travel, interaction with the animals) but provide a great deal of satisfaction (caring for the animals, stable and facilities, physical activity). The discipline chosen (dressage, jumping, eventing, endurance, driving, western) depends on the individual interests, aptitudes, motivations and socio-cultural background.

Activities with equids are nowadays particularly popular with young women; they tend to show a more charitable and caring attitude than men when caring for them and display a higher appreciation of sensitive creatures. The proportion of women in equestrian sports is similar in the rest of Europe as in Switzerland. In Germany, for example, 78.4% of the members of the German Equestrian Federation are women (Deutsche Reiterliche Vereinigung, 2019). Women are the most supportive of and most affected by equine welfare (Ammann, 2020; Visser, 2012). Other chapters discuss the consequences of this epiphenomenon that affect the entire industry[61, 62].

Many people, aware of their shortcomings, also acquire general knowledge of hippology and ethology (welfare, learning processes). To this end, the SE has set up a three-tiered education programme: basic training, brevet and license[63].

4.4.1.2 Competition

The SE has approximately 20,000 registered athletes who participate in equestrian competitions. 9,000 have a license and 11,000 have a brevet, which allows the athlete to compete up to level B in FEI (International Equestrian Federation) competition (FSSE, 2020d, 2021a, 2021b). The hierarchical organisation of national and international events allows horses and individuals to start at a level adapted to their respective abilities. The most difficult categories bring together the best-performing pairs (athlete-horse) and thus engage in maximum intensity activities in various disciplines. Finally, equestrian sport is among the few disciplines where

[58] 2.7 Weighing the interests, p. 31

[59] 5 Specific issues: management and use of equids, p. 91

[60] 6 The use of equids in breeding, p. 219

[61] 4.1.1 Current reasons and motivations for owning and using a horse, p. 39

[62] 4.2 Equids: livestock or companion animals?, p. 42

[63] 4.4.1.5 Education, p. 69

both genders coexist in the same space and compete together. However, this does not translate to equality, as the proportion of women is lower at the highest level (Poncet et al., 2007).

4.4.1.2.1 High level competition

In each discipline (show jumping, dressage, eventing, driving, vaulting), the more demanding events, extended to all nations, are organised under the aegis of the FEI. This institution classifies the levels in increasing order of difficulty, denoted by the number of stars (1* to 5*). Competitions are open to categories of able-bodied athletes (children, juniors, young riders, adults) or those with disabilities, as well as young or adult horses. Worldwide, the number of competitions increased by 66% between 2009 and 2017. In Europe, the increase is very marked (>100%) in the countries of the former Eastern Bloc and in the countries surrounding Switzerland (FEI, 2017a). In Switzerland, the number of competitions has been in slight decline over the past decade (FSSE, 2020f).

Riding and showing horses for others in a professional capacity developed as a profession in the 20th century. The participation in difficult competitions, horse trading and the training and education of young athletes (equine as well as human) provides an income for professional trainers and riders. In addition, professional sport is distinguished from amateur sport by the financial involvement of sponsors in the dyad (athlete-mount). This type of occupation therefore puts decisive pressure on the athlete as he knows that this third-party sponsor is often looking for an opportunity to turn a profit by selling the horse after a few seasons. Indeed, the market for top quality athletes is always very dynamic, especially before important events such as the Olympic Games or the World Championships. In this context, any illness or injury jeopardises marketing, especially when treatment requires the interruption of training and/or the use of medication that is prohibited in competition.

4.4.1.2.2 Racing

As far as Thoroughbreds are concerned, the number of races and the breeding statistics have remained fairly stable. The sum of earnings distributed to Thoroughbreds (flat and jump racing) reached € 3.4 billion in 2018, increased from 2009 (€ 2.5 billion), without taking into account the fluctuation of national currencies (Bergmann, 2015; IFAH, 2009, 2018). In Switzerland, the number of owners, trainers and stables in racing is less than in the disciplines of dressage, jumping and eventing.

In Thoroughbred racing, a distinction is made between the flat racing (1600-2400m) and jump racing, which is run over longer distances, up to 4500m. In the latter, the track includes hurdles or, for steeplechase, mounds, ditches and rivers. In Europe, Thoroughbred races are run on grass surfaces. In trotting - Harness racing or the ridden form (*monté*, unique to France) – races are held on permanent racecourses (grass or sand tracks) or on special grass fields. An international hierarchy lists the Thoroughbred and Harness racing events in increasing order of difficulty: Listed-race < Group III or semi-classic < Group II < Group I. Betting (e.g. PMU – Pari Mutuel Urbain) and sponsorship are the essential basis for race financing.

In equestrian sports, a deep bond is formed between the rider and his or her horse during the training and competitive season. In contrast, a jockey who rides a Thoroughbred during races (which last a few minutes) has no time to form an emotional bond with it. Under the orders of the trainer, the jockey rides the horse while remaining sensitive to the signals the horse sends him. Furthermore, the jockey does not participate directly in racehorse training. Racehorses form the closest relationships with the trainer's stable staff and the lads who look after and train them.

4.4.1.3 Advances in equine protection in equestrian sport and racing

The German Federation issued its first ethical principles over 30 years ago following a case of horse abuse reported in the media (Deutsche Reiterliche Vereinigung, 1990; Kothe, 1990; Mieusset, 2013a; Murphy, 1992; Roussel, 1990). Other cases, *"not very glorious"* (FSSE, 2009), have made headlines in the daily or specialist press, for example the doping scandal with capsaicin at the Olympic equestrian events in Hong Kong in 2008 (XXIX Beijing Olympics). Reports of abuse across the various disciplines have thus fostered a new sensitivity. Many equestrian authorities have sought to balance the needs of equids with sporting and economic realities. Documents with various titles summarise these principles:

- *Code of Practice* published in Canada by the National Farm Animal Care Council (NFACC, 2013)
- *Guide to good practice* in France to aid in applying the commitments of the Charter for Equine Welfare (FNSEA, 2018) This 159-page document gives concrete recommendations on how to achieve these commitments in the various components of the sector (equestrian sport, racing, agriculture, veterinary medicine, breeding)
- *Guidelines for Ethical Treatment of Animals in Applied Animal Behaviour and Welfare Research* published by the Ethics Committee of the International Society for Applied Ethology (ISEA, 2017)
- *SE Code of Ethics* published in 2018 by the Swiss Equestrian Federation sets out various principles (FSSE, 2018c).

The equine sector includes a wide variety of sports disciplines that have public, in particular economic, environmental and societal aspects (Poncet et al., 2007, 2009; Schmidlin et al., 2013). Above all, they expose horses to risks of physical and psychological harm that can cause career interruptions or even mean the end of an equine's career. Therefore, there is sufficient evidence of the necessity for further research to improve equine welfare (Sloet Oldruitenborgh-Oosterbaan et al., 2010).

Scientific research has already provided very important knowledge about techniques, habits and situations that may cause strain on the dignity and welfare of equids. Chapter 2 presented the scientific principles of assessment and their perspectives[64].

[64] 2.4.1.2 Scientific principles of evaluation and perspectives, p. 27

4.4.1.3.1 Despite new knowledge, there is still considerable room for improvement

In recent years, restrictive practices have not satisfactorily regressed despite progress and awareness-raising among associations and their members (Bornmann et al., 2020). Several studies by observers and in the field show that there is still room for improvement (Hässig & Kranz, 2020; Jahnke, 2019; PSA, 2019; World horse welfare and Eurogroup for animals, 2015). In particular, training and handling methods, as well as welfare issues in equestrian sports and racing are among the ongoing issues. The attention of the public and the media remains as high as ever. There is even a sense of unease among veterinarians and ethologists. On the other hand, the responsible parties in equestrian sports and racing sometimes have difficulty redefining themselves and asserting the legitimacy of their sport. The most sensitive areas include the adaptation of regulations to the current requirements of the time, member communication and the training of officials to enforce new rules, which are sometimes met with hostility from professionals.

When asked about the threat of overwork of equine athletes in show jumping the Swiss Chef d'Equipe expressed his pessimism (FSSE, 2010a): "It is almost impossible to remedy. There is far too much money involved". Ambitions are just as important in the less demanding events. The SE questions this statement and responds: *"(...) all those who have a link with equestrian sports and horses in whatever capacity are called upon to do what is necessary so that equestrian sports do not suffer from an even greater discredit, otherwise they risk being called dirty sports"* (FSSE, 2009, 2010b).

The functional longevity of sport horses is also of great importance. They tend to have a favourable organic constitution that protects them from physical and mental health problems. However, many breeding programmes do not pay enough attention to health, especially in broodmares (Koenen et al., 2004). They can carry and pass on a number of undesirable diseases that have a hereditary component[65].

This chapter describes recent knowledge about stressors and the dangers of strain in equestrian sports and racing. It also considers the effects of certain types of equipment, training techniques, the breaking-in or starting of young horses, initial transport and care on the welfare of the equid[66].

Training of young horses

The military principles on which horse training has long been based in Switzerland are gradually disappearing. Today's specialists no longer place riding techniques in the forefront. They focus on cooperation with the animal and are concerned with its behaviour and psychology. Horses often learn the first basics using groundwork before they are ridden. Often known as "whisperers", some trainers use methods that do not involve the horses carrying any weight. Some trainers use methods that are not harmful to the horses, but this is not a general rule. In addition, some conventional trainers do not possess the skills provided by the Swiss workforce organisation for horse-related occupations[67]. Unfortunately, the principles of learning and the value of motivation that promote respectful training of juvenile equids often remain underestimated in the breeding and ownership communities. In order to evaluate the quality of their young horses at an early stage trainers do not always avoid psychological or physical overwork. The young horses are then subjected to unjustified strain, with the fear of punishment[68].

Competitive sport is subject to criticism

Compared to equestrian sport as a leisure activity, competition imposes an additional level of physical and psychological strain. The initial training is generally done correctly, but competitive sport requires an adaptation of their stabling conditions and handling. For example, horses are often clipped and blanketed for the whole year, they are isolated in box stalls during events and travel several thousand kilometres a year by truck or plane. In the 1980s, severe bitting, draw reins, or neck hyperflexion (Rollkur), which brings the horse's muzzle behind the vertical (Figure 16), were regular parts of basic equipment.

Figure 16 Hyperflexion of the neck is not only observed in classical dressage competitions (Source: Patricia Korn, www.patricia-korn.com)

Several demanding equestrian practices have been the subject of scientific studies. In particular, the most recent results show that hyperflexion of the neck should be eliminated. Horses show significant signs of discomfort and stress when held in this position (Christensen et al., 2014; Kienapfel, 2011; Meyer, 2009, 2010, 2013; Piccolo et al., 2020; Rhodin et al., 2018, 2019; Von Borstel et al., 2009; Waldern et al., 2009). These results justify the prohibition of neck hyperflexion in Swiss animal protection legislation (CF, 2020) since January 1st, 2014 (Art. 21, Letter h AniWO). In addition, the regulations of the SE prohibit the use of draw reins in the warm-up arena, during the competition and throughout the award ceremony since January 1st, 2016 (FSSE, 2015).

[65] 6.2 Selection and occurrence of hereditary diseases, p. 220

[66] 5 Specific issues: management and use of equids, p. 91

[67] Website https://www.pferdeberufe.ch/wcms/index.php, Retrieved 12.12.2021

[68] 6.7 Training and selection of young horses, p. 254

Over the past 20 years, endurance racing has gained popularity but there is a considerable proportion of horses eliminated during veterinary examinations at each section or leg of the race (Vet Gate). The reasons for elimination are lameness (Nagy et al., 2017, Paris et al., 2021), exhaustion and metabolic or thermoregulatory problems. These issues are sometimes irreversible. They are manifested by an increase in heart rate and body temperature, breathing problems and excessive sweating with dehydration and electrolyte loss (Robert, 2014). Welfare conditions during international competitions have been particularly criticised in recent years, in particular since 2012/2013 (Mieusset, 2013a). In 2016, the FEI decided not to schedule the World Endurance Championships in the United Arab Emirates. It had suspended the nation in 2015 (and reinstated it in 2016) due to the death of a horse during a race as well as strong suspicions of organising fake events to qualify horse-rider teams for other more prestigious competitions (FEI, 2016). The use of banned substances has also provoked strong reactions from the FEI (FEI, 2017b). Finally, even more recently, the press has reported four fatal events at two endurance races in Dubai, demanding explanations from the FEI (Ashton, 2020; info@endurance-world.com, 2020; Murray, 2020).

Improving human-equine relations

Optimising the relationship between humans and equids seems to be a solution to promote positive experiences and advance the welfare and safety of the dyad. Mutual attachment and established interactions are key elements. Horses are good candidates to study these processes in a domestic context because of their social nature and selective breeding for willingness and dependence on human care. However, the factors that contribute to the success of these relationships remain unclear. Currently, there is no evidence that the horse-human relationships formed during training constitute a genuine affection. Further research on this topic is therefore needed, especially from the equine perspective (Hartmann et al., 2021).

The desire to win remains a very powerful driving force - without doubt the raison d'être of competitive equestrian sport - but the athlete and horse are very often at odds. The link between performance and the human-equine relationship appears to be a complex and multifaceted phenomenon. The welfare and health of the animal and related ethical principles can take second place to the quest for victory. Apart from the financial aspect, the drive to achieve results can also lead to an increase in the number of competition starts. However, the reverse is more common. A strong attachment - especially when the riders are women - can inhibit the ability of the rider to win competitions and to engage successfully in professional equestrian sport. The reason for this lies in the tension between the danger of excessive instrumentalisation and the deep interaction with their equine partner. In the context of this friction, participation in equestrian events carries a risk of physical and mental strain on the horse (Hogg & Hodgins, 2021). For example, the number of injured horses in dressage sport has increased markedly in recent years as the demands on the best equine athletes have increased consistently and to an extreme extent (FSSE, 2011).

4.4.1.3.2 Improvements in horse racing

Several practices and events in the field of horse racing (Thoroughbred and Harness) in Switzerland and abroad regularly give rise to discussions in public and welfare circles. These horses face specific problems, as they are highly qualified for speed and are periodically transported to participate in meets. In addition, retirement after their career forces them to adapt to a change of environment, which also poses risks to their welfare. Scientific articles and media publications help to summarise the major issues to be addressed:

- Horses injured or euthanized during races
- Potential overuse of drugs or doping
- The uncertain future of retired racehorses (related to the length of career).

In Europe, Australia and the United States, racing is under pressure, and even industry leaders are calling for change. They are concerned about the consistency of racing and its sustainability. The perceived importance of this issue and the specific concerns vary from country to country and depending on the viewpoint. In the United States, one report explicitly linked the decline in betting and the number of racegoers to an increase in concern about the welfare of racehorses. Debates about the use of medication are particularly heated in the Americas, as regulations give trainers a great deal of leeway (Singer & Lamb, 2011, cited in Bergmann, 2015). In 2019, a campaign targeted the high number of accidents and horses euthanised (nearly 60 in 18 months) at the Santa Anita racetrack in California and demanded its closure (CNN, 2019; Vigdor, 2020).

These difficulties have forced the racing authorities to react. The *Equine Injury Database™* records fatal events at racecourses in the USA (Jockey Club, 2021). It allows for site-specific monitoring and international comparisons (Hitchens et al., 2019). Some racecourses are also taking steps to improve the safety of horses, in particular track conditions, medication regulations and health monitoring (Stronach Group, 2019a, 2019b, 2020).

The misuse of medication in racing led the US Department of Justice (DoJ) to indict 27 members of the racing industry (trainers, veterinarians and drug distributors). The DoJ accused these players of establishing a massive doping system, misleading the government agency and committing fraud by disguising banned substances using misleading labels (CNN, 2020).

Other countries have analysed the situation, organised an educational program and improved the equine safety and welfare (Bergmann, 2015; Dubois et al., 2018; Mactaggart et al., 2021; Singer et al., 2011; Jockey Club, 2018). In general, the European racing institutions are strengthening their means of control and have been collaborating for several years with the animal protection community (World horse welfare and Eurogroup for animals, 2015). Structural changes, regulation and transparent reporting are among the main areas that still need to be monitored and developed in the various countries. The topics listed below with be discussed in further detail in Chapters 5 and 6:

- Accidents, euthanasia and sudden death on the racetrack, including steeplechase
- The use of whips and other equipment[69]
- Doping and the use of medication in racehorses[70]
- Training and education of young horses[71].

4.4.1.3.3 The Swiss Animal Protection Society and equestrian sports

Swiss Animal Protection (SAP) examined equestrian sports and their influence on equine welfare. In 2017 and 2018, it attended 18 events, a very small proportion of the thousands of competitions that took place 2017-2018 (FSSE, 2020f), and five in 2019. Its observations appear in two reports (PSA, 2019; Schaefler, 2020). In its first document[72] , the SAP found that the regulations and criteria of the SE for equine-friendly sport were too rarely applied. The second review did not find any gross violations, with one exception. The second review praised the efforts and success of the SE and the event organisers in significantly improving the treatment of the animals while calling for progress on a few points:

- The use of hyperflexion in the warm-up ring
- Rough riding style (bits, reins, spurs)
- The participation of inexperienced and poorly trained riders
- Young horses that are already showing signs of musculoskeletal problems
- Insufficient presence and intervention of judges
- The inability to identify horses competing at an event, especially on the training grounds
- The new noseband assessment device is not being used regularly
- Driving events (fixed obstacles, the use of reins, horse equipment).

A number of details are not mentioned in the documents. These include the size, duration and difficulty of the events reviewed, the level of equestrian skills of the participants (basic training, brevet, license, age) and the types of horses (age, sex, winnings, total points, experience). While this is not meant to call into question the relevance of the observations made, this weakness means that the reviews do not allow for an exact evaluation of the effective frequency of the issues or the development potential of the individuals and horses. These variables would make it possible to propose targeted measures and to ensure correct monitoring.

In 2019, the SAP organised a workshop *Sport with Respect for the Horse* with several specialists representing the equine sector. On this occasion, the SAP made its position clear: *"The Swiss Animal Protection is not opposed to equestrian sports, but they must be practised with respect for the horse"* (FSSE, 2019b). Then in 2020, the SAP launched, with the support of the SE and other organisations, a program called *Happy Horse*, which aims to reward riders who stand out for their positive behaviour with their horses in the warm-up arena during competitions (FSSE, 2020i).

4.4.1.4 The risks of strain on equids in sport

4.4.1.4.1 Introduction

Equids involved in specific disciplines (racing, show jumping, eventing, dressage, polo, endurance, reining, driving, vaulting) are still exposed to physical and psychological stress (Degueurce, 2012). The strain generated by stressful situations and resulting health disorders are of concern to the public, the media, veterinarians and ethologists, as they are, in many cases, the result of human intervention. How they are assessed in the weighing of interests can be used to justify or condemn them[73, 74].

The risks to the horse depend on the conditions in which they are kept, bred and used[75, 76]. The dangers related to their use result either from human action that affects the animal (carrying a load, pulling a cart, auxiliary equipment) or from the very nature of the activity. Being result oriented also has a socio-cultural aspect, as people with confidence problems may feel belittled and excluded. To reinforce their bravery, such individuals are encouraged to be tough and indifferent, which often negatively impacts the welfare of their horses (Jones McVey, 2021). In addition, one can also add the dangers of medication use during training, forbidden medication, doping and the thorny issue of the future of equine athletes after a sporting career. The weighing of interests[77] examines the different strains on a case-by-case basis, particularly where unsatisfactory situations are assumed, for example:

- Ignorance of the animal's own needs (free movement, social contact, food, water, functionality, health)

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[69] 5.6 Auxiliary equipment and the use of force, p. 125

[70] 5.9 Doping and the medication of sport horses, p. 158

[71] 6.7 Training and selection of young horses, p. 254

[72] The original German report translated into French is still difficult to understand due to a lack of knowledge of equestrian terminology.

[73] 2.3 Strain, p. 20

[74] 2.7 Weighing the interests, p- 31

[75] 4.3 Housing of equids, p. 51

[76] 6 The use of equids in breeding, p. 217

[77] 2.7 Weighing the interests, p. 31

- Incorrect estimation of the physical and psychological capacities of the horse
- Inappropriate human skillsets and influences in the various disciplines (poor horsemanship, inappropriate demands, neglect, mistreatment)
- Unsuitable or misused tack (saddle, bridle, bit, draw reins[78])
- Unsuitable environment for the exercise being performed (terrain, obstacles, weather conditions).

Several books, publications, studies and synopses have evaluated the variables that can immediately or indirectly generate stress, limit performance, negatively affect welfare, disrupt health or modify behaviour (Bailey et al., 1998; Bartolomé & Cockram, 2016; Baxter, 2011, 2020; Dittmann et al., 2020; Dyson, 2002, 2016a, 2016b; Gunst et al, 2014; Hodgson et al, 2014; Palmer et al, 2017; Reesink & Palmer, 2019; Ross & Dyson, 2011; Sloet Oldruitenborgh-Oosterbaan et al, 2010; Takahashi & Takahashi, 2020). A summary of their results shows several issues:

- Pathologies of the limbs (joints, tendons, ligaments, hooves), back and muscles[79]
- Digestive system disorders[80]
- Respiratory diseases
- Anxiety[81] and fear reactions[82]
- Thermoregulatory problems[83]
- Overtraining and overwork.

Regarding the last two points, one study found that after four consecutive riding lessons on the same day, riding school horses were more stressed than after being ridding just one or two times (Jung et al., 2019). As for the rider, he or she must remain stable and well balanced in order to communicate clear instructions to the horse and avoid giving unintentional or contradictory signals. Furthermore, if the rider has good pelvic mobility and pelvic control, the animal shows much less conflicted behaviour (Uldahl et al., 2021).

Unfortunately, there is little scientific work that investigates the risks to welfare in relation to various parameters in depth (e.g. by means of multivariate models). These include the discipline, the level of difficulty, the qualifications of the athletes, the age of the horse or the conditions in which the horse is housed and trained. The publications that assess the situation of racehorses are more numerous.

4.4.1.4.2 Stress factors that affect the physical condition and performance of a sport horse

The response of an animal to a stressful stimulus is triggered when it perceives the responsible factor as a threat. All mammals share normal biological reactions, including physiological and psychological aspects. However, the nature and intensity of their manifestation varies between species and individual equids. This individuality is characterised by intrinsic parameters such as sex, age, genetic heritage (breed, origin), temperament or experience.

Acute stress and homeostasis

Breeding has improved some characteristics of behavioural responses that are useful for the various sports disciplines (speed, endurance, strength, agility, flexibility, docility). The development of this athletic capacity has mainly affected populations of the species *equus caballus*, which has evolved towards a light type. In their natural environment, horses had already adapted (*coping mechanism*) to make a sudden and rapid effort to escape from predators (running away, fighting, aggression). In addition to reactivity of horses (a proactive strategy), another kind of response can be seen in stressful situations, especially in donkeys and hybrids. It is characterised by self-preservation strategies employing immobility, marked rigidity or limited withdrawal (Budzyńska, 2014). Donkeys and mules show signs of general discomfort (pain, dissatisfaction with a situation or person) by assuming an unusual posture, head nodding and swaying or tail swishing (Lesté-Lasserre, 2022).

The conditions of stabling and use (number of riders per horse, hours spent outdoors, group housing, social interactions, sport disciplines) influence the stress response (Sauer et al., 2019). For example, show jumping and training cause haematological and biochemical changes that can induce an inflammation-like state with negative health consequences (Arfuso et al., 2020).

Competitive sport is one of the most acutely stressful stimuli in equine athletes. Painful conditions (lameness and back pain) and discomfort (ill-fitting tack, rider, trainer) are other important sources of stress in the horse.

In physiological terms, exertion increases the secretion of cortisol and catecholamines and raises body temperature, plasma volume, intravascular protein content, heart and respiratory rate, blood sugar levels and perspiration. These phenomena mitigate the perceived effects and restore equilibrium (homeostasis). Immediate stress is also expressed in characteristic behavioural traits (Briant, 2017):

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[78] 5.6 Auxiliary equipment and the use of force, p. 124
[79] 4.4.1.4.3 Risks to the musculoskeletal system and the back, p. 64
[80] 4.4.1.4.3.3 Risks to the digestive system, p. 68
[81] 2.3.2 Anxiety, p. 22
[82] 2.3.2.1 Fear, fright, phobia, p. 22
[83] 5.5.1.3 Thermoregulation and the thermoneutral zone at low temperatures, p. 115

- Increased musculoskeletal activity, restlessness, herding instinct, flight
- Decreased resting behaviour
- Shortened feeding times
- More frequent alert postures (head and neck raised, mobile ears, eyes wide open, rarely resting on three feet, vocalisations, alert breaths, snorting, dilated nostrils, muscle tremors)
- Hyperstimulation of the gastrointestinal tract, increased defecation
- Increased sensitivity.

By immediately mobilising its resources, the animal adapts to the demands of the exercise and thus improves its performance and recovery. Its responses vary according to several parameters: the type of effort (intensity, duration), the environmental situation (events, the equestrian skills of the handler or rider, climate), as well as the aptitude and physical condition of the animal (Bartolomé & Cockram, 2016; Davies & Pilliner, 2017; König von Borstel et al., 2016; McGreevy, 2004; McGreevy et al., 2018; McIlwraith & Rollin, 2011; Sauer et al., 2019). Healthy and well-trained sport horses recover quickly after exercise (Coenen, 2004; Gregić et al., 2020; Jung et al., 2019; König von Borstel et al., 2017).

Chronic stress

Stress adversely affects health and performance when equids remain exposed to recurrent or permanent stimuli. For example, highly demanding competitions and a high number of competitions with short recovery periods in between can cause chronic stress and threaten or disrupt homeostasis. More specifically, the chronic stress response places excessive demands on the equids' adaptive capacities and pushes them beyond the limits normally achieved in nature. In other words, the means required to cope with the stress exceed the normal biological abilities.

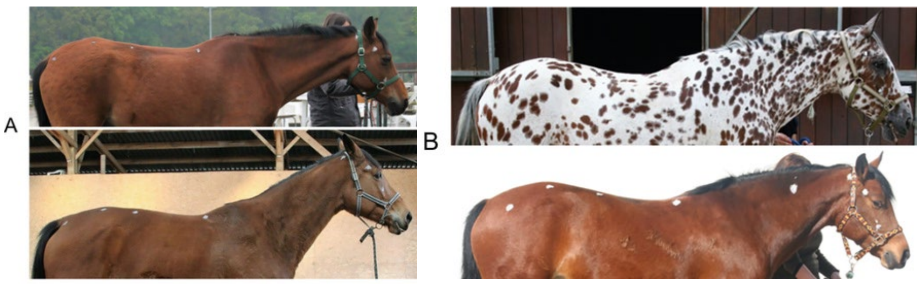

Figure 17 Two types of riding horses (A) Two horses who show the characteristic elements of a 'depressed' posture associated with a poor state of welfare. (B) Two other horses who do not show any signs of reduced welfare. (Source: Sénèque E et al, 2019, https://doi.org/10.1371/journal.pone.0211852.g007, CC BY)

High cortisol level levels for prolonged periods of time forces the animal to mobilise other resources and divert them from their primary vital function. The adverse effects are well described[84]: weakened immunity, reduced resistance to disease, reduced reactivity (apathy), stunted growth in young animals, loss of muscle mass or poor reproductive efficiency. They reveal that the animal does not cope with the perceived stress during exercise and experiences a negative emotional state. This distress impairs its welfare (Bartolomé & Cockram, 2016; Beaver, 2019; Bell et al, 2019; Jung et al, 2019, Piccolo et al, 2020, Waran, 2007; Waring, 2003). This chronic imbalance is reflected in a withdrawn posture (Figure 17, A). The white dots on the horses in Figure 17 are used to highlight some of the characteristics of depression: the head position with the jaw angle extended, neck and back at the same height, head immobile, ears often set back, eyes open and staring. Equids no longer react to stimuli in their environment but express more emotion in the presence of an unfamiliar object. They may also exhibit stereotypies or repetitive abnormal behaviour (Briant, 2017; Fureix et al., 2012; Kienapfel, 2011; Pawluski et al., 2017, 2018; Sénèque et al., 2018, 2019). These signs can often go unnoticed.

Understanding equine behaviour and identifying stimuli is of major interest to prevent deterioration of performance and value (dignity, trade, breeding). Only through better understanding of horses and recognition of stress factors can these be reduced and thus the welfare of sport horses improved.

Horse stabling during high-level competitions

The way equine athletes are housed in temporary facilities during the international competition circuit (equestrian sports and racing) is a potential source of chronic stress. The quality of the accommodation is mostly satisfactory (Figure 18), but the size of the box stalls is very small, especially for large animals (3m x 3m according to the FEI, 2022a). In some cases, the stables are noisy or almost permanently lit, which is detrimental to the rest and relaxation of the horses. In addition, these horses often do not have the benefit of turnout and outdoor exercise, as the facilities are not designed for this purpose.

According to the legislation (CF, 2020), turnout may be suspended for a maximum of four weeks, provided that the horses are exercised daily during the sporting events (Art. 61, Para 6, Letter d AniWO). However, it is likely that many top equine athletes do not benefit from regular unhindered movement or turnout during the competition season, especially when they are boarded at a competition venue for several days and adding the time for transport between competitions.

[84] 4.4.1.4.2 Stress factors that affect the physical condition and performance of a sport horse, p. 62

In conclusion, the lack of free movement (turnout), as well as the frequent changes of stable and sometimes of neighbouring horses are major sources of stress (Lesimple et al., 2020).

Sudden cardiac death

Sudden cardiac death is the acute and fatal collapse of an apparently healthy horse which occurs within minutes of the onset of the first pathological signs. It most often occurs during exercise in equestrian sports and racing. Cardiovascular origin is the most frequently reported cause. One study published a prevalence of 14 cases per 100,000 starts during competitions in FEI disciplines between 2008 and 2014 and 28.7 events at racecourses in the UK between 2000 and 2007 (Navas de Solis et al., 2018).

Figure 18 Temporary boarding facilities of tents comprised of individual indoor box stalls of 9 m2. (Source : Olaf Kosinsky, https://commons.wikimedia.org/wiki/File:Horses%26Dreams_22.4.2014_(20_von_22).jpg, CC BY-SA 3.0)

4.4.1.4.3 Risks to the musculoskeletal system and the back

4.4.1.4.3.1 General

The risks to the musculoskeletal system of sport horses have been the subject of several studies. These studies highlight the need for equestrians to have the skills to detect the early signs of health problems, especially when sports performance is declining. The risks identified also show the importance of selecting optimal health and robustness even before the early training phase[85]. Several books (Baxter, 2011; Denoix, 2014; Hinchcliff et al., 2014; Hodgson et al., 2014; Ross & Dyson, 2011) describe the risks of musculoskeletal system injuries in the various disciplines (equestrian sports and racing). In sport horses, these include navicular syndrome, inflammation of the tendons and ligaments, and osteoarthritis of the limbs, thoracolumbar (back) and sacroiliac (pelvic) regions. Thoroughbreds tend to suffer from tendonitis, suspensory ligament desmitis, bony pathologies including stress fractures of the dorsal cannon bone and osteoarticular pathologies (synovitis, OCD, arthritis of the pastern, fetlock and carpal joints). In Harness racehorses, lesions similar to those of Thoroughbreds are diagnosed, as well as an increased incidence of sacroiliac and stifle joint pathologies.

In the Netherlands, horses used in riding schools develop back pain twice as often as horses used for leisure or competition. Compared to show horses, horses used for teaching, breeding or leisure are at a higher risk of irregular locomotion or lameness (Visser et al., 2014). Another study (Munsters et al., 2013) assessed the fitness of all 22 horses and nine ponies selected for the European Eventing Championships. These horses were observed over an extended period of time and follow-ups were done on horses that were dropped from the selection list. Almost half (45%) of the horses and ponies had to be retired due to injuries to the musculoskeletal system. In the United Kingdom, it has also been observed that 21-35.1% of eventing horses are retired from competition after one year due to injury (O'Brien et al., 2005; Singer et al., 2008). The reasons for the high percentage of injuries and how to prevent them are the subject of studies on the role of intensity and duration of physical effort during training (Munsters et al., 2020).

In Germany, dressage horses and shod horses have a higher risk of musculoskeletal disorders compared to other disciplines or barefoot horses. Horses that are owned or boarded by professionals (boarding, riding, farming) have a lower risk of health problems than horses kept by unqualified individuals. Furthermore, there is no significant difference in the probability of veterinary intervention between horses kept under different circumstances (individual or group boarding, single sex or mixed, ridden or live on pasture for a variable duration). In addition, horses that are trained in Western, in comparison to other disciplines, have a higher risk of splint bone fractures. To enable changes that improve equine health and welfare, research is still needed to address the causal factors (König von Borstel et al., 2016).

Several studies (cited in Murray et al., 2010) describe the important influence of intrinsic qualities of young horses for the discipline of dressage. Several parameters have shown to have a significant influence on health, risk of lameness and potential performance level. In particular, the following are mentioned: good posture, correct conformation of the back, appropriate balance between the forehand, back and hindquarters, as well as naturally supple, active, regular and coordinated gaits. In practice, early selection shows that not all young subjects have similar and appropriate physiques and psyches. However, every individual, modest or talented, will eventually reach a threshold above which there is no longer a significant difference in probability for lameness. A recent study of show jumping and dressage disciplines also found no increased prevalence of health problems in sport horses (mostly amateur) compared to leisure horses (Dittmann et al., 2020). The limit of a horse is defined by its own constitution and the individual capacity of its musculoskeletal system to adapt to the difficulties of the various physical activities and the expectations of the people involved in its sporting development. For example, the first collection[86] exercises may already place high demands on a horse without sufficient aptitude for dressage. The load on the flexed joints and ligaments of the hind limbs, the accumulated micro-damage, as well as degenerative changes associated with age and increased duration of training can predispose to lameness.

[85] 6.7 Training and selection of young horses, p. 251

[86] Equitation textbooks define collection as when the horse engages its hindquarters under itself by increasing flexion of the lumbosacral, stifle and hock joint, increasing the engagement of the thorax muscles and raising the neck and withers.

The following chapters deal with specific aspects of these risks, in particular aids[87], hoof care[88], transport[89], and the training and selection of young sport horses[90].

Fatal accidents in competition

In the USA, the national *Equine Injury Database™* provides authorities across North America with the ability to establish the frequency and type of fatal injuries[91] (Jockey Club, 2020). These parameters allow the identification of horses at an increased risk of injury and are used to improve safety and prevention. The ratio of 1.53 cases per 1,000 starts reported in the USA in 2019 remains higher than in other parts of the world; for example in Australia it is lower at 1.17/1000 (Hitchens et al., 2019).

60-80% of racing accidents (falls) with a fatal outcome are due to fractures of the humerus in two-year-olds (Crawford et al., 2020b). On the other hand, 78% of humeral fractures occur during training. Typically, bone fatigue injuries cause limb fractures (Hodgson et al., 2014; Rossignol, 2011). They are also closely related to training interruptions (Carrier et al., 1998). A horse that falls due to an accident also puts its jockey at risk as he or she may be seriously injured in the process. Therefore, prevention of racing and training accidents would also reduce jockey injury rate (Hitchens et al., 2016).

Numerous studies have identified nearly 300 risk factors for fatal injuries caused by the nature of the track surface, the distance of the race and the age of Thoroughbreds (Bailey et al, 1997, 1998; Boden et al, 2007a, 2007b; Carrier et al, 1998; Crawford et al, 2020a, 2020b, 2021a, 2021b, 2021c; Estberg et al, 1996; review by Hitchens et al, 2019; Jacklin & Wright, 2012; MacKinnon et al, 2015; Maeda et al, 2016; Parkin, 2007; Parkin et al, 2010a, 2010b; Petersen et al, 2021; Rosanowski et al, 2018):

- The frequency of accidents with a fatal outcome is highest on the shortest courses
- The probability of fatal injuries increases with age
- Fatal injuries are evenly distributed between two-year-olds and older horses. Several studies show that age has no impact on occurrence (cited in Crawford et al., 2020b)
- When managing a racehorse, several risk factors have been identified:
    a. Change of training centre
    b. An increase in time since the previous start
    c. Interruptions in training result in a reduction in bone density
    d. A high total number of races
    e. Problems identified during the veterinary examination before the race
    f. Previous injury and the recent administration of medication or injections such as non-steroidal anti-inflammatory drugs (phenylbutazone and flunixin) and corticosteroids.

The analysis of mortality rate statistics must be done with great caution before relevant and definitive conclusions can be drawn. Several major factors influence the risk of injury and the actual prevalence of accidents:

- Distance and nature of the race (flat, jumps, steeplechase); speed, skill level of jockeys and horses
- Design and maintenance of the track: flat, with downhill and uphill sections, with or without banked turns, flexibility and surface of the ground (sand, earth, synthetic, grass or snow), weather conditions of the day and season
- Training methods (interruptions, the protective effect of high speed gallops, veterinary involvement, facilities)
- Various external parameters:
    a. The quality of the region's breeding
    b. The difficulty of the races as determined by the financial capacity of the racecourse
    c. The association's regulations on prohibited and permitted practices
    d. The procedure for collecting, recording, monitoring and analysing events.

One study (Verheyen et al., 2006) showed that in previously untrained bones, the accumulation of low-gait exercise (3 beat canter: <14 m/s) increases the risk of fracture. On the other hand, high-speed exertion (4 beat gallop, 14 to 17 m/s) has a protective effect. The distance covered also plays a role. Long distances (44 km in canter) and 6 km at a gallop over a short period of time (<1 month) increased the risk of fracture and should be avoided. Any training program therefore involves finding the correct balance for each horse. This should be done within the limit of the fracture risk inherent in high-speed loading to ensure that its beneficial effect stimulates the bone cells to produce a more robust architecture.

Morphological changes in the mineralised tissues at the exact sites of fracture initiation are observed in juvenile Thoroughbreds even before the start of training or racing (Nicholson et al., 2011). Predispositions to injury during physical exertion are also

[87] 5.6 Auxiliary equipment and the use of force, p. 124
[88] 5.7 Hoof care and shoeing, p. 139
[89] 5.8 Transport, p. 148
[90] 6.7 Training and selection of young horses, p. 251
[91] 4.4.1.3.2 Improvements in horse racing, p. 60

assumed to include hereditary factors (Tozaki et al., 2020). These points, which also apply to Harness racing, will be discussed in Chapter 6 under developmental and genetic diseases[92] (Table 9).

Even if they are spectacular, accidents with a fatal outcome (fractures) are not the only problems. There are also many musculo-skeletal injuries which are less serious at first sight, but which nevertheless have a serious impact on the health and welfare of racehorses.

Musculoskeletal injuries

Despite more than three decades of scientific work, trauma to the musculoskeletal system of Thoroughbreds remains a worldwide problem for racing. In addition to susceptibility to stress fractures, Thoroughbreds are also prone to flexor tendonitis, particularly of the superficial digital flexor tendon (Dyson et al., 2002; Firth et al., 2012; Whitton et al., 2010). Several teams are addressing this topic in multiple geographical regions (Flash, 2014; RIRDC, 2018; Wong et al., 2019). In Switzerland (Schweizer et al., 2016a, 2016b), a first retrospective study (2009-2012) analysed 17,670 starts (gallop, jumps, harnessed trot). The risk of musculoskeletal injury in Harness racing is lower on the porphyry sand track than on the grass track. It is about twice as high if the trotters are trained by their driver than if a third party trains them. In jump races, long distances (3,301-5,400 m) show a protective effect compared to shorter distances (2401-3300 m). However, the study was not able to identify all outcomes of the events found (fatal or non-fatal outcome).

The most recent study on musculoskeletal injuries of Thoroughbreds was conducted in Queensland, Australia over a 13-month period (Crawford et al., 2020a, 2020b, 2021a, 2021b). It included a review of the literature on this topic, a longitudinal follow-up of a cohort of young horses for over a year and an analysis of inflammation. This pilot study showed that the incidence of health disorders remains low (0.6%), but that the results vary greatly depending on the racetrack and training centre. This study represents only a subset of the Australian racing industry and the findings cannot be applied internationally without caution, although they are supported by other scientific research.

In two-year-old horses, adaptive inflammation of the dorsal aspect of the metacarpus (shin soreness, sore shins, bucked shins) and injuries (lacerations) are clearly the most frequent pathologies. This is no longer the case for three-year-olds (Hitchens et al., 2018; Crawford et al., 2020b). Bucked shins affect more foals of primiparous mares (Crawford et al., 2020c) and the prognosis for complete recovery remains excellent. In addition, compared to winter, training in the summer season triples the incidence of lesions in two-year-old horses. The precise cause of this difference is unknown, but it is suspected that more intensive training for the first race or the difference in ground conditions are contributing factors (cited in Crawford et al., 2020b). Older horses are more likely to be found to have suspensory ligament desmopathy, superficial digital flexor tendonitis, proximal sesamoid bone or fetlock joint injuries. These conditions reduce the likelihood of a career in racing. They affect tissues that are generally well-adapted but due to repeated stress caused by high-intensity exertion have exceeded the critical level of strain (Crawford et al., 2020b).

The work of Crawford et al (2020c) shows a link between the duration of uninterrupted training (between 10 and 14 weeks) and increased lesions. Two-year olds appear to be at greater risk as total exercise time increases because they need rest to allow tissues to recover and adjust to the effects of exercise. This phenomenon does not affect older horses. Older horses can withstand longer periods of training because their musculoskeletal system is better adapted. In addition, increasing the number of days of training at a slow pace reduces the likelihood of injury in Thoroughbreds of all ages.

The study identified that the combination of galloping speed and distance travelled in the previous four weeks was associated with an increased risk of injury. This applies to horses of all ages who ran a total of 2.4-3.8 km at a pace greater than 15 m/s (900 m/min; 55 km/h) and three-year-olds and older who galloped 3.0-4.8 km or more at more than 13 m/s (800 m/min; 48 km/h). Finally, increasing the number of days slowly appears to be more effective in preventing injury than resting alone, especially if the horses are at risk. The study also raises the possibility that the types of pathology (fractures, dorsal metacarpal disease) influences the difference in prevalence observed between the two- and three-year-olds.

The very recent review of the international literature (Crawford et al., 2020a) notes that the racing gallop and intense training seem to be necessary in order for the tissues to adapt sufficiently to prevent injury. However, beyond a critical point, continuous high intensity training causes tissue failure. The exact tipping point is not yet known at which the protective effect of high-speed training becomes potentially dangerous. Studies of the combination of distance and high speed suggest at least two mechanisms of pathology related to the accumulation of bone damage:

- Fatigue of well-adapted bone, caused by the addition of micro-damage that it cannot repair, can occur after a period of hard training
- Efforts of relatively low intensity in a poorly adapted skeleton.

In addition, musculoskeletal injuries were the most common reasons for ending a racing career (40/110 horses, 36%). A medium-term follow-up revealed that most horses (108/110; 98%) were retrained after retirement. Half were found to be capable of

[92] 6.7.1.4 Developmental Orthopedic Diseases (DOD), p. 256

performing (50/110; 46%). The subject of fractures in young horses will be further discussed in Chapter 6 on the subject of bone adaptation and developmental orthopaedic diseases[93, 94].

Review of current scientific studies

In order to reduce the impact of musculoskeletal injuries, further studies are needed to better understand the training methods of racehorses. The sheer number of variables requires robust statistical models and a large volume of relevant data. This is certainly more than can be collected in a small country like Switzerland. The objective is to establish a training program over at least two or three years. It should include the amount of exercise (intensity and duration, speed, distance, ridden vs. unridden) in the various stages of training, preparation and racing including planned and unplanned interruptions. The study will then define a detailed and standardised procedure for recording information on each horse (weight, appetite, rations, abilities, behaviour, form), its health, musculoskeletal injuries and their progression. In addition, a series of environmental (temperature, precipitation, humidity) and estimated (track condition) variables would complete the information collected to allow for longitudinal monitoring. Once the cause of an adverse event has been identified, an effective, sustainable and forward-looking change can be made, such as modifying a track or obstacle, banning a dangerous practice or reinforcing a preventive measure.

Back pain

Back pain is significantly associated with lameness and is either a muscular problem secondary to a gait abnormality, or a pathology in both the limb(s) and spine of the horse. It is estimated that about one-third of horses show signs of back pain. They are manifested as developmental defects, muscular asymmetry and a change in posture of the animal or a poor saddle fit. This last aetiological factor shows the crucial importance of proper equipment fitting for health and performance reasons. (Dittmann et al, 2020; Greve & Dyson, 2014, 2015; Gunst et al, 2019 ; Lesimple et al, 2012; Mackechnie-Guire et al, 2018; Murray et al, 2010).

Figure 19 Side views of four riders, from left to right with light L, moderate M, heavy L and very heavy LL statures.
The length of the saddle is correct for riders L and M, but too short for rider L and much too short for rider LL. The latter two are sitting on the cantle. The shoulder, hip and heel of riders L and LL are not vertically aligned.

Figure 20 Caudal views (Source: Dyson S et al, 2020, https://beva.onlinelibrary.wiley.com/doi/full/10.1111/eve.13085, Creative Commons Attribution License 4.0)

The influence of the rider's equestrian competence on horseback (weight, height, posture, balance) on back pathologies has been the subject of scientific research. The stature of the person and the position of the load must be taken into account when assessing the welfare of equids, especially as the human population becomes heavier. The most recent studies demonstrate the deleterious effects on locomotion and animal behaviour stemming from an inappropriate relationship between the height and weight of the rider and the body mass of the horse. The data suggests that a RHBW (Rider:Horse Bodyweight) ratio of 15% can already disturb the musculoskeletal system, but without clearly measurable impacts. From 20% onwards, the first painful muscular reactions appear. However, the characterisation of an appropriate RHBW or other upper limit should not only factor in the body mass of the horse and the rider. This is a multifactorial issue that includes many interrelated aspects (Figure 19, Figure 20) that can affect equine welfare (Clayton, 1997; Domino et al., 2022; Dyson et al., 2020; Greve & Dyson, 2013, 2014, 2015; Halliday & Randle, 2013; McGreevy et al., 2018; Powers & Kavanagh, 2005; Sloet van Oldruitenborgh-Oosterbaan et al, 1995; World Horse Welfare, 2018).

[93] 6.7.1.4 Developmental Orthopedic Diseases (DOD), p. 256
[94] 6.7.1.7.2 Early exercise in young horses and its effects, p. 272

At present, scientific studies (Beckstett, 2022) indicate that a clear ideal ratio between the weight of the rider and that of the horse cannot yet be provided. The number of variables is too high (morphology and habits of the rider, saddle, age, type and state of health of the horse, duration and intensity of physical effort, environmental conditions…).

4.4.1.4.3.2 The role of training and competition surfaces

The ground conditions influence the horse's gaits: increased firmness (asphalt versus sand) induces a flat and economical locomotion. There is currently limited scientific data available on this subject (Caure et al., 2021). The materials used for training and competition surfaces (composition, materials, firmness, anti-slip texture, elasticity, water content, temperature) have been identified as potential risk factors for the musculoskeletal system of sport and racehorses. The surface must be adjusted to the discipline. Grass is still the best surface for show jumping, but it is easily damaged and is subject to the vagaries of the weather. Sand surfaces (quartz or silica) are suitable for jumping and dressage and the firmness and elasticity can be adjusted by watering or mixing the sand with fibres (for example carpet fibres).

Trotting on dry, deep sand reduces the overall ground force reaction, induces a progressive loading of the limbs and increases the propulsive effort and tension of the superficial digital flexor tendon. This increased physical activity leads to metabolic adaptations, including increased lactic acid production. The hard surface of a track increases the risk of musculoskeletal injuries. An abrupt change of ground causes different or greater efforts than the tissues are adapted to, or, through fatigue, causes reduced coordination of gaits and abnormal loads on the joints. Regular training on a variety of surfaces allows for better adaptation. Careful management (moisture content, cleanliness) of an adequate surface remains crucial in maintaining a safe environment for horses (Bardin, 2020; Barstow et al., 2018; Bogossian et al., 2020; Crevier-Denoix et al., 2009, 2010, 2017; Hobbs et al., 2014; Montavon & Nido Wälty, 2014a, 2014b; Murray et al., 2010; Roepstorff et al., 2014).

4.4.1.4.3.3 Risks to the digestive system

Equids are herbivores whose digestive systems are naturally adapted to a high-fibre, low-carbohydrate diet. Equids in the wild spend up to 18 hours a day moving around to graze and rarely go more than two to four hours without eating. This feeding behaviour and the slow and continuous ingestion of forage generate a continuous flow of saliva whose buffering effect (saliva is alkaline) keeps the gastric pH above 4. In this way, the production of stomach acid is neutralised. Coarse food not only serves to provide the necessary nutrients but also keeps the equid busy for a good part of the day. In contrast, the reduction of fibre in a diet with a higher grain content prevents regular wear of the teeth and encourages the development of sharp points on the teeth that injure the cheeks and tongue. This can be painful and hamper chewing, which impairs digestibility.

However, domestic boarding conditions, most often in individual box stalls, impose a diet on the sport horse that differs greatly from that of its natural habitat. A grain rich diet, feeding schedule of two to three meals per day and fasting for more than five hours do not meet the basic needs of the horse. In general, these husbandry errors are detrimental to equine welfare, health and performance. Negative consequences include digestive disorders such as colic, diarrhoea or constipation, the causes of which can be varied and multifactorial.

4.4.1.4.3.4 Colic

Factors that increase the risk of colic include inappropriate management practices (Gonçalves et al., 2002) such as:

- Type and quality of forage and feed
- Sudden changes in schedule
- The physical characteristics of the horse (age > 10 years, Thoroughbreds and Arabians are particularly sensitive)
- Stable practices (type and change of stabling and activities)
- Medical history (history of colic, medical treatments, dentition)
- Parasite control (presence of parasites, type of worming programme – selective versus systematic).

4.4.1.4.3.5 Obesity

There is a higher proportion of overweight horses in the sport and leisure category than among high-level competition horses (Dittmann et al., 2020; Robin et al., 2015; Visser et al., 2014). This prevalence can be related to the increase in companion animal status. Obese equids are at increased risk of developing metabolic pathologies such as hyperlipemia and laminitis. Awareness of obesity is a complex issue for owners. First of all, owners find it difficult to recognise if their own horse is overweight as they often see an increased body condition as ideal. This is particularly true if a horse is a heavy breed such as a pony, cob, draught horse or a Franches-Montagnes. Weight management becomes problematic when the people concerned learn that obesity severely impairs welfare, as this information conflicts with their view of their relationship with the equine, including playing the role of the nurturer (Furtado et al., 2020, 2021).

4.4.1.4.3.6 Hyperlipemia

The prevalence of hyperlipemia is between 3-5% in the equine population. Donkeys and small ponies, used almost exclusively for recreation, have a higher risk than horses. This disease is characterised by an increase in plasma triglyceride concentrations and a progressive infiltration of fat to the internal organs. Obesity, gestation, stress and concomitant pathologies are predisposing factors to the development of this metabolic condition. It remains very difficult to manage and a mortality rate of 60-80% has been reported (Burden et al., 2011).

4.4.1.4.3.7 Gastric ulcer syndrome

Equine gastric ulcer syndrome (EGUS) is a multifactorial disease that affects health, behaviour, welfare and performance. Studies link the presence of such lesions to a number of factors (Bell et al, 2007a, 2007b; de Graaf-Roelfsema et al, 2010; Kläring, 2015; Le Jeune et al, 2009; Luthersson et al, 2009; Luthersson & Nadeau, 2013; Malmkvist et al, 2012; Nadeau & Andrews, 2009; Roy et al, 2005; Videla & Andrews, 2009):

- Chronic stress
- A diet too low in fibre and rich in grain
- Fasting for more than six hours between meals
- Gastrointestinal disorders (colic)
- Administration of non-steroidal anti-inflammatory drugs (NSAIDs) such as phenylbutazone
- Various conditions of stabling and training: stall confinement, transport[95] and equestrian sport
- Purported breed predispositions.

The prevalence of EGUS is very high in sport and racehorses (44-100% of adults). It is lower in Thoroughbred yearlings (50%) and leisure horses (10-40%). The prevalence is also found to be higher and with more severe lesions in active horses compared to resting horses. The risk of gastric ulcers also increases with age, as three-year-old horses are more likely to have ulcers than two-year-olds. This observation would support a probable link with training. These lesions of the gastric mucosa appear very quickly. Light to heavy training over a period of eight days is sufficient to cause gastric ulcers in a high percentage of equids. Gastric ulceration can therefore develop without sustained activity over a long period of time.

Further studies are still needed to find out when and why this syndrome occurs and progresses, as well as to clarify the role of the predisposing factors mentioned above or others such as *Helicobacter equorum* bacteria or the hormone gastrin.

4.4.1.5 Education

In order to rectify welfare problems directly, equestrian federations can only intervene by regulating the situations for which they are responsible: planning and implementation of equestrian competitions, managing the implementation, and qualification of the people and horses participating. Outside of competitive venues, they can only act indirectly through the publication of information, member communication and awareness-raising programs set up either individually or as part of a network with other organisations. Several recent initiatives in Switzerland and abroad are highlighted below:

- The FEI's online educational platform (FEI, 2020a) provides free courses and educational materials for English-speaking adults
- The SE athlete training programme (FSSE, 2019a) is based on three successive levels:
  a. Basic training (Attestation/Diploma in riding or driving)
  b. Brevet/certificate (Authorisation to start in competitive sport in various disciplines, or as an opportunity for further training)
  c. License (Authorisation to start in competitive sport at higher levels)
- The SE course materials cover several topics (FSSE, 2018a, 2018b, 2019c)
  a. The principles of the ethical charter
  b. Basic information on hippology
  c. Equestrian practices and techniques in the various disciplines
- IENA Academy (IENA, 2020): Youth-oriented training that combines practical work and theory. The aim is to impart values and knowledge that enables the development of a healthy and lasting human-equine relationship and promotes welfare and respect for the dignity of the equid
  a. Teach appropriate behaviour when interacting with a horse or pony from an early age
  b. Awareness of the equine's needs and the importance of respecting them.

4.4.1.5.1 Identifying key issues to ensure the welfare of the equine population

Many equestrians are not able to correctly link signs of behavioural distress in equids to their cause or the deterioration in welfare or resulting safety issues (Figure 21). A recent study (Bell et al., 2019) showed that the observed equestrian population recognised these expressions of negative emotion, but the source of the emotion was often ignored. Specifically, videos that showed natural horsemanship or bridle-free riding are automatically (mis)interpreted as positive experiences for the horses. Even if the manifestations of negative emotional states are identified, a small number of people still want to see their horse treated in this way. In many cases, they struggle to correctly discern which of their own behaviours cause discomfort, anxiety or pain. Some individuals go so far as to justify abusing horses, for example when they refuse to jump a fence or enter the arena. Mild lameness is not always recognised (Nagy et al., 2017). This clearly raises the issue of how to better disseminate knowledge on indicators of impairment of health, dignity and welfare of sport horses. In conclusion, the behavioural signs of distress remain poorly understood. Therefore, the objective of reducing stress would justify an increased focus on this topic in the education and awareness programmes of the various equestrian federations. The main challenge remains to improve the health and welfare of equids by

[95] 5.8 Transport, p.148

communicating the findings of equine scientific research to all stakeholders and providing expertise on equestrian practices to researchers.

Figure 21 Screenshots of six videos where a horse is being handled during a specific activity.1) under-saddle dressage, 2) *natural horsemanship*, 3) in-hand dressage, 4) bridle-free riding, 5) reining, 6) behavioural rehabilitation. The videos were selected because the Authors recognised that the horses showed a variety of behavioural signs of stress, both subtle, such as muscular tension and a tense eye as well as more overt indicators like ear position and tail swishing. (Source: Bell C et al, 2019, https://www.mdpi.com/animals/animals-09-01124/article_deploy/html/images/animals-09-01124-g001.png, Creative Commons Attribution License)

Success depends largely on how the equestrian population perceives scientific advances and then accepts (or refuses) to apply the new knowledge. A recent publication (Thompson & Haigh, 2018) identified several types of negative statements and only one positive statement in discussion forums:

- Science would be opposed to practical experience and sensations on horseback
- Science is overrated. It cannot represent the only truth and has its limits: it cannot teach you how to ride or train a horse
- Science would be used as a marketing tool to sell new products
- Science is reductionist, it would want to standardize horses and would not address the complex heterogenous relationships between humans and equids that riding requires
- Science is still useful and progressive, as it promotes the improvement of welfare. As far as old habits are concerned, people can continue to do stupid and cruel things with horses, but when science contradicts it, it becomes more and more difficult for them to justify.

These preliminary results did not examine the prevalence of these views, but they do show the importance of communication (content and form) and knowledge dissemination.

4.4.1.6 The retraining of racehorses

The retraining of racehorses is becoming a sensitive issue. A number of foals bred for Thoroughbred or Harness racing do not start their career with sufficient success. A lack of physical and mental prowess, such as speed, stamina or robustness forces their owners to actively seek a solution that preserves their lives. Most often they find a buyer, frequently an amateur, who retrains the horse for leisure, tourism or equestrian sport. The most talented racehorses are trained and raced for several years before being retired. If their performance and breeding are promising, the stallions and mares are retired to stud. The others are sorted out and sold.

Some federations encourage the retraining of retired racehorses in alternative disciplines. For example, France Galop (2019) supports and works in partnership with associations that actively promote the retraining of racehorses. Promotional days present Thoroughbreds that have made a successful second career in pleasure riding to the public. They demonstrate their ability to adapt quickly to new activities. Several stables have specialised in this retraining.

Thoroughbreds removed from the racing circuit are considered to be unpopular, sometimes excitable, anxious, difficult to train and often affected by old pathologies such as tendonitis. They are said to be sources of safety problems (Lloyd et al., 2008, McGreevy et al., 2015). Some, however, have a robustness and character that facilitates retraining. Generally, they are priced lower than sport and leisure horses. The majority of Thoroughbreds have a specific temperament that is reinforced by fast gallop training and these abilities can make it difficult to retrain them for other disciplines. On the other hand, well-qualified equestrians appreciate them for their intelligence, sensitivity, sociability and curiosity. The success of their new career therefore depends largely on the buyer's skills and his or her commitment to this type of horse.

As Thoroughbreds often do not have the qualities expected of a leisure horse, such as emotional balance, a quiet nature and lack of behavioural problems, they are not a priori suitable for inexperienced, young and unsupervised athletes (Koenen et al., 2004). Experienced jockeys should therefore evaluate them with the help of ethograms already developed already developed in various studies (Fureix et al., 2009; Górecka et al., 2007; Søndergaard & Halekoh, 2003). For example, they could record the behaviour, temperament and sensitivity of the animal during handling (grooming, tacking up, being led out of the stable). The other part of the assessment should focus on riding for half an hour (attention, readiness for work, calmness, reaction to aids, behaviour when halted, musculoskeletal activity), and then after the ride (behaviour, calmness and activity in the stable).

Research groups (Hellmann et al., 2021; Wilk et al., 2016) suggest that there are different responses to stimuli in Thoroughbreds compared to horses bred specifically for other sports (heart rate variability and reactions to new situations). They do not, however, support the idea that this breed is unsuitable for certain disciplines simply due to stereotypical character traits. Nonetheless, these considerations clearly complicate the marketing of off-the-track-Thoroughbreds.

Trotters have a better reputation than Thoroughbreds and observations show that they present fewer difficulties in their retraining. Despite being bred for racing prowess, they are generally more docile (Burger et al., 2007), due to breeding selection based on speed at the trot, but also their willingness to be handled (harnessing, sulky, trotting). Their innate and highly coordinated biomechanics in fast trotting, specific to their breed, often remains a handicap in cantering. A Trotter converted into a jumper sometimes falls into a trot between two canter strides, particularly while jumping a course.

In conclusion, the retraining of racehorses for pleasure is still possible and can bring a lot of satisfaction to their owners when the horses are in good health. However, their temperament and biomechanics are sources of misunderstanding that may lead to unjustified mistreatment. In each individual case, the interests of the horse should be weighed against those of the owner, in order to choose the solution that imposes the least stress on the horse.

4.4.2 Policy and Regulatory Context

Swiss legislation (AniWA, AniWO) contains general and minimum instructions that protect equids, but there are no specific articles on their appropriate use (FA, 2017; CF, 2020). The Council of Europe has also developed a number of standards in the field of animal welfare. However, there are hardly any specific recommendations on the welfare of sport and competition horses. With few exceptions, the legislative framework of the EU and Switzerland implicitly refers to the rules established by the equestrian and racing organisations. Objectively, almost all of them contain measures to combat abuse and doping but there is minimal harmonisation between the various federations.

4.4.2.1 Swiss legislation

In legal terms, the AniWO defines the use of the horse (Art. 2, Para. 3 Letter o) but does not set any specific conditions for this. It considers a young horse to be a weanling that has not yet reached the age for regular use, but that is not older than 30 months (Art. 2, Para. 3, Letter q). AniWO does not define a minimum age at which the horse is considered old enough for "regular use."

Swiss legislation prohibits two practices uniformly for all animals (Art. 16, Para. 2, Letters g and h AniWO):

- Administering substances or products to animals that affect their performance (doping in the literal sense)
- Participating in competitions and sports events with animals to which prohibited substances or products have been administered (medication according to the lists drawn up by the sports federations or veterinary authorities).

With regard to equids, Swiss law prohibits other specific practices (Art. 21 AniWO):

- Competing with horses that have had a neurectomy or where the nerves of the limbs have otherwise been rendered insensitive, or where the skin of the limbs has been treated to make it hypersensitive to touch or auxiliary equipment is employed to cause pain. In the current wording, it is noted that the equestrian population may use these techniques outside of competition, unless they contravene other laws
- Advancing or punishing equids with instruments that produce electric shocks, such as spurs, whips or electric prods
- The use of tongue ties or poling (rapping)
- Forcing the horse to maintain its neck in hyperflexion (*"Rollkur"*).

The AniWO specifies conditions for the treatment of animals at competitions (Section 5 AniWO). Organisers and participants must not expose animals to more risks than are inherent in such events and must avoid pain, discomfort, harm or overexertion. Furthermore, only healthy animals may participate in an event and their welfare must be ensured (Art. 30a AniWO). This article also applies to exhibitions and selection events for young horses. This is discussed further in Chapters 5[96] and 6[97].

Equestrian competitions (horse shows, races) are governed by various regulations issued by sports federations. In addition to the rules specific to the disciplines and events, these regulations provide measures to ensure respect for the horse and to prevent abuse. Recreational sports activities are not subject to the rules of the organisations as they are part of the private domain.

4.4.2.2 National and international regulation of equestrian sports

4.4.2.2.1 The FEI International Equestrian Federation

The FEI (FEI, 2013, 2022b) outlines its policy on behaviour with sport horses in a Code of Conduct (*Code of Conduct for the Welfare of the Horse*). The Code of Conduct contains two very clear basic principles that must be observed:

- The welfare of the horse must remain paramount at all times
- Equine welfare should never be subordinated to competitive or commercial influences.

In order to implement its commitment to clean equestrian sport (FEI, 2021b), the FEI has set out its actions in three statements:

[96] 5.10 Shows, exhibitions and other events, p. 186

[97] 6.7 Training and selection of young horses, p. 251

- *Clean Sport* for Horses
- Clean Sport for Humans
- *Prevention of Competition Manipulation*

The FEI also specifies many aspects of the welfare and health of competition horses in a set of *Veterinary Regulations* updated annually (FEI, 2022a). Among other things, the Veterinary Regulations set out the conditions for the participation of horses (identification, vaccination, prohibited methods) and the responsibilities of organisers and official FEI veterinarians (organisation of veterinary services during the event, horse inspection, medication controls).

In addition, the FEI regulates the activities of all veterinarians and other therapists who accompany equine athletes during competitions either as a team veterinarian or in a private capacity. Previously, an owner was free to request veterinary services as long as they complied with current regulations. An entire chapter of the FEI Veterinary Regulations defines the various tasks, competencies and obligations of the FEI veterinarians. The *National Head FEI Veterinarian* and the *FEI Official Veterinarians* must have a good command of the English language and be accredited to work at events. They are nominated by their national federation, which is responsible for ensuring their continuing education. Only veterinarians who are recognised and registered by the FEI (*Permitted Treating Veterinarians PTV*) can treat horses during competitions, either as competition veterinarians, team veterinarians or private veterinarians. The FEI also regulates the use of *Permitted Equine Therapists PET* (FEI, 2021a). They provide complementary care, especially physiotherapy. Like veterinarians, PETs must respect the code of conduct.

At the international level (FEI), there are few or no binding requirements limiting the frequency of competitions or transport. Most of the points are general recommendations on animal welfare. The Veterinary Regulations define the stabling requirements for equine athletes. The 132 national equestrian federations affiliated with the FEI are required to adopt these regulations for the organisation of their own competitions. The weight the different federations give to these regulations varies and the federations may add further requirements.

4.4.2.2.2 SE Swiss Equestrian

In its guiding concept called "the red thread SE", it is stated that *"the SE [...] is committed to ethically and professionally responsible behaviour towards the horse and the environment"* (FSSE, 2020j). In 2018, the SE had already published a code of ethics (FSSE, 2018c), accompanied by a brochure and statements on its website (FSSE, 2018d, 2018e). The preamble outlines its ethical principles. They concern all persons active in the equestrian field, horse breeding, stabling, and training, whether for leisure or professional purposes:

- The individual respects each horse regardless of its breed, age, sex or its use. He takes responsibility for the living being entrusted to him. He takes into account its welfare in all decisions
- Any use of the horse takes into account its natural and sporting ability, its desire to perform, as well as its physical and psychological welfare
- Riders and trainers in equestrian sports have realistic expectations of equine performance and avoid physical and mental overexertion
- The welfare of the horses and fair play in sport always take precedence in competition, over personal pride (human interests) and commercial interests.

The articles of the General Regulations (GR) of the SE (FSSE, 2020a) establish the principles relating to the protection of animals (Art. 1.14), ethics (Art. 1.15), doping and pregnant or nursing mares (Art. 6.4) and define the offences and sanctions in case of mistreatment or doping (Art. 11.1 and 11.2 Let b). Appendix I specifies the behaviours considered as an offence: mistreating a horse, using a prohibited substance (FEI Prohibited Substances Database), inciting or assisting another to do either of the above, or riding, driving or leading a horse that is under the influence of a prohibited substance.

The various regulations of the SE concern above all the organisational aspects of the athletes and the judges specific to each discipline. They do not uniformly define the behaviour of mistreating a horse. Article 6.3 of the Eventing Regulations 2020 and Article 6.7 of the Jumping Regulations 2021 (FSSE, 2021c) use different wording to describe mistreatment in the respective disciplines (beating a horse, riding an overexerted, exhausted or obviously lame horse, using the whip, especially on the head, more than three times or causing an injury, using the spurs incorrectly or excessively, approaching an obstacle in a dangerous manner). Some of the recommendations are detailed further below[98].

4.4.2.2.2.1 The role of the jury and the SE veterinarians

The general regulations (FSSE, 2020a) and veterinary regulations (FSSE, 2021d) specify the veterinary functions within the SE. It entrusts the members of its Veterinary Commission (COVET) and the team veterinarians of each discipline to defend the interests of the horse in equestrian sport, and in particular in competitive sport (Art. 9.3.6, Letter a and 10.2.2, Letter a RegOrg; FSSE 2019d). The SE also relies on team and delegation veterinarians for official international competitions, testing veterinarians in charge of doping controls, veterinarians authorised to issue passports for equids and competition veterinarians. The latter are mandated by the event organiser to provide emergency veterinary care. They ensure that the legislation on animal protection is applied on the competition grounds, examine medication declarations and, together with the president of the jury, issue the starting

[98] 4.4.4.4 The regulatory concept for competition and racing, p. 78

license. They must also comply unreservedly with all regulations of the SE. For international competitions, the SE also employs veterinarians who meet the requirements of the FEI (FEI, 2022a, 2021b). A veterinarian chairs the veterinary commission. The tasks of the veterinary commission promote ethical practices in equestrian sport. The COVET advises the members and the committee of the SE, organises training courses for veterinarians, and in particular, issues veterinary approvals (FEI, competition and anti-doping controls), draws up the Veterinary Regulations and coordinates all veterinary matters.

The various regulations of the SE and the Code of Conduct provide a procedure for all suspicious cases (illness, prohibited practices or presence of blood) observed during the event (Figure 22). Officials subject to the SE regulations and the persons acting on its behalf (SE veterinarians) must immediately notify the person riding or driving the horse. The jury shall examine horses suspected of having been mistreated, for example when fresh blood is found. Depending on the situation, the horse will be disqualified or not allowed to start. The competition veterinarian can be called in to give his expert opinion. The veterinarian thus plays a very important role in safeguarding the interests of the horses competing.

Figure 22 An example of a prohibited practice in competition; Bottle caps have been used to sensitise the limbs of a jumper (Photo: private collection)

In 2019, the SE completed the requirements originally intended for show jumping competitions and extended them to also include dressage events. The judges must always observe the warm-up arena and also apply the new regulations on noseband tightening which were enacted on January 1st, 2020. For this purpose, they have criteria and guidelines for assessing the situation (FSSE, 2020c, 2020g). This document distinguishes between three categories: correct behaviour, conspicuous behaviour to be monitored and incorrect behaviour that is contrary to the welfare of the horse and requires immediate intervention. A person who mistreats his horse and does not correct his behaviour may be punished by a "yellow card" or by elimination in the case of a serious or repeated offence.

All major aspects of horse health before, during and after each endurance event are regulated by the FEI and the SE (FEI, 2022; SE, 2020). A Veterinary Commission and Veterinary Services Manager have the authority to decide whether the horse should be eliminated, allowed to continue the race, or possible treatment to be given. The mission of the COVET in the field of anti-doping testing (Testing Veterinarian) and the evaluation of medication declarations will be dealt with in Chapter 5[99].

4.4.2.2.2.2 Limiting the number of starts

At the national level, the SE General Regulations (Art. 4.4 GR) mandate a maximum number of two starts per day and per horse or three starts on two consecutive days (FSSE, 2020a). This wording takes into account the fact that events are increasingly taking place over more than two days. After each endurance event, or if the horse does not pass one of the health checks, it must take a mandatory break before is allowed to compete again in any discipline. Depending on the distance of the race, this can last from five to 33 days.

4.4.2.2.2.3 Other welfare provisions

The SE General Regulations (FSSE, 2020a) do not make any specific recommendations or requirements for transportation or accommodation. These are based on the requirements of the AniWO. However, the Veterinary Regulations contain some general principles in Annex I (SE Code of Conduct for the Welfare of Horses). The topic of noseband tightening will be discussed in Chapter 5 on the use of aids[100].

The issue of long-distance transport of sport horses is still under discussion at a European level. At present it is being discussed whether it would be better to break up longer journeys with a compulsory rest period (risks caused by an additional change of stable and environment) and whether the creation of transit stables is practically doable. Chapter 5 deals with the issue of equine transport[101].

4.4.2.3 Racing regulations

In the racing sector, the areas that fall under regulatory control include the guarantee of sportsmanship between competitors (horses and jockeys), equal chances of winning in betting and public perception. The international agreements for Thoroughbreds (IFHA) and Trotters (UET) provide a framework for their members, in particular through a code of good practice. Through affiliation to their respective organisations, the Swiss federations (Suisse Galop and Suisse Trot) strive to ensure that the ethical principles set out in the code are observed, such as the appropriate use of equipment (whips and maintaining the biological integrity of the racehorse). The Swiss Racing Federation (FSC) is the umbrella organisation for Thoroughbred and harness racing. Several of its provisions prevent abuses and - mainly from an animal welfare point of view - lay down the conditions for training and racing.

[99] 5.9 Doping and the medication of sport horses, p. 157

[100] 5.6 Auxiliary equipment and the use of force, p. 124

[101] 5.8 Transport, p. 148

Specific paragraphs deal with animal protection and medication (testing and prohibited substances), as well as prohibited practices and equipment (FSC, 2021a, 2021b). In particular, Annex V includes a comprehensive list of all permitted tack. Specific regulations monitor veterinary services at racetracks (FSC, 2018). Like several other national organisations, the FSC also performs out-of-competition sampling. Any horse listed on a training list in Switzerland, coming from another country, stationed in Switzerland or temporarily trained in Switzerland for the purpose of racing can be required to submit samples for testing (Appendix VII/A Doping in horses). The question of doping, medication and prohibited practices will be further discussed in Chapter 5[102].

4.4.2.3.1 International rules for harness racing

Harness races are organised in a similar way around the world. Horses are raced in harness, except in France, where mounted trotting is also practised. There is a common framework of regulations in the various countries, although each country has a few unique particulars. In Europe, the UET (European Trotting Union) brings together the national federations and coordinates a European circuit for the best horses. On the basis of an international agreement, it nurtures relationships in the fields of breeding and racing (UET, 2021a). The increasingly intense exchanges on the European continent have led the members to establish a minimum level of harmonisation. The commissions (breeding, technical, health and animal welfare) prepare proposals that are then adopted by the affiliated countries. It informs professional circles, institutions and the media in French, English, German and Swedish. The major topics detail the specific differences of each country in terms of welfare, medication control, prohibited practices and equipment (bit, tack, whip, tongue tie, allowance of unshod horses) and vaccinations. For example, Norway prohibits all use of the riding whip, while other nations restrict its use, the number of strikes and the range of arm movement allowed (UET, 2021b).

The North American continent is characterised by harness racing with two types of horses: trotters and pacers. They belong to the same Standardbred breed, but are selected separately (USTA, 2020). The United States Trotting Association (USTA) set up these two types of events on the basis of a single rule book (USTA Rule book). Very general principles govern the protection of the welfare of horses and drivers. Abusive use of the whip (brutal, excessive, indiscriminate) is punishable by a fine of up to $3,000 and a 30-day suspension in the event of a repeat offence and withdrawal of the license after the fourth offence. Horses must be properly harnessed, but there is no specific list of prohibited auxiliary equipment, unlike in Europe, e.g. Switzerland, where the regulations list all allowed equipment (UET, 2021c). The use of hobbles on the ipsilateral fore- and hindlimbs of pacers to prevent them from trotting or cantering remains unique. In general, it can be said that the American codification remains much more permissive than the one governing European racing, as the medication of Standardbreds is allowed in certain American events (USTA, 2021). This will also be discussed in the Chapter 5 on medication[103].

4.4.2.3.2 The International Rules of Thoroughbred Racing

Events are organised under the aegis of the International Federation of Horseracing Authorities (IFHA), whose headquarters are in Paris, France. The IFHA brings together nearly 60 governing bodies of Thoroughbred racing (jockey clubs) from 55 countries. Its main objective is to standardise the rules in order to increase international conformity in breeding, racing and betting. An international agreement was drawn up in 2021 that does just that (IFHA, 2021). By signing this agreement, each national authority commited to integrate the policies set out into its own regulations.

A standing committee of the IFHA (*Horse Welfare Committee*) deals with horse welfare and safety issues at racetracks since 2009 (IFHA, 2009). In particular, it encourages:

- The exchange of information between countries
- Raising awareness of stakeholders and third parties
- Cooperation with the International Movement of Horses Committee[104] (5.8 p. 144) and the *Advisory Committee on Equine Prohibited Substances and Practices.*

Its Code of Conduct (IFHA, 2017) highlights a number of principles on the role of racing authorities as well as key factors for welfare and safety:

- Regulations and guidelines (horse skills, equine health, prohibited practices, biosecurity, veterinary services)
- Training and racing surfaces (construction, maintenance, standards, labour, equipment)
- Scientific and legal knowledge, experience and ethics (trainers, stable staff, veterinarians and other health care providers, farriers, continuing education programmes)
- Investment in research and development (pathology and prevention, economics, partnerships)
- The culture within the racing industry making the safety and welfare of the horse a key priority.

There are continental and national differences in the application of these principles, and each member has a certain amount of independence in dealing with welfare issues. However, there is a consensus that standards need to be improved in three categories in particular:

- The use and potential overuse of drugs and medication
- Injuries and euthanasia on the racetrack

[102] 5.9 Doping and the medication of sport horses, p. 157
[103] 5.9 Doping and the medication of sport horses, p. 157
[104] 5.8 Transport, p. 148

- Monitoring of Thoroughbreds after retirement.

4.4.3 Stakeholder interests and areas of conflict

4.4.3.1 The interests of equids used for sport

Whether a horse can be required to make a particular effort depends on the risks of the strain it will be under. Therefore, justification by weighing the interests remains essential in every situation[105]. The interest of a sport horse requires it not to be asked to do something for which it has not been properly trained and prepared for. This is even more important when there is a high risk of the horse being under strain. The intensity of exercise, the dangers to the animal's integrity and the characteristics of the animal (breed, sex, age) are among the determining factors. It must also have sufficient rest and recovery periods and receive care appropriate to its nature and condition. In addition, the satisfaction of its basic needs (free movement, feeding, social interaction with other animals, security, shelter, environmental enrichment, psychological stimulation through exercise, adequate physical condition, good health) is also part of the interests of the equid. All of these interests remain worthy of protection from the beginning of a horse's sporting career until its death.

In conclusion, the principle of the sporting use (leisure and competition) of an equine animal is legitimate insofar as it provides predominantly beneficial effects – both physical and psychological - to the human athlete and as long as said use does not disregard the dignity of the animal nor cause strain detrimental to its welfare, either acutely or chronically.

4.4.3.2 The interests of the people

People who own horses invest in their acquisition, breeding and maintenance. They therefore believe that they have a legitimate interest in obtaining certain benefits (mental and physical health) and satisfactions in entertainment or competition. They have a vested interest in practising it with all the necessary safety precautions (Luke et al., 2022). When practiced during leisure time, the satisfaction gained from human-equine interaction is heavily based on the relationship aspect (individual development, recreation, activity, control, complicity). The moral imperative to provide these animals with care (hygiene, veterinary care, food) and to meet their natural needs is observed in the vast majority of owners.

In competition, the interest can be purely sporting (victory, ranking, participation) and also constitute a more or less decisive economic objective. There are a number of stakeholders involved. There are those who use (ride, drive, vault) the horse and those who make it available, either for a fee or free of charge (trainers, owners). The challenge of achieving success and the emulation between enthusiasts also pushes them to demand that the horse gives it his all. Its dignity and welfare are disregarded if the horse is treated with negligence or in violation of equestrian principles. Stakeholders may also aim for a high number of events in order to increase the chances of results and therefore winnings. This involves transport and, if necessary, changes of stable which directly influence health and performance. Practices that are driven solely by financial interests risk damaging the dignity and welfare of the horse:

- Training young horses too quickly to prepare them for a competition or sale
- Preparing horses for sporting events while ignoring - either intentionally or through negligence - the warning signs of more serious musculoskeletal or behavioural problems
- Stabling practices that deny social contact and free movement
- Using techniques inappropriately (auxiliary equipment, poling over jumps, neck hyperflexion, forbidden practices)
- Administering substances or drugs to influence performance[106].

In summary, the use of the horse allows the achievement equestrian goals but may not be done so at the cost of undermining the equid's dignity and welfare. Its interests are opposed to those of humans. However, the latter do not always have an overriding moral value that makes their interests worthy of protection[105].

4.4.4 Alternatives and recommendations

4.4.4.1 Introduction

In general, there is no viable alternative to physical exercise with equids. What remains is to avoid undue stress by controlling the intensity of the effort required and, above all, to minimise the risks. To this end, two aspects will be highlighted:

1. <u>Competence in Sport</u> (physical and psychological) and further development of the individual practicing an equestrian discipline
2. <u>The horse's aptitude,</u> which derives from its characteristics (breed, sex, age), level of training, robustness, health, physical form and environment (living conditions, food, ability to satisfy its basic needs).

Therefore, any person practising a sport with an equid remains under a moral duty (for his or her own dignity) to continually assess the risks of strain that they are imposing on a horse with each task. This remains clearly in the domain of personal responsibility.

[105] 2.7 Weighing the interests, p. 31
[106] 5.9 Doping and the medication of sport horses, p. 157

It is at this point that ethical reflection is necessary to determine the threshold at which the risk is unjustified[105, 107]. This begins with an analysis of the situation and the risks that a horse will face. Most often, strain affects the physical and psychological state of health. This can mean causing pain, aches or harm, anxiety or fear, or reducing the animal to the level of a sporting tool when its interests and natural needs are ignored.

The equestrian federations are not exempt from this responsibility. They have the task of guaranteeing the best conditions that ensure the equine athlete's safety and respect for their dignity and the integrity of their welfare. To this end, federations could rethink the competition calendar, planning of engagements, as well as monitoring and communication of the various events that can cause harm. Specifically, the COFICHEV recommends that all parties concerned provide for sustained regulatory and organisational monitoring of horses, particularly young horses, to detect imminent or early signs of injury. Indeed, as discussed below, many musculoskeletal conditions develop before adolescent horses begin training. If a situation becomes more hazardous, thorough examinations and increasing the number of days of slow exercise are more effective in preventing injury than simply resting the horse. Thus, vigilance and appropriate interventions can significantly reduce the impact of musculoskeletal disease in sport and racehorses (Crawford et al., 2020b, 2021c). Closer monitoring of the cardiovascular system prior to high-intensity exercise is essential to prevent the rare cases of sudden death.

4.4.4.2 Developments in legislation on the use of equids

Swiss legislation specifies many points concerning the stabling, movement and breeding of animals. With regard to use, it prohibits several practices that were once common. In the future, the periodic revision of these standards will take into account the evolution of equestrian sports and scientific knowledge. However, the need for broader regulation of the use of horses remains an open question. A modification seems desirable, but the variety of disciplines makes it difficult to draft a clear and satisfactory text. When collaborating with the authorities and the animal protection and research communities, equestrian federations are best positioned to formulate technical requirements. However, they run the risk of conflicts of interest, especially when they set up testing without putting animal welfare first. Furthermore, their regulations apply only to a minority of the equestrian population: those who participate in sporting events organised under the auspices of these federations.

However, several practices deserve to be re-evaluated. Without mentioning all of them at this stage of the discussion, neurectomy remains a topic for review, even though the number of these procedures has dropped considerably since the ban on competition and the improvement in the treatment of navicular syndrome. The welfare arguments put forward by veterinary specialists emphasise the significant pain-relieving effect of this operation, which can avoid the need for euthanasia of the horse. However, the recreational use of horses having undergone a neurectomy can also cause pain or harm. If so, it would constitute a strain that impairs equine welfare and disregards its dignity. Any procedure that cuts the nerves in the legs, or renders them insensitive, fundamentally alters sensory abilities[108]. It weakens or suppresses proprioception, and especially nociception. These sensory properties are essential to respond appropriately to a dangerous stimulus and prevent harm to bodily integrity. Indeed, pain informs the body that a tissue is undergoing, has undergone or is about to undergo damage likely to alter its health (stepping on a nail, infection, tendonitis). Pain suppression risks the safety of the equine population and of the riders.

The interest of equids to retain the ability to sense pain or other stimuli and not to be put at risk carries more weight than the interest of humans (their pleasure) in using a horse with irreversible injuries. Thus, permanent desensitisation of the limbs of a sport horse fulfils the conditions of undue hardship. Although no reliable testing techniques are known, the legal prohibition should extend to all uses and be included in the equine passport. However, there should be further discussion on whether this practice should be validated for horses that have been retired from all activities, provided that those around them are made aware of the side effects.

4.4.4.3 Training and dissemination of knowledge

The first step in reducing behaviour that has a negative effect on equids is basic training[109] for equids and continuing education for riders at all levels including for those professionally involved in the industry[110]. The skills of the instructors relating to equine welfare play a crucial role in the transmission of knowledge. This knowledge is based primarily on the results of scientific research equine welfare.

In the future, federations will face the major challenge of developing their education and public relation campaigns to raise awareness of welfare issues and equine dignity (leisure, racing, competition). However, it is not enough to emphasise that animal protection is a central concern. Federations need to provide tools (equine ethology, determining factors, evaluation systems, biological and behavioural indicators) to enable equestrians to identify the characteristic signs of discomfort. In addition, this knowledge encourages a paradigm shift and a change in the scale of values in dealing with equids[111]. To this end, the authorities (sport and breeding) will need to intensify collaboration with research institutions in order to enable the gathering of the necessary

[107] 2.8 The risks, p. 31

[108] 2.3.5 Examples of interventions that profoundly alter capacity, p. 24

[109] *Foundation training is* defined by ISES (*International Society for Equitation Science*, ISES, 2019) as the basic training of a young horse to respond to aids and commands that control its gait, speed, direction and posture for any purpose. Basic training may also include habituation to the saddle and rider.

[110] 4.4.1.5 Education, p. 70

[111] 4.4.1.4 The risks of strain on equids in sport, p. 61

knowledge. At the same time, cooperation with neutral public extension services would enhance communication and a continuous transfer of new knowledge to better understand and respect the uniqueness of equids and different breeds.

Although the educational information available is already much better, national federations can still improve in this area. For example, they could develop online documentation similar to that of the FEI Campus (FEI, 2020a) in their national languages. Other solutions would be to increase the emphasis on the links between welfare and training or competition practices, including indicators of strain. Aspects that are not yet well understood could be explored, such as the way horses perceive their environment and the consequences for their welfare.

4.4.4.4 The regulatory concept for competition and racing

Federations (sports, racing and breeding) are encouraged to regulate, record and communicate the frequency and number of engagements, incidents and accidents that affect the welfare and dignity of equids. To improve welfare conditions, they could, for example, set up a permanent welfare committee. Its task would be to analyse the current situation, compare it to that in other countries and across various fields, propose measures and then disseminate the new information. This type of action would primarily bring together federation members (amateurs and professionals) and equine health and welfare specialists including ethologists and veterinarians.

Subsequently, they can examine the efficiencies that could be gained from a higher degree of harmonisation between federations in the fight against abuse, prohibited practices, doping and controlled medication. This concerns three points in particular:

- The definition of terms and the consequences for the integrity of horses and events
- The specificities of the various disciplines and regulations
- The definition of roles, competencies and responsibilities (veterinarians, judges, sanctioning authorities) on the subject of monitoring.

In general, communication on infringements, monitoring, and access to and transparency of data have significant potential for improvement.

It is unlikely that the establishment and enforcement of new regulations alone will provide a lasting solution to poor sporting attitudes. Starting now, the existing system of respect for dignity and welfare should be supported by further work on several topics:

- Enriching youth's understanding of these issues (attractive and affordable awareness and education)
- Promoting personal responsibility for sport horses
- Emphasising the animality and understanding the equine perspective including their perception of sporting activities
- Strengthening the skillset (knowledge, willingness, courage, ability) of stewards, judges or other officials to recognise and intervene in cases of rule infringement at the competition venue.

By drawing on the expertise of animal welfare specialists, the industry could also develop alternative value models - models that go beyond equestrian technique or winning an event. They would be an opportunity to promote a flourishing relationship between equids and humans, an area which remains complex due to the many determining factors. This type of change would progressively change equestrian sport and racing from an economic driven model to one that focuses on the welfare and dignity of the equid and promote sustainable means of improvement. Discussions on the sustainability of equestrian competitive sport will continue to be essential and negotiations will continue as the ethical values of society evolve. By taking these steps and actively communicating advancements, the industry stands to benefit greatly from proactive engagement.

The Swiss Equestrian Federation (Swiss Equestrian – SE)

In the General Regulations the basic ethical principle clearly states that the welfare of the equid always takes precedence. However, the SE regulatory body does not address the concepts of mistreatment and prohibited practices in a uniform manner in the various texts that govern the organisation of and participation in events (FSSE, 2021c). The priority of these concepts is not homogeneous or consistent. This suggests that the importance of ensuring the dignity and welfare of the horse is dependent on the type of competition (jumping, dressage, eventing) and that competitive goals take precedence. However, there are numerous controls (doping, medication, nosebands) that are organised without discrimination for the discipline.

At the very least, the responsibility of defining and specifying self-worth (animal dignity) and welfare (mistreatment, prohibited practices, tack, monitoring) should be placed at the highest level of governance. Ideally, a special document would summarise the obligations specified amongst the various regulations and, additionally, would establish the system of control and monitoring entrusted to official and veterinary bodies of the SE. It would then become part of the statutes and regulations applicable to all disciplines. The points specific to certain disciplines would be included in the monitoring and control practices (frequency, specific risk points).

The SE regularly publishes violations and sanctions in its quarterly publication (Bulletin SE), but a well-structured and exhaustive monitoring would help to reduce the number of mistakes that generate unjustified strain. Increasing the precision of the following two areas would greatly improve consistency:

- Methodology: registration procedures

- and evaluation of all data, setting ambitious targets, an objective evaluation system, results, decisions, deviations from targets, publications
- Characterisation of violations: violations against health, welfare and dignity.

A review of the financial aspect of competitions (prize money) should be proposed, while considering the significant costs incurred by athletes, particularly at the top level. Under what conditions does competitive sport constitute an ideal or a profession?

Two important aspects remain to be addressed: the career management of sport horses[112] and accommodation, transportation and entry conditions for equine athletes[113]. For the rest, the breeding federations, like the equestrian sport federations, could make further progress by developing codes of good practice and rules to govern their sector. The involvement of young horses, including when they are ready to compete at a particular level, should be included[114].

Racing

For its part, the Swiss Racing Federation could develop programmes that promote the retraining of Thoroughbreds and Trotters, as is already being done in other countries. Temperamental assessment and the individual evaluation of the feasibility of healthy, retired racehorses for specific sports could be done in collaboration with equine behavioural specialists to help prospective owners to make the best use of their horses. Such an initiative would support racehorse owners to bring their retired horses to the market.

4.4.4.5 Career management of sport horses

In all disciplines, the main reason for the interruption or termination of an equine's sport career is the development of pathologies in the musculoskeletal system (Dyson, 2002, 2016a, 2016b; Murray et al., 2010; Sloet Oldruitenborgh-Oosterbaan et al.) In addition to a medical cause, there is also the possibility of a lack of ability or performance. The training of young horses for sporting careers remains an important issue. Management of their early career (sport and racehorses) directly influences functional longevity (Ricard & Blouin, 2011). For example, horses that start competing at a later age, young horses with few wins or places and those with joint problems before being started are at an increased risk of being decommissioned from sport[114].

Scientific studies (Logan & Nielsen, 2021; Stover, 2003) have shown that exercise during growth benefits health, regardless of the discipline[114]. The cardiovascular and musculoskeletal systems need several weeks to achieve adequate adaptation. If the intensity of the training programme exceeds their capacity to adapt, the health risk increases. At this stage, recovery is just as important as the training itself. Rest should promote the repair of small injuries without the use of anti-inflammatory drugs, which mask the problem and perpetuate further damage should training continue. However, absolute confinement also does not seem to be the ideal solution in cases of injury, as musculoskeletal tissues weaken with inactivity (bone loss, osteoporosis). A degree of unrestricted movement remains necessary.

There are a number of variables that have been shown to be associated with health and welfare problems of a horse over the course of its career (Lesimple et al., 2016). Therefore, longitudinal monitoring beginning early in a horse's life and gathering data on initial and advanced training, as well as physical and psychological condition is of great importance to those involved. The aim of such monitoring is to identify osteoarticular pathologies linked to development (osteochondrosis) before even starting training, as well as identifying and recognising early signs of disease and overexertion (behavioural and physical signs) during training[114]. The latter occurs as a result of an imbalance between training and recovery which causes chronic fatigue and reduced performance. Special attention must also be given to the application of medication. It is considered abuse when substances are administered to mask health impairments during exercise, allow exercise during recovery (not yet fit to compete) or facilitate physical activities. The physical and mental integrity of the equine athlete is unjustifiably compromised in such situations.

The positive relationship between a horse and its environment is also an important factor (McBride & Mills, 2012). Without waiting for negative developments in an athlete's condition, trainers and health specialists can establish an interdisciplinary collaboration focused on prevention (Dyson, 2002, 2016a, 2016b; Meyer, 2000, 2009). They will have the necessary skills to observe physical and psychological disorders that may result from training or competition. Prevention recommendations will include ethical principles, risk management and indicators of welfare[115]. The at times significant gap between the owner or rider's perception of a problem and its actual importance will also be the subject of close attention.

Several publications and books already address these topics (Baxter, 2011, 2020; BEVA, 2009; Denoix, 2014; Dyson, 2002, 2016a, 2016b; Hinchcliff et al, 2014; Hodgson et al, 2014; McGreevy et al, 2018; Ross & Dyson, 2011; Waran et al, 2007). Details of the practical application of knowledge are beyond the scope of this report. The industry relies on scientific studies conducted internationally on the assessment of risk factors for exercise-related injuries.

4.4.4.6 Accommodation, transportation and the frequency of engagements

At sporting events, all appropriate measures should be taken to ensure horses have adequate rest between events (stall dimensions, noise, lighting, air hygiene, stable activities). Stabling on the competition grounds reserved for the international or national elite

[112] 4.4.4.5 Career management of sport horses, p. 79

[113] 4.4.4.6 Accommodation, transportation and the frequency of engagements, p. 80

[114] 6.7 Training and selection of young horses, p. 252

[115] 2.4.1 Approaches to defining and assessing welfare, p. 25

must meet the regulatory conditions. In particular, it shall allow the horses to move freely in accordance with the provisions of Article 61 AniWO. It should be remembered that adherence to this regulation can only be suspended for a maximum of four weeks (Art. 61, Para. 6 AniWO).

When long-distance transportation and accommodation in temporary stables are the rule instead of the exception, a limit on the number of entries should be considered. This could be justified by the need to avoid excessive starts propelled by financial attractiveness and their accompanying negative impact on equine welfare. Reflections on the organisation of the show season (circuits, championships) would probably allow for improvements. The quota should be based on a defined period (e.g. per year) or on a minimum time interval to the next event. The competition should not be considered as an isolated event, but as the whole of the events that take place from the initial departure from the home stable to the horse's return; the time frame would therefore also include transportation and possible waiting times. However, limiting the number of starts at the international level is only feasible if it is harmonised between FEI members. Otherwise, stricter rules in some countries than others could lead to an imbalance in competition or an exodus of athletes or owners to countries with less restrictive policies. On a national level, the current regulations seem to be acceptable.

In addition, monitoring the frequency and nature of training seems unlikely at this time. This is why raising awareness among the equestrian population and chef d'equipe on this subject remains important.

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5 Specific issues: management and use of equids

Chapter 1 explored the ethical issues surrounding the particular practices that may be encountered with equids kept and used in the domestic environment. It does not address what conditions are especially conducive to their welfare. The advantages of the box stall and group boarding outdoors or on pasture are sufficiently described (bibliography cited in Ruet et al., 2019, 2020). Chapter 5 will deal with issues related to animal husbandry.

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5.1 Conditions for keeping stallions[116]

5.1.1 Description of the current situation, trends, strains and risks

In nature, stallions usually live in specific conditions: either a family group of mares (harem) or a band of single males (bachelor band). They can then establish the social relationships that meet the needs of their species. The stallion in a herd of mares does not spend all his time on reproductive interactions but also fulfils a role in protecting and holding the herd together. In contrast, domestic stallions are generally kept in box stalls and paddocks. They are kept in strict isolation or have limited physical contact with other horses. In Germany, for example, 70% of stallions are not permitted to interact with other horses. The environment is therefore particularly impoverished (Burger D et al., 2012; de Oliveira & Aurich, 2021; Irrgang & Gerken, 2010).

Individuals who keep stallions are often unaware of their natural needs and the extent of the challenges of having a stallion. They generally hold the traditional view that the more freedom of movement and social interaction stallions are given the greater the risk of property damage and injury. Recently there have been innovative ideas and changes implemented to provide more respectful living conditions for stallions (Gehlen et al., 2021; see the paragraph below on the social box stall[117]).

The subject of the desocialisation of stallions in the domestic environment has gained significant importance in recent years. The number of stallions in the equine population is not negligible but actual data varies according to the source. In Switzerland, 4.3% of adult male equids remain intact (Ackermann, 2017; Bachmann & Stauffacher, 2002; FSSE, 2011; Knubben et al., 2008), but data from Identitas in early 2021 show that 19.2% of males aged three years and older are not castrated. The latter figure is likely overestimated, as not all castrations are reported.

People who own a stallion do not want to castrate it for several reasons[118]. First, stallions that complete a successful career in one of the various equestrian and racing disciplines have the possibility of being retired to stud. This is relevant in Thoroughbred or Harness racing, where only the very best and fastest have a real chance of a successful stud career. For this reason, racetracks set up events especially reserved for the selection of the best colts. For the same reason, breeding selection in show jumping, dressage and eventing is based on a horse's success in its discipline. Second, some individuals question whether surgical castration respects the physical integrity of the horse. Some find it rewarding to own stallions, while others do it out of interest or even for amusement.

5.1.1.1 The strains and risks

The social confinement of stallions as a means of preventing accidents and injury is a major determining cause of high aggression, undesirable behaviour towards other horses and humans as well as stereotypies. It compromises animal welfare and undermines equine dignity (Burger D et al., 2012; de Oliveira & Aurich, 2021; Zilow, 2015).

Unmet needs for social contact and freedom of movement

The restrictive keeping of stallions primarily reduces their ability to satisfy social contact needs (physical, visual, olfactory and auditory) (Vandierendonck, 2006). The intensity of this limitation depends on the construction of the enclosures, e.g., whether high, closed walls or fences separate the enclosures. However, it is also important that a stallion can withdraw from continuous proximity of a dominant or threatening neighbour as this too is a source of stress. The lack of permanent access to turnout also restricts free-range movement and reduces environmental enrichment. Other needs are not substantially affected.

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[116] In hippology, a *stallion* is a male horse that has not been castrated, whereas a *stud* is a stallion used for breeding. In common parlance, the term *stallion* is used for both.

[117] 5.1.4.1 The advantages of the social box stall for social interaction, p. 95

[118] 5.2 Castration, p. 98

The vast majority of breeding stallions are kept in isolation in individual box stalls. Several precautions can be taken to prevent trauma and strain during breeding that results in a negative experience[119, 120]. Unfortunately, very few stallions are allowed to live in a herd of mares, the situation closest to natural settings.

Reproductive needs can be problematic

Stallions – especially those that are or have been used as studs - sometimes express their needs in a dramatic and forceful manner. However, these behaviours are part of their normal repertoire (McGreevy, 2004). Their management is usually not a problem if the people around them have the right skills to avoid conflict. Indeed, experience shows that it is possible to condition a stallion very effectively. He learns very quickly that after being fitted with the bridle, bit or halter reserved for breeding, he will be taken to the usual premises for preparation and breeding. Breeding (or mounting a dummy in the case of collection) and ejaculation act as positive reinforcements (rewards). Different situations, such as grooming and tacking up for riding or driving, are not associated with breeding and therefore do not usually generate excitement. It should be noted that problems observed in breeding are more commonly related to libido disorders, precopulatory or ejaculatory dysfunction, and insufficient fertility.

The sexual needs of a stallion that is never used for breeding are limited if it is not brought into direct contact with other horses. The extent of the reduction in libido depends on the magnitude of the reproductive instinct and the conditions in which the horse is kept. Sexual desire can be manifested by the noisy and energetic pursuit of social interaction, agitation and neighing. These expressions occur to varying degrees depending on a stallion's experience, environment and training. In general, all stallions may display typical behaviours such as rearing, threatening, aggression (biting) or preparing to breed without warning at the sight of another horse. The sight of a mare's group is enough to trigger reproductive reflexes. It should also be remembered that a stallion's sense of smell enables it to identify a mare in heat several metres away. They therefore represent a safety risk for those around them, especially if the handler does not have the necessary skills and experience. If the stallion is regularly confronted with these type of situations, he can develop the stereotypical traits attributed to stallions. This can happen in the stable or at other locations, for example during prize-giving ceremonies at competition. Handling stallions requires skills that can only be acquired with experience and people without this experience are quickly overwhelmed.

Identifying the causes of difficult behaviour that a stallion may exhibit is sometimes difficult. The cause may be the fact that he is not castrated, that he has inadequate living conditions and training, or a misinterpretation of his attitude due to a lack of knowledge of those around him. On the other hand, there are great differences between individuals and breeds. It is also worth remembering that behavioural disorders probably never occur in herds of wild horses or in horses living permanently in a natural setting. This clearly suggests that the environment of domesticated equids contains factors that favour the expression of frustration and stereotypies. These aspects influence the question of how stallions should ideally be managed.

Figure 23 A horse displaying stereotypy (cribbing) (Photo: Swiss National Stud)

Risks of stress, aggression and frustration

The search for social contact is one of the natural activities of horses to meet their essential needs. The long-term deprivation of social contact can lead to chronic stress and aggressive behaviour (Christensen, 2002a, 2002b; Lebelt, 1998). It represents a risk of stereotypies (Figure 23, Bachmann et al, 2003; Cooper et al, 2000; McGreevy et al, 1995; van Dierendonck, 2006). Sexual frustration is also suspected to be a cause self-mutilation (McDonnell, 2008) and a marked frenzy of spontaneous erections or masturbation (McDonnell et al., 1991, 2005; McDonnell, 1992, 1999, 2000, 2008). These signs indicate a deterioration in welfare.

Frustration is a psychological strain that can lead to chronic stress, which is a recognised potential source of behavioural disorders, often undesirable and even dangerous for the animal and humans. This risk is minimal for an in-demand breeding stallion, as his sexual appetite is usually satisfied. He should therefore be able to be well controlled through conditioning and training that allows him to differentiate between competition and breeding, provided the handler has the necessary knowledge and experience. Self-mutilation of the flanks or thighs from biting is manifested by aggressive, repeated, compulsive, silent and stereotyped behaviour. The stallion redirects his frustrations caused by isolation or a failure to have his needs met onto his own body. It causes skin injuries, which are also sources of infection and pain. It is hardly ever seen when the stallion's environment is enriched by the presence of humans or other horses.

In a non-sexual context, spontaneous erections and masturbatory practices without ejaculation are part of the normal repertoire observed in stallions and even some geldings in wild and feral herds. Sexual hormones are not necessarily involved. Erection facilitates the removal of smegma[121]. It can also be hypothesised that these activities are a way for stallions to adapt to a poor environment. The appearance of frenetic activity (very high intensity and frequency) or signs of chronic stress (diarrhoea,

[119] 6.3 Live cover, p. 231

[120] 6.4 Artificial insemination, p. 235

[121] Secretions produced by the preputial sebaceous glands, sometimes abundant and solid.

emaciation, anxiety, apathy, indifference to the environment, stereotypy) lead to the suspicion that the animal's capacity to adapt has been exceeded.

Managing unwanted behaviour

Moral considerations prompt some people to adopt punitive measures to prevent unwanted behaviour. These take the form of hitting the penis, applying a penile ring to inhibit erection (Figure 24), a stud brush fitted in front of the sheath (Figure 25) or electrified equipment. All of these interventions are unjustifiable. They cause pain and injuries, as well as disturbances in sexual behaviour and semen quality. They constitute serious violations of the welfare and dignity of stallions (McDonnell, 1992; McDonnell et al., 2005).

Several authors have proposed solutions to manage the undesirable behaviours described above (Dodman, 2004; McDonnell, 1987; Rousset, 2009; Stout, 2005). These include substances that act on the nervous system or that result in chemical or immunological castration[122]. Apart from the fact that these substances are unethical and contravene anti-doping regulations[123], they do not always have the desired effect.

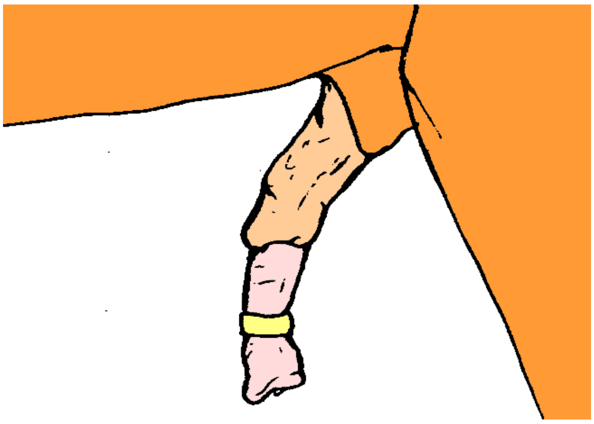

Figure 24 A penile ring (yellow) placed on the penis to prevent erection (Adapted courtesy of Sue McDonnell)

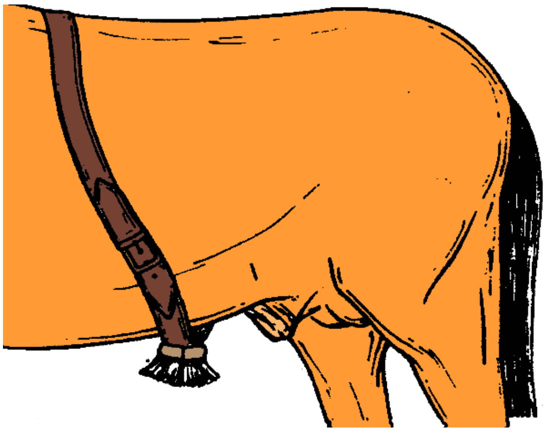

Figure 25 Stud brush to prevent erection (Adapted courtesy of Sue McDonnell)

In Switzerland, stallion owners do not always have the knowledge and experience to assess the risks and strain involved and to initiate appropriate training and handling measures – this deficit is at least partly due to the large number of hobby stallion owners. This has implications for the responsibility of the stable owner to exercise all due diligence in order to avoid harm to the welfare of the stallion.

5.1.2 Policy and regulatory context

The requirements of Swiss animal protection legislation on the keeping of equids do not distinguish between the sexes (stallion/gelding/mare). More specifically, the legislation requires that all equids must have visual, auditory and olfactory contact with at least one other equine. In justified cases, the cantonal authorities may issue a temporary exemption to continue to keep an elderly equid alone. In addition, the AniWO (CF, 2020) requires the keeping of young equids in groups after weaning and until the age of 30 months or the start of their regular training. All of these regulations are minimum requirements for all equine stable owners (Art. 59 AniWO).

Figure 26 Holding a stallion in an individual box stall with bars that allow him to smell a fellow horse and establish olfactory contact (Photo: Swiss National Stud)

The keeping of an adult stallion in an individual box stall is therefore legal as long as it can establish visual, auditory and olfactory contact with another equine (Figure 26) and it enjoys movement in the form of work or at least two hours of daily turnout in a paddock or field (Art. 61 AniWO). It should be remembered that the required contact to another equine cannot be replaced by another domestic animal, or the good care or affection of the person keeping it. The notion of olfactory contact includes the two dimensions of bodily proximity and the ability to use the specific olfactory organs located in the nasal cavities. Consequently, a stallion must be able to at least smell a conspecific. To the Authors' knowledge, no breeding organisation has a regulation that specifies the conditions under which stallions should be kept.

[122] 5.2 Castration, p. 98

[123] 5.9 Doping and the medication of sport horses, p. 158

5.1.3 Stakeholder interests and areas of conflict

The specific and overriding interests of a stallion are primarily behavioural requirements. The conditions under which he is kept must provide him with several benefits and meet certain requirements:

- Do not generate sexual frustration
- Provide the opportunity for full social contact with other horses
- Enable provision of a sufficiently rich stable and turnout environment
- Ensure sufficient freedom of movement in all gaits and outdoors.

In order to do this, the persons responsible can draw on the latest knowledge in ethology and modern stabling facilities. The ideal solution is to keep a stallion in a group of mares. These conditions, similar to those found in horses in the wild, present an absolute minimum of strain. The stallion's need for sexual activity, movement and social contact are optimally satisfied. People who keep a stallion in a poor environment such as an individual box stall with limited social contact with other horses are primarily concerned with minimising the risk of injury or damage that could result in liability. At the same time, they are interested in minimising construction costs by limiting the size of the stabling area. In this way, they can easily keep their stallion for breeding activities. Owners also regularly claim that their stallion is behaving badly or that he would be too low in a group hierarchy. Finally, they argue that administrative or economic requirements do not allow other solutions. This is especially the case when the stallion is of high value. All these arguments also serve to defend the maintenance of a tradition.

Some stallions are provided with an individual box stall with an adjoining walk-out. They are thus able to escape the stable climate, but these run-outs only provide limited opportunity for outdoor movement, and they cannot trot or canter normally due to the small area. This type of stabling improves visual and auditory contact, but not necessarily tactile and olfactory interaction if they cannot smell or touch another horse.

Not all human interests morally override those of the equid, especially when they primarily serve to preserve economic aspects (animal value and infrastructure costs). Those who defend these interests pose an obstacle to the search for a better system that respects stallions' natural needs. The advantages of an improvement would reduce the strain imposed on stallions, such as sexual frustration and the deprivation of extensive social relationships. The public's interest in seeing stallions kept in a proper manner, especially in the stables that keep them, should also be stressed in this respect.

These issues concern breeding establishments, stabling, animal protection interests, insurance companies (for humans or animals), law enforcement authorities as well as market for the construction of stables and fencing.

5.1.4 Alternatives that achieve the same results with less stress

Keeping a stallion in a well-equipped individual box stall can reduce some of the strain on him. However, he may not live alone in a stable. Social contact is defined as when a horse can see, hear and smell at least one other equine. To this end, the wall separating two adjoining box stalls shall be fitted, from chest height, with bars or another form of protective barrier that offer every guarantee of safety. In most cases, after a period of familiarisation, the increased opportunity for inter-equine relationships eliminates the deleterious consequences of isolation, notably sexual frustration. The stallion's need for freedom of movement is satisfied when the legal requirements are met (Art. 61 AniWO).

5.1.4.1 The advantages of the social box stall for social interaction

Figure 27 Interaction between two stallions in a social box stall (Photo: Swiss National Stud)

Figure 28 The plastic-covered bars of a social box stall (Photo: Swiss National Stud)

The most interesting alternative developed in recent years is undoubtedly the social box stall (developed by Kurtz)[124]. The principle consists of separating two adjacent box stalls by a wall in two parts. The section closest to the stall door is completely solid so that the horse can withdraw from the field of vision of its neighbour if desired. The other section is fitted with metal bars running vertically from the ground. The spacing between them (30 cm for adult males) should allow each individual to reach his head, neck

[124] Animal Consulting website, Steg ZH, http://animalconsulting.ch/, Retrieved 08.08.2019

and legs into the adjacent stall. If necessary, the bars can also be padded to prevent scrapes, particularly in the area of the orbita and zygomatic arch (above the eye) should the horse retreat quickly (Figure 27 and Figure 28). Some stables have chosen a bar diameter of up to 20 cm with a PVC covering.

The installation of social box stalls is also possible for geldings and mares. Several stables use this system (Gehlen et al., 2021). The principle is to enrich the environment of the equids and to offer them the opportunity to interact with neighbouring equids without causing aggression (Zollinger et al., 2016 a, 2016b). It allows mutual grooming, except for the head-to-tail position. It also has the advantage of facilitating resocialisation of equids experiencing difficulty within a herd structure. This is particularly true for geldings that retain stallion-like behaviour, as well as older, very dominant, lower-ranking horses or horses that show agonistic traits after bad experiences with their peers. The section with bars can also be constructed as a sliding wall, which in theory has the advantage of being able to test the understanding of two subjects that are intended to live together. However, this could violate the rule prohibiting cul-de-sacs or dead ends (Art. 59 Para. 5 AniWO).

Group boarding

As shown above, keeping a breeding stallion in a broodmare herd is the ideal solution. If this is not possible, stallions can be kept with one or more other stallions, provided sufficient space is available and monitoring measures are taken. The frequency of antagonistic interactions decreases very quickly after group formation and remains low after only four days (Briefer Freymond, 2013). Common at the turn of the 20th century in the large Swiss studs (Figure 29), the keeping of stallions in groups has all but disappeared in Switzerland. In Austria, on the other hand, Haflinger and Noriker stallions are kept in herds on the mountain pastures after the breeding season. (Figure 30). The stabling of geldings in groups after a period of acclimatisation is still possible.

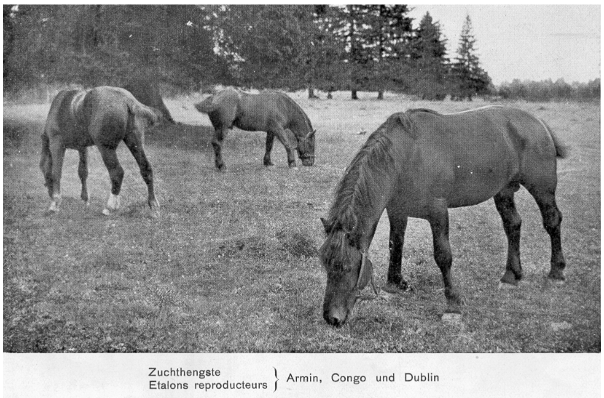

Figure 29 A group of breeding stallions at Bellelay around 1915 (Photo: Swiss National Stud)

Figure 30 A herd of Noriker stallions on an alpine pasture near Rauris, Austria (Source: Peter, https://commons.wikimedia.org/wiki/File:Hengstauftrieb_Rauris_6.jpg, Creative Commons Attribution-Share Alike 2.0 Generic license)

Resolving the problem of self-mutilation

Self-mutilation appears to be an indicator of poor living conditions. The only way to reduce its frequency (McDonnell, 2018) is to modify the way the stallion is kept: to distract him, including allowing him to interact with other equids. Turnout on pasture with mares or the presence of a companion (pony, donkey) enriches his environment and keeps him occupied. A significant reduction in the amount of grain feed in the diet and a switch to feeding mainly grass and hay increases the amount of time the stallion spends eating and thus reduces the frequency and intensity of this behavioural disorder. Several devices have been tried to prevent flank biting: muzzles, bibs or rigid neck cradles. Generally, these tools and punishments do not reduce aggression, but redirect it to other parts of the body or promote different disorders (kicking against the wall, biting, aggression).

Precautionary measures

Owning a stallion is not just a source of daily pleasure. An uneducated individual may be confronted with an escalation of undesirable behaviour. A frustrated stallion that is not able to have contact with other horses or is stressed or bullied may become anxious, disobedient, and then aggressive or even dangerous for humans. A few precautions can prevent this from happening:

- The stall of a stallion should not be surrounded by mares
- The staff responsible for day-to-day care should be kept as stable as possible and, without exception, should be educated in the stallion handling including detailed training on appropriate practices
- The turnout area should be set away from busy areas and other turnouts to avoid disturbance from the scent of mares or other horses
- The fencing of the turnout area should provide a visible boundary and prevent escape and injury (three rails and 180 cm high). It should be checked and maintained regularly
- When more than one horse in the barn is to be taken outside (paddock or field), the stallion must always be taken out first. The centre aisle passing the other horses should remain clear and the heads and necks of the other horses should not protrude into the aisle as the stallion passes.

5.1.5 Results of the balancing of interests and justification of strain

The legal obligations requiring freedom of movement, social interaction and care must be respected in all situations. If this is not the case, the strain imposed on the stallion becomes abusive and constitutes an offence. In such a case, any weighing of interests is superfluous and inappropriate, as the legislator has already implicitly done so. As a result, the interests of the above-mentioned owners or stable owners cannot be overriding - in other words, the legislation applies as the offences cannot be justified by personal interests.

When permanent social contact (sight, smell, sound) is not possible - for example when the dividing walls of the stalls are solid from top to bottom - keeping stallions in an individual box stall (with or without permanent access to turnout area) imposes undue strain and clear-cut infringements on the welfare of the stallion. He must, however, also be able to withdraw - part of the dividing wall can be top to bottom solid. These two aspects (the possibilities of interaction and withdrawal) also apply to the stabling of geldings and mares.

When a stallion kept in an individual box stall shows clear signs of sexual frustration over a long period of time, despite social contact, then the strain imposed is also considered abusive. An owner who is unable to satisfy either the stallions needs or the minimum legal requirements must therefore optimise the living conditions or consider castrating the equid out of respect for the dignity of the animal[125]. Impugning castration for reasons of respect for bodily integrity is not sufficient to justify the imposition of deficient living conditions. In all other cases, safety interests may outweigh the need to provide optimal and permanent opportunities for social contact, e.g. mutual grooming.

Finally, the principle of keeping a stallion and entering him in sporting events with the goal of a future breeding career is justified provided that the interests of the animal (as outlined above) are safeguarded. If this is not the case, the solution is to build up a sufficient bank of frozen semen and then castrate him.

5.1.6 Recommendations for implementation

- The legislative requirements must be strictly adhered to
- Individuals owning or boarding stallions must have, or acquire, the necessary knowledge of appropriate stable construction, handling and ethology
- Research programmes on the keeping of stallions and their behaviour should be developed, including the issue of sexual frustration
- The use of punitive and coercive means to prevent unwanted sexual behaviour remains unjustifiable. It is an abuse that should be outlawed as it impairs the welfare and disregards the dignity of stallions.

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5.2 Castration

5.2.1 Description of the current situation, trends, strains and risks

In common parlance, the term castration is understood primarily as the amputation of the testicles (orchidectomy, orchiectomy). In a broader sense, it deprives an individual, male or female, of his or her reproductive faculties by means of a surgical operation or the injection of chemical substances (hormones, vaccines). This intervention transforms the phenotype and abilities of a horse. The loss of reproductive abilities is therefore a profound violation of its dignity[126]. However, overriding interests may justify this strain. The strain of castration will therefore necessarily be subject to a careful weighing of interests of each party.

5.2.1.1 Surgical castration of stallions

In Switzerland and surrounding regions, owners castrate a very large proportion of their colts from the age of one year, mainly because of their lack of prospects as studs. In Switzerland, a little over 4% of colts are not castrated[127]. This percentage remains higher in the racing sector. In the West, there is an increasing number of stallions used for sport and leisure activities. Animal

[126] 2.2 Dignity, p. 20

[127] 5.1 Conditions for keeping stallions, p. 92

rights activists are increasingly questioning the ethics of this operation and the elimination of painful surgical procedures is a growing concern among young people. This trend could also be linked to the feminisation of the riding population[128].

The most common surgical procedure

Castration remains the most frequent surgical procedure performed on horses. It is performed for reasons of convenience (suppression of sexual behaviour) or for therapeutic reasons (inguinal hernia, cryptorchidism). It consists of the surgical removal of the testicles with its associated structures (epididymis, part of the spermatic cord). Castration results in a loss of fertility, a reduction of the libido and a change in body conformation. In young colts, it slows down the ossification of the growth plates. As a result, the colt grows larger than it would have as a stallion. Another method, called sterilisation, involves the surgeon cutting the vas deferens, preventing ejaculation of sperm, but leaving the testicles (and therefore hormone and sperm production) intact – therefore the sexual behaviour remains. This procedure is rare in horses and is performed endoscopically. Surgical castration is either performed in standing sedation or lying down in general anaesthesia; in both cases the use of local anaesthesia is mandatory. Castration in standing sedation is done less frequently for reasons of surgeon and personnel safety. The method chosen depends on the age of the stallion, the infrastructure available and the skill and experience of the veterinarian. Appropriate postoperative pain therapy is administered.

Testosterone, produced by the testicles, is drastically reduced immediately after castration. It generally takes four to eight weeks before the gelding loses his stallion behaviour but this transformation can take up to six months in some horses. Castration reduces the desire for sexual activity. Even before surgery, sexual desire is likely to be low in prepubescent foals and unsatisfied for most stallions that were not used in breeding. However, castration is seen by some as an affront to the dignity of the animal. In view of the growing interest in not castrating stallions, the question must be asked to what extent and in what circumstances castration leads to restrictions that are detrimental to a horse's welfare and disregard their own value (animal dignity).

5.2.1.1.1 The strains and risks of surgical castration

The castration of a stallion is an attack on his dignity because it profoundly alters his abilities and his appearance. The surgical method imposes psychological and physical strain on the stallion, in particular postoperative pain of varying intensity and lasting several days. Studies have developed indicators[129] to assess pain in horses (Dalla Costa et al, 2014; de Oliveira et al, 2020; Orth et al, 2020; Taffarel et al, 2015). Castration can also result in mild to severe complications, including side effects of general anaesthesia or injury during recovery, haemorrhage, infection, evisceration and even death of the animal (Nigg, 2000). However, these risks are lower when the operation is performed on colts one or two years of age. The question remains as to what overriding interests can justify the procedure[130].

The risk of incomplete castration (involuntary) is almost non-existent if an experienced surgeon performs the procedure *lege artis*. Hormonal testing (Esteller-Vico et al., 2013), can rule out the presence of functional testicular tissue in cases of uncertainty. However, typical stallion behaviour may persist even is the surgery is correctly done. This phenomenon is sometimes observed after castration of older studs.

In stallions, the strains and risks inherent to the surgery are not the only ones that require consideration. Leaving a stallion intact also presents risks if his sexual and social needs remain unfulfilled. This is particularly true if his owners and handlers do not have the necessary skills and knowledge[131].

5.2.1.2 Spaying of mares

The spaying of mares has very little importance, in contrast with stallions. The main reason is that the sexual behaviour of mares is not a problem in the vast majority of cases. The indications to deprive them of their reproductive capacity are therefore much rarer. In common parlance, the term spay is used when the procedure involves the removal of both ovaries. Specialists use the term ovariectomy. If a mare is given hormones or other substances and the goal is a reversible effect, it is called oestrus suppression rather than chemical castration.

5.2.1.2.1 The various indications for an ovariectomy and its effects

The most common indication for an ovariectomy is when a mare has an ovarian tumour. These can cause reproductive behavioural problems (marked aggression, attempts to mount other horses, tail flagging and frequent urination, nymphomania due to prolonged or permanent heat) caused by hormonal disturbances (Montavon, 1994). Abnormalities in sexual development (male with female organs (XY mare), hermaphroditism) can also cause character disturbances and justify removal of the intra-abdominal gonads (ovaries, testes or undifferentiated organs). In addition to behavioural problems, the production of the male hormone (testosterone) can lead to an unexpected positive result in a filly during a doping test. The presence of pathology also justifies an intervention to improve the welfare of the mare.

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[128] 4.1.1 Current reasons and motivations for owning and using a horse, p. 39

[129] 2.4.1 Approaches to defining and assessing welfare, p. 25

[130] 5.2.5 Results of the balancing of interests and justification of strain, p. 101

[131] 5.1 Conditions for keeping stallions, p. 92

Sometimes the owner also asks to spay a mare when she shows abnormally high reactivity or sensitivity at the beginning of oestrus. In this case it is suspected that cysts or painful ovaries cause colic and aggression. Spaying is occasionally performed for empirical reasons, at the request of a client who feels that the behaviour is incompatible with participating in sporting activities during heat. These sexual manifestations may in fact be quite natural in a mare and an ovariectomy might not result in the expected change in behaviour, as hormonal activity is not the only phenomenon involved in sexual expression. Several authors note that they can persist to varying degrees (cited in McKinnon et al., 2011) and conditioning may also play a role. However, the surgery may alter behavioural responses and utilitarian ability (Melgaard et al., 2020). An ovariectomy coupled with hormone replacement injections (progesterone daily for 100-120 days) can be used to provide recipient mares for an embryo transfer programme[132].

5.2.1.2.2 The strains imposed

Removal of the ovaries causes strain (pain, anaesthesia), the intensity of which depends on the surgical technique. Today, laparoscopic ovariectomy (abdominal endoscopy) is performed either on the standing sedated mare with various approaches or under general anaesthesia. This method is much less restrictive and traumatic than a laparotomy (open abdominal surgery). This procedure is only done by surgeons who are experienced in laparoscopy. In any case, an ovariectomy profoundly modifies the phenotype and capacities of the mare. When this surgery is performed solely so that the mare can better serve as an embryo recipient, there is a risk of excessive instrumentalisation if her basic needs are disregarded.

5.2.2 Policy and regulatory context

Animal welfare legislation does not contain a specific requirement that prohibits surgical castration of equids. As it is a painful procedure, it must be performed under general or local anaesthesia by a competent person (Art 16 AniWA), in this case a veterinarian. The application of drugs that have similar objectives is not covered by the legal provisions on the protection of animals, but by those on the use of veterinary medication (OVMP).

The regulations of the FEI and European national federations do not provide for the organisation of events reserved for stallions or mares unless they are intended for breeding selection. Castrated animals are therefore not restricted in participating in competition. At some racecourses in Europe, notably in France, this is not the case and geldings are excluded from most races. Geldings are however, permitted in most to all races in North America, Australia and the UK. Furthermore, hormone injections are included in the list of prohibited substances. This rules out their use to modify the behaviour of horses in equestrian competitions (FEI, 2022) and racing (FSC, 2021a, 2021b). Altrenogest (Regumate)® is part of the repertoire of prohibited substances for racing in Europe. Contaminations of Regumate® with anabolic drugs even led the international racing authorities to ban its use from the time of the birth of the horse until its definitive retirement from racing (BHA, 2019). The application of altrenogest remains approved by the FEI to mares but prohibited for geldings and stallions. Therefore, a stallion whose reproductive functions are to be suppressed may not compete with this substance in his system. Many national equestrian federations, for example the Swiss Equestrian SE (FSSE, 2021), automatically adopt these rules.

5.2.3 Stakeholder interests and areas of conflict

5.2.3.1 The interests of stallions and individuals

The specific interests of a stallion are to be able to behave in a balanced way, to establish optimal social contacts with other equids and to be able to satisfy its sexual desire without frustration. The sections on care and stabling conditions for stallions[133] and on natural breeding set out the particular interests of a stud[134].

The issue of the castration of stallions is of particular interest to those involved in breeding, owning and boarding equids, animal protection organisations, legislative authorities as well as insurance companies. People who have their stallions castrated expect the libido to be suppressed. They count on the gelding being safer and easier to handle, more adapted to socialise in the equine and human environment, as well as easier to sell (where appropriate). Above all, owners seek to improve animal welfare by reducing the stresses related to potential social isolation and the use of the animal (training, riding, driving). They also want to reduce infrastructure costs and the risks in the event of damage that could affect their liability. The interests of parties who do not castrate their stallions are primarily to preserve physical characteristics (Figure 31) and to not damage his dignity surgically. These owners are rarely concerned with the effect of their decision on the stallion's welfare or his sexual desire to breed.

Figure 31 Not castrating a stallion allows him to retain his male behaviour and specific aesthetic characteristics (Photo: Martin Rindlisbacher)

[132] 6.5 Embryo transfer, p. 240

[133] 5.1 Conditions for keeping stallions, p. 92

[134] 6.3 Live cover, p. 232

5.2.3.2 The interests of mares and individuals

The interest of the mare is to be able to establish optimal social contacts with her fellow equids and to behave in a well-adjusted manner. If she shows prolonged oestrus and behavioural problems, she will benefit from therapy that causes a minimum of stress, for example training, that does not endanger her physical or psychological health. Spaying or the administration of hormones or intrauterine devices to suppress oestrus do not protect her interests when these interventions are employed to modify or improve her performance without medical indication. A mare that has undergone a double ovariectomy to serve as a recipient for an embryo transfer should be protected from excessive instrumentalisation. In addition, the basic needs of the mare should always be met (food, shelter, social contact, freedom of movement).

The anti-GnRH vaccine may only be given by a veterinarian and with the owner's consent after being informed of the risks (inflammatory reactions, sterility and lasting suppression of the heat cycle). It remains essential to effectively protect humans against the undesirable hormonal effects of altrenogest (Laurentie, 2019). In order to avoid direct contact during handling, the veterinarian should always wear safety clothing and intact, leak-proof single-use gloves. In all cases, they should wash their hands after treatment and before eating. Accidentally contaminated skin should be thoroughly cleaned with soap and water immediately. In addition, many people at risk should not administer the product under any circumstances. People with known or suspected tumours (progesterone-dependent, such as breast or uterine cancer), coagulation disorders (thrombosis, embolisms) and women who are or may become pregnant are at particularly high risk. Finally, a potential buyer must be informed in all cases and in detail of the consequences of treatments administered to modify the ovarian cycle and any surgical procedures previously performed on the animal's reproductive organs.

5.2.4 Alternatives that achieve the same results with less strain

Hormonal castration of stallions and mares is a theoretical alternative to the surgical method. In reality, the administration of such substances does not always give satisfactory results, due to the necessity of frequent application, insufficient efficacy, side effects, and issues with doping and residues. The application of a natural or synthetic hormone (altrenogest - Regumate®) is a possible solution. It is known that a high blood concentration of progesterone abolishes the ovarian cycle. Altrenogest is a prescription drug available as an oral solution for the management of oestrus in mares. It must be handled with extreme care (Laurentie, 2019). The use of intrauterine devices can also be used to suppress oestrus (Nie et al., 2001, 2003; Gradil et al., 2019; Klein et al., 2016).

Finally, immunological castration can be attempted with an anti-GnRH (*gonadotropin releasing hormone*) vaccination. It reduces sexual behaviour for at least six months. Booster doses prolong this effect (Imboden et al., 2006). Immunological castration is only a practical alternative if the indication is well established. In each situation, the choice of which method to use should be based on a balance of interests between respect for the dignity of the equid, the possibility for improvement in welfare and a possible career in breeding. Gonadal activity resumes as the antibodies disappear gradually, similar to other vaccinations. The effects appear reversible in about 80-90% of cases after two injections (Burger et al., 2006, 2010; Imboden et al., 2006; Janett et al., 2009; Schulmann et al., 2013). After more than two doses, castration appears to be permanent in stallions. In contrast, at least 10% of mares do not regain normal ovarian activity within nine months after a single application. This alternative therefore remains contraindicated for breeding females.

5.2.5 Results of the balancing of interests and justification of strain

The major question to be answered by the weighing of interests is whether a stallion can manifest his sexual behaviour. The absence of a reproductive career can undermine this overriding interest. Even with the possibility of interaction with other horses, the likelihood of suffering from frustration-induced strain remains high. On the other hand, if used for breeding, the stallion can adopt normal reproductive attitudes if he covers a sufficient number of mares and satisfies his need for social contact[135, 136].

Safety for the stallion and surrounding horses and persons is the first argument that can justify castration. This intervention has the advantage of no longer inflicting the risk of sexual frustration onto the stallion, which leads to undesirable and even dangerous behavioural disorders. However, surgical castration can only be justified if it is performed in an effective and safe manner and is followed by pain management. Scrutinising testicular removal from the perspective of respect for the integrity of the physical body is not in itself overriding and sufficient. From an ethical point of view, one cannot refuse an intervention and tolerate strain imposed by a poor care environment. If the measures taken do not improve living conditions to a suitable level, castration is justified.

In the absence of medical reasons, spaying of a mare is much more difficult to justify, particularly when the argument is that the mare's behaviour during heat makes participation in sporting activities difficult or impossible and alternatives exist. Interventions of convenience to modify the normal sexual behaviour of a mare are by no means overriding. They remain unjustifiable.

Only a few provisions allow for the legitimisation of chemical or surgical interventions on the sexual physiology of a mare. First, the equine gynaecologist and ethologist (if necessary) must establish a clear causal link between the pathological functional state of her genitalia and a deterioration in her welfare caused by the expression of abnormal behavioural traits. If this professional body finds that the incurable pathology of a gonad causes character disorders, laparoscopic spaying is preferred. An experienced and

[135] 5.1 Conditions for keeping stallions, p. 92

[136] 6.3 Live cover, p. 232

well-equipped surgeon can perform the procedure. If such a diagnosis is not made, but the patient's welfare is impaired, an ovariectomy is not justified until the specialists have confirmed the cause of the behavioural disorder through appropriate diagnostics and ruled out other possible treatments. They must first try conservative treatment (intrauterine techniques, hormone therapy, GnRH inhibition, conditioning) to inhibit the mare going into heat or to reduce its intensity and duration. During a weighing of interests, these specialists must evaluate the efficacy, advantages and disadvantages of each method as relates to each individual animal, owner and environment (training, stables, infrastructure). Prior to insertion of an intrauterine device, a gynaecological examination is required in order for the treatment to be done *lege artis*. This serves to identify and resolve any problems that are independent of the cycle and to avoid masking other sources of pain or inflammation for the benefit of owner convenience.

Before proceeding with a treatment intervention, the veterinarian must verify the existence of the behavioural problems and, if so, whether a clear link can be established with the pathologies observed by his clinical examination. If this is not the case, alternatives should be sought[137] and spaying or immunological castration should not be performed. The section on doping[138] discusses the application of oestrus-suppressing substances for the purpose of improving performance.

5.2.6 Recommendations for implementation

- Improve training in risk assessment, care, education and handling of stallions
- Develop research projects:
    a. in the field of anti-GnRH immunisation for the permanent castration of stallions and mares with companion animal status
    b. to clarify the indications and effects of intrauterine devices.

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[138] 5.9 Doping and the medication of sport horses, p. 159

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5.3 The restriction of the geographic range of equids

5.3.1 Description of the current situation, trends, strains and risks

By nature, horses live within a large territory in the range of 0.6 to 78 km². They are non-territorial, i.e., their home ranges may overlap and are not explicitly defended. Their ranges and movements are therefore not restricted (Boyd & Keiper, 2005). For equids, spatial boundaries are unnatural and potentially dangerous. Compared to this natural habitat (Figure 32), the artificial environment of domestic boarding necessarily leads to a reduction in space. This limitation is accentuated by high land prices in areas with high population density. In addition, keeping horses in paddocks or in a stable ensures their availability. This restriction is within their capacity to adapt, provided that it is not too extreme and that they are offered additional opportunities for movement (turnout or exercise).

Figure 32 Arid steppes, the natural habitat of the horse (Source: Marián Polák, https://upload.wikimedia.org/wikipedia/commons/8/82/Mongolia_2012.jpg, CC BY-SA 4.0)

The legislation on the protection of animals (CF, 2020) sets out the minimum dimensions to be made available to equids; these may be reduced to the size of a box stall for permanent stabling. An equid can be confined in even smaller dimensions for a short period of time during temporary activities or handling, such as being secured in a trailer, starting gate, horse walker or for veterinary examinations. Young horses, who must be kept in groups from weaning until the start of their regular training, are most often confronted with an impoverished environment (individual box stalls, reduced exercise time, lack of social contact) when they enter into training (Art. 59 AniWO). If the needs of horses for freedom of movement are not met on a permanent basis, the physical and psychological harm that results is well documented (Arena et al., 2021; Bachmann, 2014; Bachmann et al., 2015; Henderson, 2007; HNS, 2018; Lebelt, 1998; Lesimple et al., 2020; Ruet et al., 2019; Schatzmann, 1988; Thelen, 2014; Zeeb, 1998).

5.3.1.1 Fences

The topic of fencing has been the subject of several publications (Collective, 2014, 2016; Doligez & Zanibelli, 2020; Les Haras nationaux, 2005, 2006, Lallemand, 2013; Lallemand et al., 2020). This research stresses that the primary role of a fence is to prevent equids from leaving the enclosure. They are also to warn passers-by of the danger of entering a restricted area reserved for equids. Furthermore, these constructions structure the outdoor areas and affect the legislation on land use.

Surface design influences equid behaviour and welfare

Several studies show that the surfaces and facilities available to equids influence their behaviour. In a herd, increasing the minimum resting space according to legislation increases the amount of time that low ranked herd members sleep in recumbency and reduces the frequency of them being driven to stand by more dominant herd mates (Burla et al., 2017). More specifically, antagonistic behaviour (threats, biting, kicking, chasing) and submissive behaviour (retreating) decrease with the increase in the size of the turnout area (with or without pasture). After the introduction of a new herd member, the number of conflicts per hour decreased. These effects appear significant up to 10,000 m^2. During daily social interaction, the level of aggression and stress in a group is significantly reduced if the available space exceeds 321-342 m^2 per head (Flauger & Krüger, 2013; Suagee-Bedore et al., 2020). Several studies confirm the benefit of larger turnout areas on the behaviour of horses kept in groups (Boyd, 1991; Jørgensen & Bøe, 2007).

Figure 33 Run-out area with metal partitions that allow for social contact (Photo: Swiss National Stud)

Figure 34 Box stall and small run-out area with electrified rope. This type of fencing is now prohibited in run-outs (Art. 35 AniWO). (Photo: Swiss National Stud)

Stalls and run-out areas

In stalls and adjoining run-outs, solid walls (wood, concrete) of various heights, horizontal and vertical metal bars (Figure 33) or a combination of both are installed. Until they were banned, electric fences were available (Figure 34) in run-outs areas of about 12 m^2. The possibilities for social contact and withdrawal depend on the type of barriers installed[139] and the size of the adjoining run-outs. In this context, one can observe particularly introverted equids who prefer to leave the run-out area and stay in their stall to avoid an argument or threats from a more dominant or aggressive neighbour. In this regard, owners and stable managers should carefully assess the type of barriers they want to use and take appropriate measures to optimise the social climate in the barn, e.g. by stabling horses next to each other according to their affinity (Moesenbacher-Molterer, 2013).

Paddocks and pastures

The fencing of paddocks and pastures is usually constructed with metal, wooden or synthetic posts and rails, or with electric wire, rope or tape. Good visibility remains essential. Despite the recommendations, barbed wire is still used – in Switzerland barbed wire is now banned, but the supervisory authority may allow its use in large pastures provided the wire is used in conjunction with another fencing type (Art. 63 AniWO). Equids may be stressed in the enclosure - a major risk factor for escaping. Escape attempts can occur if the quantity and quality of forage available is insufficient, when there are swarms of biting insects or if there are adverse weather conditions against which they cannot protect themselves (insufficient shelter). The most dangerous fences include, in descending order, barbed wire, wire mesh and knotted wire mesh, as well as metal beams that do not bend should the horse become trapped in them (e.g. mobile panel fences). Those that can break, particularly if they have a breaking point, reduce the risk of injury but increase the risk of escape from the enclosure.

Figure 35 Large turnout area for breeding stallions. The galvanised metal and impregnated wood fence is enhanced by an electric rope at the top (Source: Rachid Gharbi, https://cdn.pixabay.com/photo/2015/12/05/18/00/frank-mountain-1078558_1280.jpg, Pixabay License, free for commercial use)

The type of separation and the extent of the available space influence the range of equids and consequently their ability to express natural behaviours, including social interaction with other equids in nearby turnouts (Angliker, 2010; Moors et al., 2010). Negative experiences caused by a fence (electric shock, accident) can trigger a permanent fear (phobia). The horse then keeps its distance from the barrier, which reduces the available surface area of the enclosure (Glauser, 2015). For this reason, electric fencing is not permitted for small paddocks (Art. 35 Para. 5 AniWO).

In this respect, metal bar fencing is very suitable for paddocks that are independent of the stables. On the other hand, fences consisting solely of electrified demarcations do not allow any physical contact with a neighbour. The simple wire fence used for cattle is not sufficient for equids, even if it is electrified, because it is not visible enough. The required height of the fence depends on the height of the horses (measured at the top of the withers) and the level of risk. For large horses and stallions, fencing composed of metal bars (160 cm high) and three wooden rails (40-50 cm apart) can be raised to 180 cm using electric rope fencing. When the legal

[139] 5.1 Conditions for keeping stallions, p. 92

requirements are met[140], this type of fencing allows them to freely and safely use the enclosure while keeping their distance from the electric rope (Figure 35).

5.3.1.2 Walkers and treadmills

There are several pieces of equipment on the market that allow a horse to be exercised without the assistance of a rider, driver or stable staff. In Switzerland, 10-15% of horses are regularly exercised using a horse walker (Giese et al., 2009, 2014). Modern variants are no longer equipped with a tethering device and the compartments are separated hanging panels that can usually be electrified (Figure 36 and Figure 37).

The use of electricity in walkers

Figure 36 Automatic horse walker with divider panels that can be electrified (Photo: Swiss National Stud)

Figure 37 Automatic horse walker without electrified divider panels (Photo: Swiss National Stud)

Generally, electricity is only used during the training and habituation phase, e.g., to teach horses not to change their compartment. In studies (Giese et al., 2009, 2014; Glauser, 2015), the authors found no difference in blood cortisol and heart rate values between the walkers with or without electricity. A survey of stables using a walker also revealed that accidents are rare and occur primarily with nervous equids. They result in superficial injuries. For this reason, the use of electricity in walkers is still permitted, as stated in a FSVO Datasheet (OSAV, 2018). As a matter of principle, legislation prohibits "aids for forward motion or punishment of equids using instruments that produce electric shocks such as spurs, whips or electric prods (Art. 21, Letter c AniWO). However, in horse walkers, the electrified dividers between the compartments are not used to move the equids forward, but for delimitation purposes. For this reason, these walkers can be operated with the use of electric current elements in the divider panels.

Treadmills

The use of a treadmill to exercise horses has been increasing in recent years. These devices are now offered for straight line training. They offer a choice of different programs including inclination and variable speeds of up to 660 m/min (40 km/h) for trotting and cantering (Figure 38). The manufacturers offer several advantages of such a machine. They emphasise the considerable time saved, personalised training programme of the equine athlete and the possibilities of automatically carrying out exercise sessions including warm-up, interval training and recovery. A preliminary study (Ohmura et al., 2013) showed that the aerobic capacity and running performance of young Thoroughbreds could be improved without risk of lameness by adding high-intensity intermittent treadmill exercise to their training on a track.

Figure 38 Treadmill with an inclination function (Source : Horse experts, https://upload.wikimedia.org/wikipedia/commons/6/67/Laufband_HorsePro_by_ActivoMed_bergauf.jpg CC BY SA 3.0)

Some treadmills are also equipped for balneotherapy (water treadmill). The advantage of water is that it offers the possibility of adapting the exercise to the needs and pathologies of the individual horse because buoyancy counteracts up to 50% of body weight and thus reduces the recovery time. This use for medical reasons remains justified.

Strains caused by walkers and treadmills

The range of action and freedom of movement in a walker or on a treadmill is strictly limited and linked to an impoverishment of the environment. The possibilities to run away, choose a place to stand, explore their environment or to move around independently remain low or non-existent. This confinement constitutes a first source of strain. This is why Swiss legislation considers that all activity done under these circumstances represents a use (Art. 2, Para 3, Letter o AniWO), and not turnout (Art. 2, Para 3, Letter c AniWO).

The strain imposed is particularly relevant when these tools illegally replace compulsory turnout (Art. 2, Para 3, Letter c AniWO) and are aimed at following a strict and mechanical training programme for a sporting event. Furthermore, this situation prevents any tangible interaction between animals and humans. This situation is encountered in some establishments that prepare horses for high-level competition. The owners of these horses claim that their value is inestimable and that total autonomy in open-air pasture or paddock turnout carries too high a risk of injury and accident (Jaeggi, 2019). This attitude may lead to a mechanised degradation of some equids[141]; their welfare is not ensured and their dignity

[140] 5.3.2 Policy and regulatory context, p. 107

[141] 2.3.3 Degradation, p. 23

is disregarded. This practice remains prohibited, unless overriding interests provided for in the legislation justify a restriction of free movement. Additionally, racehorses should normally be exercised in groups. This promotes positive motivation and the spirit of competition between them. Everything that takes place outdoors including the stimulation of the jockeys or drivers enriches their environment. These stimuli are obviously not present in a mechanical environment. Moreover, success does not only depend on physical condition, but also to a large extent on their mental state.

Exercise performed on a treadmill only develops endurance (aerobic capacity). In comparison, outdoor sports require other skills that are essential for success. These include the ability to accelerate suddenly in order to better position oneself at the start or on the course, and the ability to maintain a steady pace on the turns. Finally, natural locomotion is fundamentally different from moving on a permanently rotating band. A treadmill propels the limbs backwards, forcing the animal to move them, and therefore the muscle engagement is different than if the animal decided to move forward itself. This force modifies several characteristic phases of equine locomotive biomechanics, in particular hoof placement, limb extension and hindlimb impulsion.

Other elements also impose strain. The strenuous and rapid exercise of trotting and galloping on a rotating surface significantly reduces thermoregulatory capacity. In this respect, a key point should be understood. It is not a cool environment that best contributes to the dissipation of the heat produced by the effort, but the relative flow of air created on the horse that moves outside. On the treadmill, however, the horse is deprived of this, as it remains in place, even if it moves its limbs. It never benefits from this possibility of lowering body temperature by convection and sweat evaporation. Allowing thermal energy to accumulate in the body leads to dangerous and unjustifiable stresses such as heat stroke (hyperthermia) and overexertion. These systemic failures reveal the excessive demands on the adaptive capacity of the horse. The only remedy available is to simulate wind with powerful wind tunnels and to reduce the effort required. The majority of companies that sell and install such devices do not offer them for equine treadmills. On the other hand, these machines are used with treadmills for scientific research. Finally, it is also worth noting that a recent study showed an adverse health correlation between time spent in a mechanical environment and lameness (Murray et al., 2010).

5.3.2 Policy and regulatory context

The Ordinance on the Protection of Animals (AniWO) contains several provisions specifying under which conditions the restriction of the range of freedom of movement of equids is permitted or prohibited (CF, 2020):

- Legislation allows electric fences. However, turnout areas[142] may only be bordered by an electric fence if they are large enough and designed in such a way that animals can keep a sufficient distance from the fence and still avoid each other if necessary (Art. 35, Para. 5 AniWO). Turnout spaces must comply with the minimum areas laid out in Annex 1, Table 7, Point 3 of the AniWO (OSAV, 2018)
- This provision no longer allows the use of an electric fence to separate small run-outs adjacent to individual box stalls (Figure 34)
- It is prohibited to use fencing systems that give electric shocks by means of a receiver attached to the body of the animal (Art. 16, Para. 2, Letter m AniWO)
- It is also prohibited to use electric shock devices to influence the behaviour of animals in the stable (Art. 35, Para. 1 AniWO). This provision therefore prohibits the use of electricity to separate two stalls in a stable or to prevent horses from nipping or gnawing on parts of the stall
- It should also be noted that Art. 21 Let. c AniWO (instruments producing electric shocks to aid forward motion or punish horses) does not apply to electric current used for fencing of pastures to separate horses or to prevent them from escaping
- The issue of electrified partitions separating horses in a walker has been discussed above[143]
- It is forbidden to fence paddocks with barbed wire but temporary exceptions may be granted by the cantonal authority if the pastures are large and the wire is coupled with another type of fencing (Art. 63 AniWO)
- Exercising an animal in an automatic walker is considered to be use (Art. 2, Para. 3, Letter o AniWO), in the same way as under saddle, ground work or driving. Exercise on a treadmill is not specified in the AniWO, but also meets the definition of use
- Equids must be granted sufficient movement every day (use or turnout). Article 61 AniWO (Paragraphs 1 to 7) specifies the conditions under which equids must be allowed to move: the size of the turnout area, exceptions (unfavourable weather conditions, ground conditions), duration and number of outings per week, keeping of a logbook. The article contains a subparagraph (Art. 61, Para. 6) that specifies the conditions under which turnout may be suspended for a maximum of four weeks
- Deviations from the provisions governing the manner in which equids are kept and treated are only permitted insofar as they are necessary for medical reasons or to comply with animal health regulations (Art. 14 AniWO). This means that a horse may remain in a stall for several days without being allowed turnout in the event of illness, accident or convalescence, or in the event of an epidemic

[142] Turnout area: pastures or paddocks set up in such a way as to allow the animals to move freely every day and in all types of weather (Art. 2, Para. 3, Letter f AniWO)
[143] 5.3.1.2 Walkers and treadmills, p. 105

- At events, animals may be kept for up to four days in accommodation and pens slightly smaller than the minimum dimensions set out in Annexes 1 and 2. If the animals are given sufficient movement or training each day, the period during which they may be kept in such accommodation and pens may be extended to a maximum of eight days. However, the layout and lighting requirements of the accommodation and pens must be respected and the climate conditions must meet the needs of the animals (Art. 30b AniWO)

The Swiss Federal Spatial Planning Act (SPA) devotes a specific article 16a^{bis} to the keeping of horses outside the building zone (FA, 2019). It regulates construction measures that may be permitted. Article 34b of the Spatial Planning Ordinance (SPO) specifies that the enclosure for an all-weather daily turnout may exceed the minimum area stipulated in the animal protection legislation up to the recommended area of 150m^2/horse, if, among other things, the ground reinforcement can be removed without undue effort (CF, 2021).

The stable owner is responsible for damage caused by the animal under his or her supervision, in particular if it escapes from the enclosure. He or she may be released from liability if they can prove that all necessary measures were taken with regard to fencing.

5.3.3 Stakeholder interests and areas of conflict

The interests of equids

When equids are exercised in an automatic walker or on a treadmill, their interests lie above all in guaranteeing their welfare and protecting their dignity. Some of their most important needs are:

- Satisfaction of their need for social contact and freedom of movement to the greatest extent possible
- Ensure their safety (including feeling that they can withdraw and run away)
- To provide accommodation in facilities that do not present a risk of injury, harm or escape
- Their ability to adapt should not be permanently affected.

However, the impoverishment of their environment and restrictions on their range of movement constitutes strain as it conflicts with their interest in interacting with other equids and enjoying unrestricted movement and turnout.

The interests of stable owners/managers

Several parties are affected by the issue of fencing. In the forefront are those who keep horses. They seek to keep them as securely as possible and to minimise the risk of injury or escape. They are also interested, for financial and accessibility reasons, to house them in accommodation systems at low cost and in the least amount of space. Companies strive to sell materials and equipment that has all the expected guarantees at a favourable price and sometimes has attractive aesthetic qualities. All these stakeholders defend, to varying degrees, values that concern the protection of horses and the economy (personnel and infrastructure costs).

Areas of tension between stakeholders

In view of the above, there is a clear conflict between the interests of equids and stable owners/managers. There is also a discrepancy between the natural needs of horses (freedom) and the safety measures implemented to prevent their escape (housing in stables). The cantonal authorities in charge of spatial planning are also involved, as they can impose building restrictions. The protection of the landscape and farmland, in particular arable land, are among their main concerns (ARE, 2015). For this reason, they only allow the minimum requirement for turnout areas to be exceeded if it is compatible with these overriding interests. As a result, most cantons only approve around 40m^2 instead of 150m2 per equine outside the building zone (Art. 34, Para 3 SPO). Finally, the interests of wildlife should be taken into account – their freedom of movement should not be impeded by impassable fences.

5.3.4 Alternatives that achieve the same results with less strain

Domestic care systems inevitably lead to a reduction in the freedom of equids. This is small for groups of animals kept in semi-freedom on large pastures, but substantial and decisive for those held individually. Once this premise is accepted, the ethically relevant question is how to reduce the strain to a permissible level. As noted above[144], the answer lies in personal responsibility and duties towards equids.

Flexible rubber, wood or metal rail fencing are satisfactory alternatives to electric fencing for turnout areas and pens. Metal fences are more expensive and more damaging to the landscape. For large grass areas (meadows or pastures), several rows of electric tape or rope are often necessary, especially if other species are turned out with the equids. Combining them with natural elements (dry stone walls, hedges, an avenue of trees) is also very useful. It provides richness of flora, fauna and landscape and functions as a hydraulic regulator and protector against sunlight, wind and erosion. For individual box stalls the walls that allow social contact and offer the possibility of retreat remain the only alternative. The distance between the vertical metal bars should be 30-35cm or less than 5cm (for horses).

The use of horse walkers and treadmills has its advantages. It allows certain parameters of exertion and locomotion to be measured for scientific research or during certain phases of a training programme. The majority of training objectives can be achieved through

[144] 1.5 The positioning of the COFICHEV, p. 16

routine and sensible outdoor training without imposing strains on the horses caused by the limitations of their freedom of movement. However, training can benefit from the support of modern technology, such as heart rate monitoring.

5.3.5 Results of the balancing of interests and justification of strain

Enclosing the stabling and turnout areas (fencing, walls) remains unavoidable to keep horses, but is only justified within the limits of the horse to adapt. Enclosures should be made of safe materials that can withstand impact without breaking. The aim should be to reduce the risk of injury and at the same time optimise safety against escape. Wherever possible (space, legal requirements), the area provided (turnout areas, stalls) should exceed the minimum legal requirements. Furthermore, freedom of movement should not be further restricted.

Electric fences are acceptable under certain conditions

Equids respect the electric current as a barrier after a very short learning process by operant conditioning and negative reinforcement. These fences optimally combine maximum safety to deter those who would attempt to escape and minimum risk of injury should they succeed. These advantages prevail and, to date, no severe or lasting strain on equids has been demonstrated by the use of this type of fencing (Angliker, 2010; Giese et al., 2009, 2014; Glauser, 2015; Moors et al., 2010). They are therefore justified for pastures and turnout areas, especially if the areas are large enough to allow animals to keep their distance from the fence, avoid each other as required, and do not have cul-de-sacs. Their visibility is ensured by using suitable materials (bands, ropes) that are less damaging to the landscape than more massive fences. They are also adapted to allow wildlife to pass through.

The justification for the use of horse walkers and treadmills

In using a horse walker or treadmill, the strain on an equine is imposed by the severe restriction of its social contact and its freedom of movement - this can only be justified under two conditions *sine qua non*. First, the stable management and turnout must be able to satisfy these needs in a sustainable manner. Second, temporary use of this equipment can never replace the obligatory turnout time. If this is the case, the horse is excessively instrumentalised and subjected to unjustifiable strain. This practice remains prohibited. The animal must be provided with a paddock in which it can decide its own pace, direction and speed of movement. Furthermore, there is no overriding interest where humans can legitimise the substitution of a mechanical device for a well thought-out and managed outdoor sporting activity. However, the legislation does allow the suspension of a horse's turnout when controlled and limited walking is indicated during convalescence for rehabilitation or in the cases provided for in the AniWO (Art. 61, Para. 6). If the infrastructure, financial and personnel resources are not sufficient to guarantee an equine athlete appropriate training and freedom of movement, the only solution is to change the conditions under which the athlete is kept or used.

Starting young horses

Special attention must be given to young horses when starting them. After spending the first part of their lives in a group, their environment is profoundly changed during this period. Too often, they are moved to an individual box stall at the same time as their initial training starts. The restriction of their range of movement imposes strains on them that cannot be unconditionally justified. Saving time and human resources can in no way legitimise this strain. It is essential that they continue to be able to satisfy their need for contact with other animals and for free movement, at least to a large extent. An optimal alternative is to keep them in a group with other equids either of their own age or in a mixed group. Social box stalls are still a very good solution. However, care should be taken to ensure that the space between the bars only allows the neck and head to pass, but not the chest or croup. This can be complicated when young horses of different sizes are kept together.

5.3.6 Recommendations for implementation

- Applying the minimum legal requirements is not always sufficient to ensure optimum welfare. Care should be taken to provide more space and movement when horses are regularly turned out in paddocks
- Even if it remains legal to keep a pony (<120cm) permanently in a 17.5m^2 facility (5.5m box^2 + 12m^2 turnout area) next to another equid, this very impoverished environment does not guarantee its welfare
- Develop research programmes to assess the nature and degree of strain (stress, behaviour) imposed on equids under various conditions of use on treadmills (speed, thermoregulation, adaptive capacity, biomechanics, musculoskeletal loading).

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5.4 Identification and branding of equids

5.4.1 Description of the current situation, trends, strains and risks

At a time of increasing international trade, obligatory identification, registration and tracing of equids has been discussed for several years for the purpose of ensuring animal health and food safety surveillance. At the turn of the 21st century, the European Union began to develop guidelines to monitor the various commercial and veterinary aspects of the breeding and keeping of horses (IFCE, 2021). This topic was discussed in Chapter 4[145].

5.4.1.1 The Swiss Animal Tracing Database (ATD)

For reasons similar to the European objectives, Switzerland introduced a registration system for horses in 2011. The Animal Tracing Database (ATD) now guarantees the international traceability of Swiss equids by assigning each horse an identity that is as clear as possible. The UELN (*Universal Equine Life Number*) plays an important role.

Identitas SA[146] manages the ATD on behalf of the Federal Office for Agriculture and the Swiss Confederation owns the majority of the shares. The portal agate.ch[147] allows the owners of animals and stables to enter their animals and consult the relevant information. Birth, transportation, death including euthanasia and slaughter of equids and status as a livestock or companion animal should be registered. This data is used to adopt emergency measures in case of an epizootic outbreak and to enforce agricultural legislation, in particular the direct payment ordinance. In addition, Identitas provides a wide range of statistical information[148].

Before the introduction of this centralised system, each breeding, equestrian and racing organisation as well as the military had established their own procedures for identification and registration according to their security needs. They used permanent or temporary methods that were developed over the course of history. The list of identification methods includes the identification number, the phenotype-based signalment (coat colour, whorls, natural and artificial markings), the certificate of origin with pedigree, the equine passport, hot or freeze brands, hoof brands, lead seals affixed to the mane by border officials, tattoos, microchips, biometrics, DNA profiles and retinal scans. Between 2008 and 2016, France tested visual and electronic ear tags for horses intended for slaughter, then abandoned them due to the significant strain on a sensory organ (RF, 2009, 2018; IFCE, 2021). In summary, an identification system should fulfil two functions related to traceability:

- <u>To identify an individual</u> as reliably as possible, for reasons of ownership, animal disease control, genetics, food safety, sporting fairness, international transport or other
- <u>To document membership in a group</u> such as the population of a country, a breeding organisation or other association or a group of vaccinated animals.

Reporting based on phenotype alone provides good reliability, but artificial markings, such as the microchip are needed to improve it.

145 4.2.3.2 European Union legislation, p. 47

146 https://www.identitas.ch/fr/, Retrieved 08.08.2019

147 https://www.agate.ch/portal/?login&language=fr, Retrieved 08.08.2019

148 https://tierstatistik.identitas.ch/fr/genus-equids.html, Retrieved 30.04.2021

5.4.1.2 An opportunity to meet future challenges

The pressure to identify every equid in a simple, but indisputable way will further increase for several reasons. Mobility is increasing across our continent, society demands security and traceability of goods and technological innovations are opening up new opportunities. Given the wealth of such a large amount of data (megadata or big data), new challenges, including their risks and opportunities, will have to be characterised and addressed in several areas related to identification (Rieder, 2017):

- The ownership of the data, which is derived from several successive sources (breeder, breeding organisation, owners, sporting federations)
- The rights to manage access to these elements, to share and use them and to take advantage of the added value (benefits, competitive advantages, knowledge) added at each stage of this chain
- The various approaches: an isolated and proprietary solution, centralised management (central database), network of open platforms and interfaces based on mutual trust, *blockchain* to store and transmit immutable information without a controlling body, but in full transparency
- The acceptability, understanding and mastery of new concepts, terms and acronyms by stakeholders in the value chain: precision farming, internet of things.

These issues do not directly affect the welfare and dignity of the equine population. However, they do make it possible to monitor the evolution of health, boarding and use conditions, to trigger virtuous processes of sustainable improvement of these last points and to generate competitive advantages for the actors of the sector based on traceability.

5.4.1.3 Strains on equids

In recent decades, discussions about the identification systems have focused almost exclusively on the justification of strain and induced pain. The subject of hot branding has crystallised passions, as it has significant cultural importance in several regions (Germany, Camargue, Iberian Peninsula to name a few), in particular those where cattle branding remains traditional. This brand can bring a competitive added value comparable to that of a logo. Hot iron and freeze branding with liquid nitrogen are prohibited in some European countries such as the Netherlands (2001) and Denmark (2010). In Switzerland and its neighbours, this system is also gradually disappearing. The Veterinary Service of the Swiss Army (Confédération suisse, 2018) also abandoned hot and freeze branding in in 2019. All methods that alter the phenotype (hot or freeze branding, tattooing) cause stress during the period of restraint and pain during their application and in the following days (Lebelt, 1997; Lindegaard, 2009; Meyer, 2009). However, the localised and irreversible intervention to the animal does not cause profound changes or loss of functionality as defined by the legislation[149]. Furthermore, it does not provide a precise and explicit individual identity.

The implantation of a microchip causes stress during restraint and pain during injection, but this strain is less than that experienced during branding (Lindegaard, 2009). Pressure sensitivity normally disappears within three days and direct complications remain low. However, restraint of the foal can be risky if not done gently.

Today, equine identification is based on the equine passport including microchip implantation and registration. Its inert and biocompatible material does not contain antigens that can trigger an intolerance response. A microchip does cause initial irritation and then the development of scar tissue that limits its migration (Gerber, 2012). For this reason, it is implanted in the fatty tissue of the cervical ligament in the upper left third of the neck about three centimetres below the mane. In this way, the chip does not end up in the musculature. Subcutaneous implantation is not recommended as it encourages displacement (Stein, 2003). Discussions about the appropriateness of hot branding as regards animal protection have become less relevant with the introduction of the microchip.

5.4.2 Policy and regulatory context

European and Swiss legislation

At the European level (European Commission, 2015, 2018), the identification of each equine is based on several elements:

- A unique, lifelong identity document with a phenotypical description and diagram (signalment)
- A clear link between this document and the animal of an equine species by means of a microchip
- Databases managed by passport-issuing bodies that rely on a central database and a unique identification number (UELN).
- An alternative method such as DNA profiling or retinal scan could replace the microchip in the future.

In order to uniquely identify equids, the Swiss Epizootic Diseases Ordinance EzDO (Art. 15a EzDO) requires all equids to have a microchip implanted with the exception of foals slaughtered before December 31st of their birth year (CF, 2020b). Swiss animal protection legislation (CF, 2020a) does not explicitly mention the branding of equids but it does specify (Art. 15, Para. 2, Letter e AniWO) that the branding of animals may be carried out by competent persons without prior anaesthesia. Swiss sporting organisations (equestrian sports and racing) require that all horses, regardless of their origin, be identifiable by an equine passport and all equids born after 2011 or those being newly registered in Switzerland must be identifiable by microchip.

[149] 2.3.4 Interventions that profoundly alter the phenotype, p. 23

5.4.3 Stakeholder interests and areas of conflict

The branding techniques used on horses cause varying degrees of pain. They also require restraint, which can be significant. It is in the best interests of the equine population to keep this to a minimum. Any permanent change to the phenotype or abilities constitutes a strain that may be detrimental to the dignity of the animal. However, modern identification methods do not cause profound damage and loss of functionality as defined by the legislation.

Individual identification (equine passport, branding or microchipping) is of major relevance for the animal because it gives it unique characteristics that remove its anonymity. This individualisation, for example having a name, reinforces its consideration, its recognition and its protection in its relationship with humans, whether as a livestock or companion animal.

These topics concern all sectors of the industry (breeding and sport organisations, the equestrian population, trade). They defend the interests of a highly reliable individual identification. They concern in particular questions of ownership, monitoring of the genetic value of breeding stock, the regularity of sporting competitions, the fight against epizootic diseases, food safety and general surveillance of animal movement. Irreversible (hot or freeze) skin branding mainly concerns breeding organisations and its members. A group brand (breed, studbook, stud farm) contributes to its identification and enhancement even if it is not specific to the individual. This marketing value acquires importance insofar as it is seen from a certain distance. For a long time, it was defended because of its low costs. However, this tradition is less marked in Switzerland than in other countries and has almost completely disappeared. As for reservations to the implantation of a foreign and electronic body in an animal, they no longer play a role.

5.4.4 Alternatives that achieve the same results with less strain

The implantation and reading of a microchip have definitively replaced the hot or freeze branding as a complement to the equine passport, in particular because of the strain. The debate on this subject seems to be closed for the moment. No real alternative to the passport is known. It physically follows the horse and can be checked as necessary. On the other hand, the data is only partially available in digital form and there is no secure application for viewing this data electronically, in particular the signalment, the pedigree or the vaccinations.

The use of DNA profiling is a non-invasive and painless procedure to uniquely identify a horse. The method is virtually stress-free for the animal. However, the time and costs involved do not allow for the possibility of proving the identity of a horse quickly and on a regular basis. This is because verification requires repeated sampling and analysis of the DNA. In addition, some collection techniques (hair or mane) can be a source of contamination and confusion. As a result, this approach does not allow for real time use on farms, for administrative purposes or in the food chain.

A few digital imaging procedures are of particular interest, including the retinal imaging, iris recognition or other biometric identification methods (Caja et al., 2004; Taha et al., 2020). Despite their high accuracy, they have not yet proven their practical value and met with international approval.

5.4.5 Results of the balancing of interests and justification of strain

The individual and unambiguous identification of an equine presents undeniable interests serving the protection of society and the animal. It helps to protect equine health during transport or epizootic outbreaks. Microchip implantation causes little strain and does not result in phenotype modification, therefore the implementation of microchips in equine identification is justified in addition to the signalment contained in the passport. The latter remains indispensable, as identification is still possible, especially if the person identifying an equid does not have a microchip reader or cannot read the chip for other reasons (migration, incompatibility with the reader, presence of several microchips). In comparison, hot and freeze branding cause excessive stress and risks to the animal. Their cultural value and competitive advantage in Switzerland is insufficient to justify them. As a general rule, live animals should not be branded as a means of advertising. Finally, the identification of horses by tattooing on the inside of the upper or lower lip should be discontinued because of the pain imposed.

5.4.6 Recommendations for implementation

- Limiting the marking of equids to microchip implantation
- Retention of non-invasive methods (passport with signalment) as a standard procedure
- Research projects for the development of simple, safe and non-invasive identification techniques (DNA)
- Initiate discussions to assess the consequences of new technologies including in the areas of ethics, welfare and dignity of equids, as well as traceability through the blockchain and value chain.

5.4.7 Thematic bibliography

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5.5 Excessive or inadequate care of equids

5.5.1 Description of the current situation, trends, strains and risks

The natural habitat of equids generally preserves their health and prevents injuries. However, the domestic mode of management and use hinders their behaviour to a decisive extent. As a result, humans provide care. They have to protect horses in other ways, e.g. grooming and shoeing[150], and renounce overprotectiveness to promote robustness. The horse should be kept in a stable or be treated with insect repellents. A number of aids are also used to maintain the health and welfare of horses that are weakened by their domestic living and working conditions (Figure 39, Figure 41, Figure 46). One example is a grazing muzzle to restrict food intake in cases of obesity, ear bonnets, fly masks or blankets against insects and insect hypersensitivity (sweet itch or summer dermatitis) and headshaking (Figure 41) or cribbing collars.

Sometimes these interventions seek to enhance aesthetic characteristics of the animal[151]. Some examples are trimming and pulling the mane, clipping the hair in the ears, clipping the feathers, the dock of the tail[152], the coronary bands, or the vibrissae[153] (Figure 40), or applying a false tail or tail extensions. Clipping the coat, docking the tail[154] or protecting an equid's hooves is done with the intention of facilitating easier or safer use of the equid. These measures are not without consequences. The questioning is

[150] 5.7 Hoof care and shoeing, p. 141

[151] 4.1.1 Current reasons and motivations for owning and using a horse, p. 39

[152] Upper section of the horse's tail

[153] Tactile hairs; prohibited practice in Switzerland

[154] This practice is forbidden in Switzerland and in FEI competitions, but is still common in some countries.

therefore legitimate. Before providing an answer, it is necessary to examine the strains and risks of each practice and weigh the interests:

- When does over-care disregard the dignity or limit the welfare of the equid?
- What negligence or omissions directly affect the dignity or restrict an equid's welfare?
- Is it justified to use aids to control the behaviour of the horse in a domestic environment and to simplify its boarding conditions?


Figure 39 Grazing muzzle to prevent food intake (Photo: Swiss National Stud)

5.5.1.1 The strains of some types of care can affect equid welfare

Several measures are detrimental to the welfare of equids and may disregard their dignity. Such interventions are physically and psychologically unjustified if they restrict the satisfaction of an equid's natural needs, profoundly alter the sensory capacities[155] or lead to frustration. Excessive care of the coat (shampooing) reduces the sebaceous layer, removes its barrier function and can cause skin irritation and long-lasting itching. If the owner clips the coat or trims the mane, it removes their protective functions (parasites, cold, humidity). Extensive management of the horse, which favours its robustness, is replaced with stabling, blanketing, ear bonnets or fly masks. The use of a blanket limits mutual and individual grooming. The removal of the internal hair of the auricle allows the intrusion of insects and foreign bodies into the ear canal. Removal of vibrissae (Fikuart, 1998) and the application of ear bonnets and fly masks (Figure 40, Figure 41) reduce sensory perception. Ill-fitted equipment causes pressure or friction injuries.


Figure 40 Nose and upper lip with shaved vibrissae (Photo: Swiss National Stud)

Some auxiliary equipment (muzzle, cribbing collar) are detrimental to behavioural motivation and can lead to frustration and, in the long term (Hall et al., 2008), learned helplessness[156]. For this reason, experts recommend that a grazing muzzle (Figure 39), should not be left on for more than 6-12 hours per day (Ahrling, 2020; Longland et al., 2016; NEWC, 2051; TVT, 2015) after a period of habituation. In addition, some models that are not flexible enough or poorly adjusted cause abrasion of the vibrissae and several areas of friction on the head. When the grazed grass is too short, abnormal wear of the incisors is also observed after prolonged wearing of the muzzle, as well as an aversion when the blades are too difficult to grasp; the horse hits the ground with the muzzle when trying to bite the short blades. The mouth of a horse that is not grazing must not remain in permanent contact with the base of the muzzle. A grazing muzzle also hinders the ability to self-groom and alters facial expressions communicated to other equids. In addition, there is a risk of getting caught in a fence. One study suggests that this equipment does not cause significant physiological stress even when worn for 24 hours (Davis, 2019; Davis et al., 2020).

In each case, the weighing of interests shows whether an intervention can be considered to disregard the dignity or excessively instrumentalize the animal. Practices already prohibited by the AniWO (removal of vibrissae, tail docking) and therapeutic care are not included in this procedure. However, the principles of veterinary medicine require that the least restrictive method be chosen.

The relationship between humans and equids where the latter are treated as companions and family members will continue. As a result, the frequency of excessive care problems will increase, while cases of neglect rather than ill will, will become less frequent. Clipping of horses and fundamental problems of thermoregulation are two very common aspects of inadequate care.

5.5.1.2 Clipping and blanketing

The clipping of horses and the use of blankets for convenience are among the most problematic developments in recent decades (Fink, 2014). Blankets can reduce the energy expenditure of horses in cold ambient temperatures. However, hay consumption only decreases by 0.2% of body weight compared to those not blanketed (DeBoer et al., 2020). This small benefit does not compensate for the disadvantages.

Presumed benefits and proven disadvantages

The practice of blanketing horses has long been an essential part of horse care. "[...] blankets should be used more frequently, as they protect the animals from the cold, from the excessive heat of the sun's rays, from bad weather, and expose them less to dust and the annoyance of insects. The usefulness of blankets is especially undeniable following hard exercise, as they prevent a host of illnesses caused by the sudden stopping of work or by the repercussions of perspiration" (Cardini, 1848). Even today, several advertisements claim that blankets improve the horse's comfort after a work session and allow it to dry out away from draughts.

[155] 2.3.5 Examples of interventions that profoundly alter capacity, p. 24

[156] Acquired distress (helplessness, resignation) occurs when a horse realises, after several unsuccessful attempts to respond to a stimulus, that it is still unable to respond correctly, whatever it does. It is thus forced to adopt an apathetic and very passive, even depressed attitude, which can be mistaken for obedience, submission or quietude.

Figure 41 Protective fly mask. It reduces head-shaking. This equipment hinders the mobility of the ears and reduces visual acuity (Image : Anemone-Projectors, https://upload.wikimedia.org/wikipedia/commons/6/66/GOC_Kimpton_010_Horse_%285722588184%29.jpg, CC BY SA 2.0)

As soon as the weather turns cooler many owners feel that their horses are having difficulty naturally managing their body temperature in turnout, while working, recovering, in the walker or in the stable. In the absence of any medical indication, many horses find themselves clipped and blanketed in their stalls. For these reasons, there are countless types of blankets on the market: anti-insect, waterproof, drying, heating, massaging, anti-eczema, for the stable, for the walker, for all weathers and all situations, with various weights of fabric. Some even cover the head and neck. A poor fit can cause pressure or rubbing on the skin.

The weight of anthropomorphism

Very often, tack stores, owners or trainers only look at the issue of thermal comfort from their perspective. These parties greatly overestimate the cold felt by horses and are unaware of the thermoregulatory processes and their consequences (Hartmann et al., 2017; DeBoer et al., 2020). Fortunately, the perception of equine welfare has evolved and the animal perspective is beginning to take hold. In a recent survey on the most offensive practices in the equine industry, 43% of respondents (n=2938, 75% of whom were women) cited clipping and over-blanketing as mistreatment justified by customs and habits (Doligez et al., 2014).

5.5.1.3 Thermoregulation and the thermoneutral zone at low temperatures

Through powerful and complex mechanisms of body temperature control and behavioural adjustment horses have a very high natural capacity to adapt to large climatic variations (Hodgson et al., 2014). Their living conditions in various continents show that they can survive, depending on the region, when the temperature drops to -40°C or rises to +40°C. Ignoring this fact, either intentionally or through negligence, presents a risk of abuse.

The thermal comfort zone

Between these extreme variations, a thermoneutral (or thermal comfort) zone allows an organism to maintain its internal temperature without having to fight either the cold or the heat. Although it depends on a few parameters, the thermoneutral zone is much lower in horses (between -15 and +5°C) than in humans (> +20°C), because their coat reduces heat loss and the undercoat protects against humidity. These characteristics are incomparable.

Individual factors influence thermoregulatory processes in domestic equids. These include species, breed, age, body fat percentage and environmental adaptation, coat length and density. Stabling conditions play a major role: group or single boarding, feeding, ambient temperature, humidity, local climate, season, topography, presence of natural or artificial shelter, use. Humans need to manage these factors to avoid stress and ensure animal welfare. Draft horses and ponies appear to be more resistant to cold than light and Warmblood types (Autio, 2008).

5.5.1.3.1 Strains and risks

Thermoregulation of the horse at rest maintains an energy balance between heat loss and heat production. Its reserves (fat, muscle) and food intake are an equine's main sources of energy. Movement, sunlight and building heating play only a minor role. If the temperature falls below the critical zone (-15°C without wind or rain and +5°C with rain or wind) it burns more calories. Equids adapt and maintain their internal temperature under three key conditions: not being clipped, receiving an extra ration of food and having access to a natural or artificial shelter. If it is deprived of its coat, it loses even more heat. For a clipped horse, the thermal comfort zone is closer to +5 °C, even without precipitation and wind.

If a horse does not consume enough energy it is more sensitive to the cold and has to draw on its reserves to stay warm – as a consequence it burns more calories and loses weight. Tense abdominal muscles, a hunched back, tail clamped between the buttocks, and shivering are the first typical signs of cold stress (stress and aches) that indicate that the equid needs to warm up. Immediate help should be given, including extra feed. Blanketing the animal immediately limits heat loss.

Necessary measures

Clipping of leisure horses in winter is rarely necessary, as they do not exercise intensively. Leaving the coat does not cause any strain. If they do perspire at low temperatures, the usual measures ensure their thermoregulation and welfare. Walking for at least half an hour before returning to the stable is sufficient to reduce the physical exertion required and thus reduce sweating. Wiping the coat down (with a towel or handful of straw) and grooming complete the preventive measures.

Healthy equids kept in groups have an advantage in protecting themselves from frost. Their close proximity, postures against the weather (hindquarters exposure), freely available hay, moderate free-range movement and covered resting places limit their heat loss. Under these conditions, they rarely suffer from the cold, even if the ambient air drops well below zero.

Several studies show that the ability of horses to withstand the harshness of winter is underestimated. For example, in Iceland, temperatures as low as -31°C do not compromise the horse's thermoregulation if they are acclimatised, kept in groups and provided with sufficient quality feed and shelter (Mejdell & Bøe, 2005).

Equids most vulnerable to cold

Several types of equids suffer from strain due to low temperatures and humidity:

- Donkeys and hybrids (they do not have enough undercoat)
- Equids not yet acclimatised to such conditions. It takes about three weeks to become accustomed to the cooling of the atmosphere from 25°C to 5°C
- Sick, injured or thin animals
- Foals and older horses
- Wet or damp coats - from rain or perspiration – are poor insulators
- Fully clipped equids.

The equine perspective

A Norwegian study (Mejdell et al., 2019) examined the perspective of horses who may or may not choose to be blanketed. The study shows that horses prefer to wear a blanket when the air temperature falls well below 0°C or when the air temperature remains moderate (+4°C to 10°C), but with rain or strong wind. On the other hand, they rarely decide to use a blanket when the temperature reaches 10°C. The same team (Jørgensen et al., 2019) studied the attraction of horses to shelter in winter conditions south of the Arctic Circle (Ø 1.3°C, -8.7 to 8.1°C). Regardless of the weather (cold, wind, snow), they spend more time outdoors than indoors whether they are blanketed or not. Under these conditions, blanketing reduces the impact of the weather but does not make the shelter useless.

Donkeys are more sensitive to cold

In the temperate climate of the UK, the behaviour of donkeys when seeking shelter (built or natural) differs markedly from that of horses (Proops et al., 2019). In general, changing weather conditions affect donkeys more than horses. They take refuge in shelters more often, especially below 10°C, in rainy weather and moderate wind. Under these conditions, horses rarely seek shelter. Horses, however, seem to be more bothered by insects than donkeys. They seek out shelter to escape harassment from insects outside, especially when the temperature is above 20°C.

5.5.1.4 Thermoregulation in high temperatures

The adaptability of equids allows them to survive in the wild when the temperature exceeds 30°C in a rather dry atmosphere (Figure 42). In contrast, hot and humid air hinders their thermoregulation. At this latitude (Switzerland), summer temperatures, even when it is hot, are generally not a problem for equids if trees and bushes provide sufficient shade.

Figure 42 Horses in the wild in the Namibian desert (Source: Stuart Orford, https://commons.wikimedia.org/wiki/File:_Namib_desert_feral_horses.jpg, CC BY-SA 2.0.)

In summer, horses are often equipped with light cotton sheets. They provide protection against flies but increase rectal temperature and sweat production. Instead of being blanketed, horses should be provided with shaded areas for their welfare. In view of global warming, it is expected that heatwaves will occur more frequently and earlier in the future.

5.5.1.5 The strains and risks for a horse that has exerted itself

When horses exert themselves, their muscular metabolism generates a very large amount of heat, up to forty times more than at rest. To eliminate this heat, they have the capacity to sweat to a degree that has no equivalent in the animal kingdom. A horse can produce 15 litres of sweat per hour if pushed to its functional limits. Sweating dissipates heat, cools the skin and lowers the body temperature. In the horse, the efficiency of this system depends on the intensity of the superficial blood circulation and the environment (ambient heat, humidity, wind speed). The practice of covering horses after exercise compromises cooling and places an additional thermal load on the horse during recovery (Hartmann & Dahlborn, 2013; Padalino et al., 2017).

Heat stroke can be life-threatening

A condition of hyperthermia called Exertional Heat Illness (EHI) occurs when horses fail to thermoregulate during intense exercise (Brownlow et al., 2016; Brownlow & Mizzi, 2020, 2021; Brownlow & Smith, 2021; Takahashi & Takahashi, 2020). This condition is life-threatening and constitutes a strain and a serious detriment to their welfare. Severe clinical signs usually appear shortly after physical activity during the recovery phase. Knowledge of the normal thermoregulatory processes and their variations is essential for the earliest possible detection (Verdegaal et al., 2021).

Evaporation of sweat is not a problem if dry air is circulating (wind, breeze, current) and the ambient temperature remains significantly lower than that of the skin, which is usually around 30°C. However, the skin surface temperature can rise to 41°C or more during exercise. The dissipation of perspiration slows down or stops when the skin becomes warmer than the air and the moisture-laden air does not flow. In this case, the sweat runs off the body and the skin remains wet. The risk of heat stroke (hyperthermia) is greatly increased. The body must be cooled in another way[157]. External cooling methods reduce the occurrence of catastrophic, even fatal, signs of thermoregulatory failure (apathy, weakness, loss of balance, muscle cramps, rectal temperature above 40°C), very rapid heart rate, fast and shallow breathing, dry skin and other clinical signs.

Horse racing and other competitions requiring high levels of exertion in hot and humid weather conditions require extreme thermoregulation. A recent and richly illustrated review (Brownlow & Mizzi, 2020) focuses on the thermoregulatory mechanisms of Thoroughbreds during exercise, including the physical processes of heat exchange by convection and evaporation during sweating.

Hose down or put on a cooler after exercise?

The reasons given for the strain of clipping sport horses are simple: they dry more quickly than if they keep their winter coat, they will not suffer from cold or back pain if they sweat and grooming takes less time (Münch & Steffen, 2013; Steinhoff-Wagner, 2019). In fact, thermoregulation is more complex. A blanketed horse recovers more slowly after exercise. This is because the insulating layer of the blanket slows down and reduces the cooling effect of perspiration and the blood circulation of the skin. If the equid is then exposed to the sun, or if the ambient temperature rises, and no one removes the blanket or replaces it with a lighter (less insulating) one, the equid may suffer from thermal stress. The blanket obviously protects against the cold caused by the weather (rain, wind and very low temperatures), but the clipped horse loses more heat than if it keeps its coat. In addition, the equipment does not adapt to the rapid changes in weather from day to night (Hartmann et al., 2017). These strains should be taken into account when weighing up interests.

Many sport horses are clipped in early winter and then blanketed after exercise. This is much less common for racehorses. For example, Swedish trotters are generally not clipped but hosed down and then blanketed after a race, but only after they have been dried. A study conducted at a temperature of about 7°C showed that hosing down an equid is effective in lowering rectal and skin temperature, but that blanketing compromised heat dissipation (Hartmann et al., 2014).

5.5.1.6 Extreme weather conditions

Sporting events (dressage, show jumping, eventing, driving, endurance, racing) are sometimes held in extreme climatic conditions. For example, the international endurance discipline is organised in the deserts of Arabia or in hot countries (Malaysia, India, Tunisia, Nicaragua). Many prestigious events are run over long distances (100-120 km) at high speed, which leads to an increase in the number of horses exhausted due to thermoregulatory and metabolic disturbances.

The subtropical climate of the Olympic equestrian competitions at the Hong Kong Summer Olympics in August 2008 predicted difficult conditions. The temperature averaged 30°C between 10am and 5pm with humidity above 65% and peaks of 90% at night, virtually no wind and intense solar radiation (Bradsher, 2008; Jeffcott, 2009). In such situations, the main challenge for an equine athlete is to rid the body of the heat generated by muscular exercise, which can raise the body temperature by 3°C to 4°C above normal values during sustained exercise. The rectal temperature can then exceed 42°C. The cooling process through evaporation of sweat and breathing is considerably slower under such conditions. If the horse is unable to reduce the hyperthermia, it suffers from heat stress and exhaustion. Without going into all the details of these very serious disturbances (loss of electrolytes, dehydration, lactic acid accumulation), there is no overriding interest that can justify these critical strains. It is therefore essential to take preventive measures to support thermoregulation and avoid organ failure (Bradsher, 2008; Jeffcott, 1995, 2009; Marlin et al., 2018).

The assessment of meteorological and environmental parameters to define the thermal load that horses withstand under extreme conditions is very difficult. Sunshine, sun intensity, shade, air humidity, wind speed, ambient temperatures as well as the reflection of radiation from the ground all play a major role. Furthermore, each horse reacts individually according to its state of acclimatisation and training, the intensity and duration of the exertion, degree of hydration and various factors that determine heat tolerance (species, breed, genetic heritage, behavioural profile).

The WBGT index is a powerful tool for assessing climatic conditions

Various indices (heat, comfort) are used to assess the overall effect of temperature, humidity, sun and wind on human athletes. These indices are not suitable for competition horses. In contrast, the WBGT (wet bulb globe temperature) Index[158] was validated for the management of the three-day eventing competition at the 1996 Atlanta Olympic Games and was subsequently used in Athens 2004 and Beijing 2008 (Figure 43). The FEI devoted a seminar to all the above points and developed a project to refine the WBGT-based guidelines for eventing, dressage and show jumping (McEwen et al., 2018).

[157] 5.5.4 Alternatives that achieve the same results with less strain, p. 120

[158] WGBT Index: The wet bulb globe temperature index estimates the temperature felt by taking into account temperature, humidity and solar radiation.

Reading the WBGT	Recommendations
< 28	No change to the FEI recommendations for the eventing competition should be necessary
28-30	Certain precautions are necessary to reduce the heat load on horses
30-32	Additional precautions to those above are necessary to minimize the risk of horses overheating
32-33	Hazardous weather conditions for the horses participating in the competition - additional modifications are required
> 33	Environmental conditions that are unlikely to be compatible with the safety of the competition. Further veterinary advice is required before continuing with the competition

Figure 43 On the left, the WGBT measuring device (Source: http://www.extech.com/products/HT30). On the right, the recommendations for the different levels of the WBGT index for the day's cross-country event (Source: Marlin et al., 2018)

5.5.2 Policy and regulatory context

Swiss legislation defines the keeping of equids in accordance with their needs

The AniWO (CF, 2020) defines compliant boarding (Art. 3), care (Art. 5), prohibited practices on all animals (Art. 16) and horses in particular (Art. 21), facilities for influencing behaviour in the stable (Art. 35), and hoof care (Art. 60). The FSVO's monitoring procedures are based on these requirements (OSAV, 2021). However, the AniWO does not lay down specific conditions for the use of equids[159].

The at times deficient regulation of breeding and sport organisations

Among the breeding federations, to the Authors' knowledge, the only association that prohibits certain practices is the Swiss Arabian Horse Breeding Association (SSECA) in their Rules of Presentation: *"It is forbidden to modify the original colour of the skin, coat and hooves. The use of colouring agents and colourless varnish for the hooves is prohibited. Dyes for the coat and cosmetic operations as well as transplants are not permitted. Colourless hoof grease, Vaseline or oil on the hooves and white chalk on white legs are permitted. All artificial procedures to enlarge the eyes or to modify the natural gaits of the horse are forbidden. Means such as oxygenation of the blood, weighted shoes, electrical and chemical treatments of any kind used to influence the horse's movements and behaviour are prohibited. Blister marks, scars or other marks on the body of the horse presented, which could indicate the use of prohibited measures may be considered by the DC (Disciplinary Committee) as a valid reason for the exclusion of the horse concerned from the show. The eyelashes, inside of the ears, the hair around the nostrils, mouth and eyes must not be clipped. Nursing foals may not be clipped in any way. At the show site, no coolers, clippers, tail sets or weights are permitted. Presenters who use such devices on the presentation site will be excluded for the duration of the presentation by the DC"* (SSECA, 2017).

The SE has introduced a Code of Conduct for Animal Welfare[160] into its Veterinary Regulations (FSSE, 2021). It specifies that *"competitions must not be held during extreme weather conditions that may endanger the welfare or safety of the horses. In case of heat or humidity, measures shall be taken to be taken to cool the horses quickly after the competition."* Certain cooling methods (e.g., enemas, dry ice, CO_2 spray) are not permitted in endurance events.

The following sub-chapter[161] deals with the use of auxiliary equipment that concern the SE and the FSC in more detail.

5.5.3 Stakeholder interests and areas of conflict

The interest of equids is mainly about ensuring their welfare

In the area of care, the interest of horses lies in the possibility of living conditions that allow them to prevent disease and injury through species-specific body hygiene behaviours. If this is impractical, humans will replace this deficit, particularly through maintenance (grooming, hoof care).

The values defended by the animal protection community are therefore concerned with welfare and preservation of the functionality of organs and body parts (mane, coat, vibrissae, sebum) without function being limited by human intervention. For example, blankets that almost completely cover the body prevent grooming between fellow animals. Furthermore, the authorities responsible for enforcing the legislation support the respect of animal welfare. Animal welfare stands in opposition to socio-cultural, aesthetic and economic interests (financial, time).

Human interests: use, safety, aesthetics

People who keep or use horses are interested in keeping them under control, safe and unburdened. They avoid having to adapt their management style and aim for ease of care. Winter coat clipping allows simple use without the need for drying and grooming due to excessive sweating; hands are not tangled in the mane if it is kept short; a fly mask or fringes covering the nostrils prevent headshaking (Figure 41); a muzzle prevents food intake[162] (Figure 39).

[159] 4.4.2.1 Swiss legislation, p. 72
[160] 4.4.2.2.2 SE Swiss Equestrian, p. 73
[161] 5.6 Auxiliary equipment and the use of force, p. 126
[162] 5.5.1.1 The strains of some types of care can affect equid welfare, p. 115

Some measures also prevent undesirable behaviours associated with domestication, such as cribbing collars or insect repellents (Herholz et al., 2016; Lincoln et al., 2015). Sweet itch whole body blankets make it possible for an equid affected by insect-bite hypersensitivity to stay on pasture. (Figure 46). In short, their arguments are mainly about unrestricted use, economy and health.

Figure 44 Hogged (roached) mane of a 3-year-old Franches-Montagnes filly (Photo: Camille Jeanne Poncet)

Figure 45 Mane of a horse kept extensively (Photo: Swiss National Stud)

There is often a need to plait horse's manes to compete, to remain fashionable and belong to a group, or to maintain historical practices such as roaching the mane (polo ponies, Franches-Montagnes, Fjords or Iberians). In Spain, breeders believe that manes roached at a young age grow back better. Aesthetic appearance meets the requirements of varying traditional and socio-cultural values (Figure 44). Utilitarian arguments are also put forward. Hogging (roaching) the mane of polo ponies prevents the mallet and reins from getting caught in the mane. Owners also want to avoid the mane and tails of equids that are kept very extensively getting tangled and knotted with twigs or branches (Figure 45).

In response, the breeders of the Franches-Montagnes breed (FSFM, 2011) argue that "in the canton of Jura the horses spend the entire summer on pastures with fir trees. Foals and young horses, and to a lesser extent the older ones, rub against these fir trees, which often have sap on them. The sap sticks to the mane of the horses and it is not possible to remove it without hogging (roaching) the mane. The manes of young horses are systematically roached to avoid this problem. Over the years it became a habit to roach the manes of foals and often of adult horses. When horses were still used in agriculture, it was also not pleasant to harness a horse with a mane full of sap."

As for the organisers of events (competitions), they try to entice the public by presenting aesthetically groomed horses. It should also be noted that fans of breeds with an abundance of mane and feathers (most draught breeds and some ponies) are very fond of this aesthetic and take great care to emphasise it. The phenotype of long feathers reinforces the breeding ideal.

A very lucrative market

The market for equestrian products and supplies (grooming items, blankets) is very profitable for the industry and for other corporate groups such as veterinarians and farriers. In this way they defend economic values.

5.5.4 Alternatives that achieve the same results with less strain

5.5.4.1 Managing obesity

To help an obese horse lose weight, the first step is to eliminate high energy feed (grain, carrots, apples, treats). If grain intake is necessary, the quantity should be strictly adapted to real needs (gestation, lactation, growth). In all these cases, the body condition score should be monitored very regularly (Carroll & Huntington, 1988; Doligez, 2018, 2020; Doligez & Genoux, 2018; IFCE, 2016, 2017). The feed ration is based on high-fibre, low-energy forages. The amount of late cut hay (cut in June/July) should not exceed 1.0 to 1.5 kg dry matter (DM) per 100 kg bodyweight. Chopped or pelleted hay is not suitable, as this form does not provide the opportunity for a physiological number of chews per day.

Managing access to pasture remains a very important factor in limiting the consumption of vegetation in spring and autumn. Grassland that has already been grazed by other animals, is at an advanced stage of growth or has a reduced surface area can be made available. Specific grass mixtures for horses provide better weight control than the grass offered to dairy cattle. In the stable, devices that slow down the intake of feed should be used (slow feeders). There are individual or large bale hay nets on the market with varying degrees of mesh size and feeders with a net or perforated plate. Obese equids should be exercised daily, without overexerting them. In addition, a veterinary exam is recommended to check for comorbidities (Equine Metabolic Syndrome, laminitis, Equine Cushing's Disease)[163].

5.5.4.2 Insect-bite hypersensitivity (also known as summer seasonal recurrent dermatitis)

As soon as the first clinical signs (itching, loss of mane and tail, bald patches, scabs) appear in the spring and lasting until late autumn, horses should be kept in the stables from dusk until 10 p.m. and from dawn until two to three hours after sunrise. Horses can still be turned out without a blanket during the rest of the day and at night, especially when it is rainy and windy. Several additional measures are useful:

[163] PPID - Pituitary Pars Intermedia Dysfunction

- Do not keep equids on wet ground, near manure heaps, standing water, forest edges or hedges (insect habitats)
- Apply natural pyrethrum-based products frequently. Their effect is limited, as they are quickly eliminated by perspiration
- Blanketing may be exceptionally beneficial, particularly for severely affected horses (Figure 46)
- Control should be based on zootechnical measures (breeding strategies), as its hereditary predisposition has been demonstrated.

Figure 46 Full coverage summer sheet for horses suffering from insect-bite hypersensitivity (Photo: Anne Ceppi)

5.5.4.3 Boarding horses under optimal conditions

Boarding arrangements should be chosen that limit self-grooming as little as possible (the ability to roll): body grooming. To this end, a variety of materials should be used for the floor and the turnout areas. Provide opportunities for social contact, including mutual grooming. As soon as their winter coat grows in, group housing of equids should be encouraged and permanent access to shelter (built or natural) should be available. Avoid making them sweat if possible and if not, they should be dry and groomed after work before being put back out. They should be given an extra ration of good quality forage. Because of their adaptability, these measures are sufficient to gradually adapt equids to low temperatures. Horses that are clipped during the winter period should be protected from the cold for various reasons. They should not sweat heavily, especially if it is raining or windy, as their minimum thermal neutral zone is 5-10°C. If they are blanketed, this will reduce the stress on a clipped horse's thermoregulation and prevent increased risk of disease.

Horses do not usually have problems when the ambient temperature rises to 30°C. However, the effort required should not overtax their metabolism. They must have access to sufficient water. In case of extreme conditions, especially if a horse's rectal temperature reaches 40°C, the body should be cooled down by dousing with cold water (6 to 15°C). A sudden icy shower is not an alternative; it overtaxes the thermoregulation, causes stress due to overcooling (chills after exercise) and increases the risk of infectious diseases. In the mid latitudes, shelter against the wind and rain is enough to protect donkeys in winter. Without a medical indication, these equids will not be clipped, because they need their coat to defend themselves against bad weather and insects. When they shed late in the spring or if the hair remains stuck (due to sweat or dirt), grooming is preferred. The installation of automatic brushes (Figure 47) also generate positive emotions (Lansade et al., 2022).

Figure 47 Automatic brushes that promote grooming(Source: amanderson2, https://commons.wikimedia.org/wiki/File:Donkey_Brush_(7157712283).jpg, CC BY 2.0)

5.5.5 Results of the balancing of interests and justification of strain

A weighing of interests must be carried out for each case of boarding and use. A few examples are provided to help understand the guidelines.

5.5.5.1 Mutual grooming is part of the natural needs of equids

Adequate care will compensate for deficiencies in boarding conditions, use or equipment that inhibit equine-specific grooming behaviour (Figure 48). If the care is inappropriate (neglected, exaggerated) or carried out by incompetent persons (grooming, hoof care, management of thermoregulation), the animal's health is compromised and its welfare unjustifiably reduced.

Interventions that only serve to alter appearance or simplify work do not usually strain the horses. For example, grooming of manes so long as it does not affect their functionality is not condemned. A meticulous and time-consuming grooming practice with temporary enhancements (braids, ribbons) does not strain an equid. This care even fosters its relationship with humans (Lansade et al., 2019).

5.5.5.2 Some grooming practices are restrictive

Several grooming practices represent a potential strain for an equid (debasement, loss of sensory or behavioural capacity, profound modification of its appearance or abilities, excessive instrumentalisation, restriction of its welfare). There are some unjustifiable cosmetic interventions:

- The feathers should not be removed (draught horses) except when medically indicated in horses suffering from pastern dermatitis (mud fever)
- Clipping the ears (outside and inside), neck or mane
- Shampooing too often, for example daily.

Figure 48 Mutual grooming is a natural need (Photo: Swiss National Stud)

5.5.5.2.1 Roaching (hogging) the mane

There are fundamentally different views on roaching the mane. Several breeders of Franches-Montagnes roach the mane not only for aesthetic reasons, but also because the weight of tradition and the potential difficulty of grooming due to sap remain more important (Figure 44). Conversely, opponents argue that these interests do not outweigh the hardship caused by the loss of the natural protective function of the mane. They add that sap being stuck in the mane is an exceptional situation and that manes can be washed using fats, solvents and soap to remove the sap. Therefore, this practice is detrimental to the welfare of the horses and their dignity and should be abandoned.

5.5.5.2.2 Clipping and blanketing in winter

Without medical indication, the burden of clipping and blanketing is not generally justified during the winter season. These practices disrupt equine thermoregulation and delay or even prevent them from becoming accustomed to low outdoor temperatures. This is particularly the case if temperatures frequently remain above 5-10°C (even with wind and rain), if the animals have access to shelter, and do not exert themselves - or only occasionally (recreational horses), if they are off between competition seasons or if they are kept in groups. As a rule, the usual (post-)exercise measures are sufficient to allow normal thermoregulation (do not make them sweat profusely, rub down the coat on return, groom the coat). The reasons most often given for clipping (they dry faster, the winter coat is too thick, care takes less time, to avoid back pain) are not preponderant.

If a horse has to work hard in winter temperatures, and is clipped to accommodate this, it is necessary to protect the thermoregulatory capacity of the horse. However, the need for a blanket (and therefore clipping) is not justified:

- under specific conditions that only take place seldomly (intercontinental travel, unavoidable intense exercise), or
- if other appropriate measures can be implemented to prevent thermal stress (overloading of the thermoregulatory capacity), especially when the animal is likely to sweat, the blanket is damp, the temperature falls below 5°C and the weather is windy, rainy or snowy.

5.5.5.3 Constraining aids

This will be analysed separately[164]. Auxiliary equipment is intended to maintain equine health and welfare when the conditions in which equids are kept are not optimal. In the absence of alternate management options and if the equipment itself represents only a minor strain to the horse in relation to the benefit, its use may be justified, particularly if it is temporary and used correctly. Devices that slow down the rate of feed intake (muzzle, hay net) and sweet itch blankets used to protect a horse suffering from insect-bite hypersensitivity can be included in this framework after weighing the interests.

On the other hand, the application of a cribbing collar, or any measure that prevents an equid from expressing a behaviour, causes unwarranted strain (Briefer Freymond et al., 2015; Nagy et al., 2009; McGreevy & Nicol, 1998). It is also questionable whether there is an overriding medical reason for it.

If severe symptoms of insect-bite hypersensitivity cannot be controlled despite care and improved housing conditions, and the animal is in permanent pain requiring long-term medication, the owner should have the horse put down.

5.5.5.4 Physical exercise in high ambient temperatures

A horse should not be put under intense strain when the outside temperature is hot with a high humidity index. This can impair thermoregulation and lead to heat stroke. When such exercise is unavoidable, the welfare interests of the horse are paramount. The persons responsible for the animals and event organisation must take all necessary measures to support the normalisation of their internal temperature post-exertion and prevent short and long-term harm as effectively as possible (Jeffcott, 2009; Takahashi et al., 2020).

Training an equine athlete on a treadmill in a closed room, without air circulation or while the horse is wearing a blanket, in order to acclimatise the athlete to exertion under high temperature conditions shall be prohibited. These restrictive conditions impose very high risks of abuse, health problems (thermoregulatory failure) and excessive instrumentalisation. No interests worthy of protection can justify this.

5.5.5.4.1 Measures in the event of a heatwave

In the event of a heatwave, the following preventative measures are recommended:

- Learn what the signs of heat exhaustion and heat stroke are, as well as the real impact of climatic factors
- Always provide sufficient water
- Maintain electrolyte balance in the diet and provide supplements for extensive exercise and deficits caused by heavy sweating. Observe horses for the development of metabolic disorders such as exertional myopathy (*tying-up*) or synchronous diaphragmatic flutter[165]

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[164] 5.6 Auxiliary equipment and the use of force, p. 126

[165] SDF (*Synchronous Diaphragmatic Flutter*) is the contraction of the diaphragm in synchrony with the heartbeat and not with the respiratory movements, which is detected by the appearance of spasms on the flanks and sometimes an audible thumping sound.

- Evaluate cardiovascular parameters, hydration status and rectal temperature of horses before, during (if possible) and after exercise (recovery phases)
- Accustom the equine athlete to hot climates with the aim of improving its thermoregulatory capacity and tolerance to body heat accumulation without fluid loss. Refrain from demanding such efforts if the equid is not properly prepared
- Avoid transporting the horse during a heatwave, or do it in the evening or very early in the morning when the temperatures are cooler
- Choose the time of day when the temperature and humidity are lowest for exercising equids. Adjust the timing of outings, training sessions and events (bring them forward in the morning or delay them until nighttime). Take frequent breaks
- Select surfaces where the evaporation of moisture creates a cool atmosphere (vegetated areas, forest). Avoid exercise on areas overheated by the sun (dry sand paddock, roads). If necessary, regularly water the grounds (courses, arenas, relaxation and rest areas). Use the WGBT index to assess the climatic factors at these locations
- Monitor the temperature of the air in the stable. Ventilate if necessary
- Keep the horse in the shade and do not confine it in a closed and hot stall
- Do not cover the horse with a blanket or sheet
- Cool the horse's skin, especially areas with large blood vessels (head, neck, legs, belly). Apply plenty of cold water (6-15°C; no ice showers) and repeat as necessary, monitoring the reduction of rectal temperature until the horse cools and dries spontaneously. Wiping the body (cloth, sweat scraper) to remove moisture and sweat remains a controversial practice (Takahashi et al., 2020)
- Install sufficient fans and misting systems to cool the environment before (*pre-cooling*) and after exercise, especially in front of stables and stalls, and at the entrance to the show ring during competition (Klous et al., 2020)
- Call a vet at the first sign of heat stroke.

5.5.6 Recommendations for implementation

- Neglecting the care that is essential for maintaining health and welfare is unacceptable
- Excessive intervention, especially those where the consequences lead to strain, are rejected if carried out without proper justification – examples include hogging the feathers of draught horses, removing ear hair, pulling or clipping the dock of the tail and roaching the mane, as well as frequent shampooing
- Equine and breeding organisations should encourage each other to disseminate information with the goal to stimulate informed decision-making, e.g. a code of conduct for clipping, use of blankets, and sporting events, and, if necessary, ban certain practices in their regulations
- Care that does not excessively strain the equid, such as grooming and braiding the mane remain permitted, as long as the horse is not deprived of its abilities, instrumentalised or degraded
- Under sub-optimal but sufficient boarding conditions, temporary measures that cause little or no stress may be implemented to protect the health and welfare of equids, provided that natural equine behaviour (self-grooming and mutual grooming) is allowed to continue for the majority of the time
- Encourage scientific research and the dissemination of knowledge, particularly on thermoregulation, the effect of clipping and blanketing horses on sweat regulation after strenuous exercise, and social interaction
- Emphasise research findings to appreciate strains and their causes: hereditary diseases and interactions between genotype and environment[166], slow feeding, fly masks and sheets to protect equids from insects and mask for horses affected by headshaking.

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[166] 6.2 Selection and occurrence of hereditary diseases, p. 220

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5.6 Auxiliary equipment and the use of force

5.6.1 Introduction

Throughout history, there have been various methods used for training horses to keep them submissive (Baucher, 1864; Boot & McGreevy, 2013; Dwyer, 1869; Saurel, 1971). In the art of horsemanship the natural aids - the seat, bodyweight, legs, arms, the use of voice and clicking - are the essential basis for communicating encouragement and corrections to the animal. These aids are used to govern the equid's muscular strength and locomotion (flexibility, impulsion, balance, straightness, speed), according to the relaxation and tension exerted by the hands on the lunge or reins (riding and driving). Driving and riding horses almost always requires the use of additional techniques (aids) ranging from simple halters to multiple bridles and bits or other instruments (spurs, whip). Depending on the disciplines practised, or the difficulties encountered, there are still several types of tack and an incalculable number of tools that human inventiveness has put on the market to train horses, facilitate their use, improve their performance and to correct the expression of undesirable behaviour - from a utilitarian point of view. Education books on horsemanship largely explain the proper, abusive or obsolete use of these tools.

Today, the majority of the equestrian population recognises the need for a better relationship between humans and equids. The increase in leisure activities with equids and the importance of competitions have nevertheless contributed, through ignorance, over-ambition or economic pressures, to the maintenance or even the development of inappropriate and forceful training methods. The idea that forced submission is the key to sporting success persists. Rightly, it is now being challenged.

In reality, auxiliary equipment is often employed in order compensate for the powerlessness or incompetence of the person who uses it. It then exerts physical and psychological strain on the equid with deleterious repercussions on its welfare. Several questions remain:

- Can painful auxiliary equipment be legitimized in order to ensure effective use with the least possible risk to both the equid and its environment?
- Should the application of methods of restraint causing temporary discomfort or pain be allowed if it is intended to promote future use without the need of said methods?
- How can the use of coercive equipment that is painful and inconvenient be justified to influence the physical and psychological constitution of the horse?

Several researchers have proposed answers to these questions in recent publications in equestrian science (ISES, 2020; McLean & McGreevy, 2010; McGreevy et al., 2018b; Mellor, 2020; Mellor & Beausoleil, 2017). Several issues remain to be addressed. These include the validation of measurements or assessments of the tension exerted by the reins and bits as well as signs of anxiety, fear, discomfort, pain and aches caused by these aids (Bell et al., 2019; McGreevy et al., 2018a), including relevant indicators of welfare[167]. This section discusses the main tack items (bridles, reins, bits) that act, sometimes forcefully, on the head and neck.

5.6.2 Description of the current situation, trends, strains and risks

Any use requires prior training

Equine training is a set of procedures that create conditioned reflexes and habituation to being ridden or harnessed, which allow the equid to be used for various tasks. The general approach consists of removing the horse's inclination to resist with force, leaving the human to make the decisions (Decarpentry, 2012). All hippologists stress the importance of a progressive training scale (FR: *une échelle de formation progressive*, DE: *Ausbildungsskala*). For a long time, the use of force was legitimised (Figure 49, Figure 50) to make equids safe and cooperative.

Auxiliary equipment may cause pain and impair welfare

The current trend is to challenge the methods of training and restraint of horses. Techniques that put pressure on their psychological and physical constitution quickly disregard their dignity when they cause them pain and negatively affect their welfare. The advocates of a return to the school of *Légèreté* (lightness) and the veterinary and animal welfare community are also fighting

[167] 2.4.1.2 Scientific principles of evaluation and perspectives, p. 26

against the harmful use of these devices. They advocate the reintroduction of principles of horsemanship that have been neglected in favour of dominant economic interests.

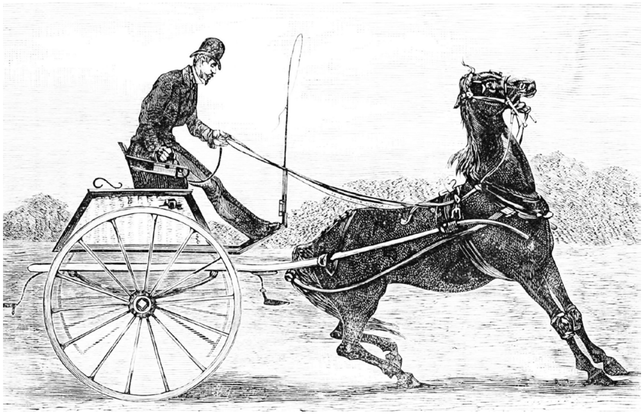

Figure 49 The application of electric shocks for training rebellious horses in the 19th century. A practice since banned (Source: *Popular Science Monthly*, Vol 17, May 1880, https://en.wikisource.org/wiki/File:PSM_V17_D149_Controlling_an_unruly_horse_by_electrical_shock.jpg, public domain)

Figure 50 American Saddlebred horse harnessed with a bearing rein (overcheck) and a running martingale. Extreme flexion of the neck and compression of the throat latch are undue strains (Source: Jean, https://commons.wikimedia.org/wiki/File:Saddlebred_Stallion_in_Harness.jpg, Creative Commons Attribution 2.0 Generic license)

The science of horsemanship today is based on knowledge, methodologies and practical applications from various fields (biology, ethology, sociology, technology, psychology, medicine). The ISES also brings together members of the equine industry and specialists who promote research on ethics and ethology. This organisation promotes a better relationship between equids and humans (communication and control) and the sustainability of training techniques, especially those respectful of animal welfare. The COFICHEV sees evidence of this development in the increase in scientific publications (Jones & McGreevy, 2010; Kiley-Worthington & Franchini, 2007; McGreevy et al., 2010; McLean & McGreevy, 2010; Randle, 2010), especially in the areas of biomechanics and strain, such as neck hyperflexion (Goodwin et al., 2009 ; McGreevy et al., 2010, 2018a ; Meyer, 2013 ; Smiet et al., 2014) and other aids (Fenner et al., 2016, 2017, 2019 ; Uldahl & Clayton, 2019).

To prevent abuse and ensure that equine welfare remains guaranteed, most federations publish ethical principles or guidelines. The best way to implement them remains the dissemination and correct and reasoned application of equine communication and learning theories. The SE states that *"Any use of the horse takes into account its natural and sporting abilities, its willingness to make an effort as well as its physical and psychological welfare, and any act causing fear, suffering or pain must be avoided"* (FSSE, 2018). In a similar vein, the eighth ethical principle of the German Equestrian Federation (Deutsche Reiterliche Vereinigung, 2006) states: *"The use of the horse in riding, vaulting and driving should be based on its natural abilities and its willingness. Any intervention by humans that is contrary to the horse's welfare or influences its performance through medication must be rejected and punished."*

A form of equitation, improperly called ethological, questions and even banishes, the academic equestrian art and its auxiliary equipment. Referring to one type of horsemanship as ethical suggests that the other forms (classical, western, working) are not ethical in essence. The COFICHEV recognises all the efforts to apply ethological knowledge, but notes that other schools also take into account, sometimes instinctively, the natural behaviour of equids. Nonetheless, this new approach is a great economic and media success (course costs, sale of training materials, films, presentations).

5.6.2.1 Bits and reins

Figure 51 Examples of the Icelandic curb bit; on the left double jointed and ported (curved in the middle for the tongue) and on the right a single jointed bit with no port (Source: Björnsdóttir et al., 2014, 2015, https://actavetscand.biomedcentral.com/articles/10.1186/s13028-014-0040-8/figures/4 & https://actavetscand.biomedcentral.com/articles/10.1186/s13028-014-0040-8/figures/5, CC BY 2.0)

Several authors discuss the need for and the way to use traditional aids such as such as bits or nosebands (Johnson, 2018; Mellor & Beausoleil, 2017; Mellor, 2020; Uldahl & Clayton, 2019). The term bitless bridle encompasses an impressive number of systems, some of which are patented. Examples include the simple rope halter, in some cases with knots, breast plate, cavesson, bitless bridle, bosal (a rope noseband with a headstall and mecate reins) and mechanical hackamore consisting of a noseband with shanks of various lengths and sometimes a curb chain attached to the headstall and reins. This equipment aims to direct the horse by putting pressure on the various parts of its head (nose, cheeks, mandibles), but never on the mouth. In French, the term for bit is "mouthpiece" (*embouchure*), and fittingly the term "*ennasure*" designates a device that exerts influence on the nose. There is a growing trend towards the use of bitless bridles but there is a lack of quantitative and qualitative literature on their effects. The paragraph on alternatives deals with the principle of the bitless bridle[168].

On the other hand, the notion of contact, used in horsemanship to describe the connection between the mouth of the horse and the rider's (or driver's) hands, is not yet fully understood. Many observers focus on the biomechanical issues (force, tension, pressure) exerted by the hand on the mouth. However, several aspects of this interspecific communication remain largely unexplored. Taken as a whole, they involve multimodal and reciprocal effects. In particular, one can observe the effects of the use of the voice, the emotional state of the horse and individual (behavioural profile, nervousness, stress, fear), the various parts of the body in the saddle or next to the animal (non-verbal language, posture, flexibility, coordination, balance) and the various perceptions of the partners in their interactions with each other. A recent study (Leblanc et al., 2022) has clearly shown that contact is a complex concept that goes beyond the simple relationship between the mouth and the hand. The analysis of this contact during a session also reveals the fluctuation of convergence, tension and divergence.

Behavioural signs due to pain remain ignored or misunderstood

The horse-riding population generally considers that horses do not experience bit-related mouth pain if they use the bit correctly. However, they may fail to recognise or even ignore most behavioural signs of pain (Bell et al., 2019). It remains plausible that compression, stretching and injury stimulate nociceptive receptors in the oral mucosa (bars/interdental spaces, tongue, corners of the mouth). In addition, the horse experiences anxiety if pain is anticipated, as well as fear if the pain is intense. The action of the bit and reins can cause a change in position of the mouth and neck (hyperflexion) that restrict airflow through the upper airway (Meyer, 2013).

Relevant indicators of discomfort or pain

Several publications[169] consider certain behaviours during riding as indicators of pain or discomfort generated by the bit, as these indicators disappear when the bit is removed. Signs of pain in the mouth are: opposition when bridling, agitation, persistent jaw or tongue movements, an open mouth, grinding of the teeth, sticking out the tongue or placing it over the bit and excessive salivation. This pain can also be expressed in changes to the neck and movement of the forehand: pulling the head sideways or downwards, or raising it above the horizontal, a stiff neck, being "behind the bit", having an arched neck and back or trying to forcefully lengthen the reins. Facial expressions also reveal discomfort: dilated or tense nostrils, pricked ears, visible sclera (white of the eye) and tense muscles. Certain body postures and gaits are also specific to discomfort: stiff, hesitant or irregular strides, excessive alertness, moving on two tracks, difficulty in maintaining control or stopping, rearing, bucking or tail swishing (Dyson & Thomson, 2021).

A severe example is the curb bit used in classical or Icelandic riding, which is characterised by a mouthpiece and a shank on each side (Figure 51). It has been shown to be a decisive risk factor for several sometimes severe lesions at the corners of the mouth and oral mucosa, especially on the bars (Björnsdóttir et al., 2014; Dashper & Helgadóttir, 2021; Swoboda, 2021; Tell et al., 2008; Uldahl & Clayton, 2019). This mouthpiece can be a bar or single or double jointed, with or without a port.

5.6.2.2 The noseband and the tension on the reins

The use of the noseband

The tightening of the noseband and its consequences (mouth, nasal bone, stress or discomfort) have been a recent topic of discussion. Most competitive riders, especially in the disciplines of dressage and eventing, do up the noseband too tight (Doherty et al., 2017). They do this out of habit or if the horse shows what they call "an overactive mouth." In reality, they are trying to discourage or prevent the horse from opening its mouth and moving the tongue. In this way, they reinforce the impression of obedience required by the dressage regulations (Weller et al., 2020, 2021). In particular, FEI Article 416 penalises signs of discomfort such as sticking out the tongue or placing it over the bit and grinding the teeth (FEI, 2022a). Doing up the noseband tightly is also thought to improve control of the horse while reducing tension on the reins (Randle & McGreevy, 2011).

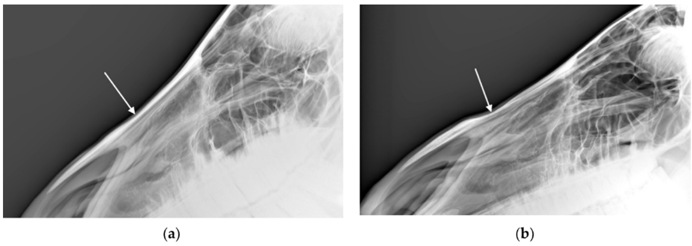

Figure 52 Radiographs of the nasal bone of two horses. Both radiologists (n = 2) in this study agreed on the diagnosis of thinning of the nasal bone in (a) and (b). (Source: Pérez-Manrique et al, 2020, https://www.mdpi.com/animals/animals-10-01661/article_deploy/html/images/animals-10-01661-g005.png, CC BY 2.0)

Excessive tension on the noseband and reins compromises equine welfare

Recent studies (Crago et al., 2019; Pérez-Manrique et al., 2020) found that a tight noseband causes discomfort or pain and can cause lesions (exostosis, thinning) on the nasal bone (Figure 52). Horses can also no longer fully express natural behaviours such as yawning, licking, chewing and swallowing if the noseband is too tight.

[168] 5.6.5 Alternatives that achieve the same results with less strain, p. 135

[169] 2.4.1 Approaches to defining and assessing welfare, p. 25

Furthermore, horses ridden without a noseband have their nose behind the vertical less often and have better neck mobility (Bornmann et al., 2020). Neither the complete removal of the noseband or the bit (hackamore) nor the type of bit can completely avoid problems with head carriage[170], but the frequency of this issue decreases when the noseband is loosened (Uldahl & Clayton, 2019).

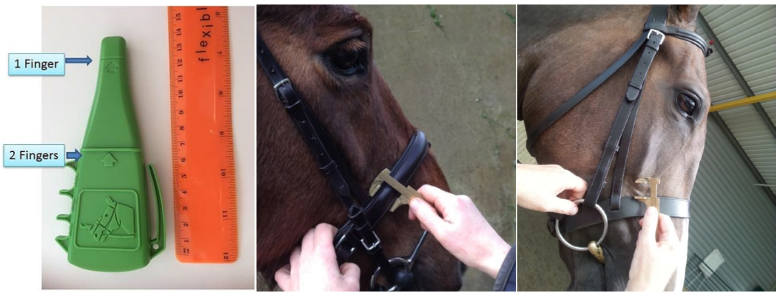

Figure 53 Devices for measuring the freedom between the noseband and nasal bone (left), noseband width (middle) and position (right). (Source: Doherty et al, 2017, https://doi.org/10.1371/journal.pone.0169060.g001, https://doi.org/10.1371/journal.pone.0169060.g002, https://doi.org/10.1371/journal.pone.0169060.g003, Creative Commons Attribution License)

Several studies highlight the need to quantify (Figure 53) the pressure of a tight noseband (Fenner et al., 2016; McGreevy et al., 2012; ISES, 2019). It has also long been observed that excessive or untimely tension on the reins and bit compromises the welfare and oral health of ridden horses (Dumbell et al., 2019; Kau et al., 2020; O'Neil, 2018). Several determining factors have been identified: riding skills, applied force, and the type of horse, reins and bit. The methodological protocols and the results of the research are not yet coherent enough to develop a clear doctrine on the use of these aids. Once a clear guideline is available, it will be easier to understand how the measured tension of the reins equates to the pressure exerted on the anatomical parts of the mouth.

Proposals to avoid discomfort and injury

The recommendations suggest that after tightening the noseband, two fingers should fit comfortably between the noseband and the muzzle. Several federations have adapted their regulations on this subject[171].

The diversity of solutions

The search for practical solutions is varied. New materials, e.g. titanium-based (Guzzo et al., 2018), novel bit designs (Neue Schule, 2019; i-Bride, 2021) or devices to relieve and relax the masticatory apparatus (Allegeoir®; Balaresque, 2018) have been proposed. The advantage of these devices is not obvious, except that they are intended, as with most aids, to compensate for mistakes made in the training of horses and for deficient riding techniques. This supports the view of specialists (Pichon & Plewa, 2019) that the restriction of allowed bits by federations would improve the equestrian skills and equine welfare.

Riders of all levels should present their horses - insofar as the rules allow - in a simple snaffle (without extra tack) or bitless (the Dutch Equestrian Federation allows this in entry-level dressage competitions).

5.6.2.3 The use of the crop in racing

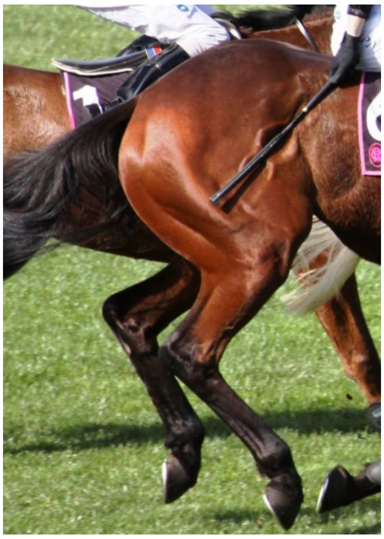

Figure 54 The visible impact of the whip on the hindquarters of a racehorse (Source: Jones et al., 2015, https://www.mdpi.com/animals/animals-05-00138/article_deploy/html/images/animals-05-00138-ag.png, CC BY)

In French, the crop was known as a *gaule* until the end of the 19th century, which was a piece of wood used to get nuts down from trees. The riding crop, or whip, has traditionally been used in riding schools to instruct the horses, in particular in the Haute Ecole airs (airs above the ground), as well as to replace the leg on the right hand side in side-saddle riding. This auxiliary equipment has indiscriminately penetrated the customs of horse shows, but also races where its use is particularly conspicuous before the finish line (Figure 54). Many spectators are shocked to see horses being hit when they are obviously tired and unable to react. In several countries, observers strongly criticise its cruel use in such a situation and call for its ban. For the abolitionists, it has taken on a symbolic role in their fight against racing where jockeys whip their horses 'to death' (Échevin, 2019).

The reluctance of the racing authorities

Studies in Australia (Thompson et al., 2020), Great Britain (Jones et al., 2015) and the USA (Toma et al., 2020) examined the use of whips in racing. They mainly looked at the ethical aspects, animal welfare, sustainability and social acceptability. They noted that the regulations (racing code) did not take these factors sufficiently into account. In general, the racing authorities initially expressed apprehension at changing the regulations - without a whip, the performance of the horses would decrease. A jockey could also mask the quality of his horse, not defend his chance to win or not be able to prevent his mount from swerving. A survey shows that men appear to be more in favour of the use of the whip in races than women (McGreevy et al., 2018a). This finding confirms

[170] 5.6.5 Alternatives that achieve the same results with less strain, p. 135
[171] 5.6.3 Policy and regulatory context, p. 132

social studies that reveal that a higher number of men are likely to engage in violence and that women show greater sensitivity to protecting equids (Visser et al., 2012).

Limiting the use of the whip does not slow down the speed of the races

Several studies have analysed the actual effect of the whip on the course of the race and on equine athletes (Evans & McGreevy, 2011; Thompson et al., 2020; Toma et al., 2020; Wilson et al., 2018). The findings make several points clear. Limiting the use of the whip does not lead to any decisive reduction in the general speed of trotting or the speed of the winning horse. The findings in Thoroughbred racing point in a similar direction. The horses even reached the highest speeds in those races without a whip. Furthermore, the whip was not associated with a significant maintenance of a tempo that allowed a better positioning of the horse at the finish line. The results do not provide evidence that the whip improves horse handling, reduces the influence of a horse or jockey affecting another competitor, increases safety, speeds up race times or compromises the integrity of the event. Finally, a traditional whip with a rigid leather cap was found to exert less force on the horse than one with a soft body.

The use of a riding crop increases the risk of falling

The risk of falling is significantly related to the use of the whip and the placement of the horse during the race. Horses that are whipped and make progress during the race have a more than seven times greater risk of falling than horses that are not whipped and do not change position in the field or lose ground (Pinchbeck et al., 2004).

A change in practice in several countries around the world

These reflections have led to a change in several countries around the world. The subject of the whip has been discussed in Chapter 4[172]. After taking these opinions into account, several organisations have restricted the use of the riding crop in Thoroughbred and harness racing[173]. These provisions create a level playing field for all participants and protect punters who expect that no corruption or unfair practices will affect the chances of winning. Many countries now prohibit drivers in harness racing from taking both reins in one hand in order to have the other hand free for the whip. Norway has prohibited its use altogether[174].

5.6.2.4 Knowledge on the use of restraints

Sensitivity and emotions of equids are most often expressed through anxiety and fear[175]. These behaviours remain fundamental despite domestication (Hontang, 1989). They vary between individuals, breeds and species and are manifested by the desire to flee or the total inhibition of movement. A distinction is made between temporary restraint used to obtain a reaction from the horse, to channel its instinct to flee or to increase its performance level. When used on a long-term basis, they can influence the horse's physical and psychological health, in particular locomotion and its ability to learn and compete (fit to compete). The equestrian population's knowledge of these subjects is often meagre despite the abundance of training courses or publications in the media. However, objective and scientific knowledge is still lacking in many of these areas.

5.6.2.4.1 Temporary restraints

The strain experienced by the horse affects its body and mind during the temporary use of restraint, force or conventional and auxiliary equipment (bit, saddle, harness, whip, spurs). The horse perceives them individually. The scale of sensations ranges from a light touch to actual pain. Difficult to measure, how something is perceived depends on the sensitivity of the equid. Stress and anxiety caused by this equipment also generate negative emotions that affect welfare. Reactivity and rebellion are often observed, as well as cases of learned resignation - the animal no longer responds to even painful stimuli (Hall et al., 2007; McGreevy & McLean, 2009). However, training in the broadest sense of the term is difficult, probably impossible, without some means of controlling and communicating with the horse.

The twitch

Applying a twitch to the nose distracts the horse's alertness, induces the release of endomorphins (Lagerweij et al., 1984) and allows painful or anxiety-provoking treatment to be carried out. However, the animal remembers the discomfort felt if it is repeatedly forced to have the twitch applied. Prolonged use of the twitch also causes burning and sometimes scarring of the nostrils. Many horses no longer tolerate the use of the twitch. Others tolerate it if the application is kept short and tactful. Despite this, many owners prefer to use sedatives. On the other hand, progressive habituation helps to avoid the need for using a twitch or sedation. There are situations, however, where time pressure or urgency (emergency situations) makes the use of a twitch or sedation necessary.

The tongue tie

The regulations of the disciplines under the aegis of the FEI (dressage, show jumping, eventing) prohibit the use of a tongue tie. However, the racing industry adopts a different attitude. Apart from Switzerland (CF, 2020), whose legislation excludes this practice (Art. 21, Letter f AniWO) and Germany (LANUV, 2018), several countries do not prohibit it. According to proponents of this method, tongue ties should prevent the tongue from going over the bit and reduce or prevent airway obstruction. This effect does not seem to be proven. On the other hand, several studies highlight the physical and behavioural complications, mainly anxiety,

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[172] 4.4.2.3 Racing regulations, p. 74
[173] 5.6.3.3.1 The regulated use of the whip in racing, p. 134
[174] 4.4.2.3 Racing regulations, p. 74
[175] 2.3.2.1 Fear, fright, phobia, p. 22

discolouration, bruising and lacerations of the tongue. The media report these findings and offer their criticism (Findley et al., 2016; Franklin et al., 2002; Franklin & McGreevy, 2018; Weller et al., 2021).

5.6.2.4.2 Auxiliary equipment used on a prolonged basis

Draw reins, side reins and other auxiliary reins

Draw reins[176] (Geyer & Weishaupt, 2006; Pichon, 2019), leather or elastic side reins (with no contact to the hand) and other auxiliary reins such as the standing or running martingale, Gogue or Chambon are examples of auxiliary means used to restrain the horse (Homeric, 1998). They cause continuous discomfort or pain when the forced position goes against the physiological head and neck position (Figure 50; Figure 56). The sustained use of draw reins disrupts the horse's physical and mental development. The horse feels tension in the forehand and back. The pressure of the bit on the bars and tongue is multiplied by the pulley effect. All of these instruments are used systematically to restrict a horse at the level of the head and neck, an example being neck hyperflexion (Figure 16, Figure 56), contrary to its biomechanics. They deprive the equid of some of its abilities necessary for locomotion, vision, environmental perception and balance (Ollivier, 1999). The same applies to means that hinder sight or hearing such as blinkers, ear plugs or sound dampening (even noise cancelling) ear bonnets. Strain (long-term pain and anxiety) gradually deteriorates the natural capacity of the horse as well as its physical and mental constitution, which risks debasement. The horse can become uncoordinated and inefficient as a result. Special attention should therefore be given to young equids who do not show the expected talent and to adults who have been retrained in another discipline.

Figure 55 Amish carriage horse harnessed with an overcheck (bearing rein) (Source: OlinEJ, https://pixabay.com/fr/photos/amish-buggy-amish-ohio-2393639/, Pixabay License)

Figure 56 Thoroughbred in training fitted with a tongue tie, draw reins and being ridden in neck hyperflexion (Source: https://pxhere.com/en/photo/944322, Creative Commons CC0)

The stresses caused by neck hyperflexion are particularly pronounced in carriage horses or breeds with certain upper airway malformations such as congenital or acquired stenosis, dorsal displacement of the soft palate (DDSP) or laryngeal collapse (Strand et al., 2009; Vermedal et al., 2021). These issues are also seen in overeager Trotters that the handlers have to restrain, especially before and during the race. In order to prevent neck hyperflexion and to limit upper airway obstruction, several types of lifters have been developed (bearing reins, also known as overchecks or check reins). The proponents justify this use by citing safety requirements. Animal welfare groups have been criticizing their use for more than a century (Angell, 1872; Anonymous, 1890; Jenyns, 1886).

The lifters exert varying forces on the mouth (Easley et al., 2011; Fjordbakk et al. 2012; Meyer, 2013). A study of Finnish Trotters shows that the vast majority run with a bearing rein (83-96%), but that this is not a risk factor for bit injuries (Tuomola et al., 2021a, 2021b). Other authors (Bennett-Wimbush et al., 2019) show that a harness with a bearing rein applied for long periods compromises muscle health. It causes stress after 45 minutes (high cortisol levels), but horses can become accustomed to it (Figure 50, Figure 55). However, the results do not include measurements over the short duration of a race and the authors recommend further investigation. They also note that several aids are not banned in harness races but that many countries may soon ban them.

5.6.3 Policy and regulatory context

5.6.3.1 Swiss legislation

Swiss legislation explicitly prohibits certain practices

As of January 1st, 2014, the AniWO (Art. 21 Let. f to h) explicitly prohibits the tongue tie, poling (rapping) and neck hyperflexion (Rollkur). The animal protection legislation (CF, 2020) also contains a number of criminal provisions that require the welfare of animals to be upheld and to ensure that they are not subjected to pain, suffering or harm, without justification, nor to put them in a state of anxiety or to violate their dignity. It is forbidden to mistreat animals, to neglect them or to overwork them unnecessarily (Art. 4 and Art. 26 AniWA, Art. 16 and Art. 21 AniWO).

[176] Single reins that extend from the hands, slide through the ring of the snaffle and remain attached to the girth under the saddle or between the forelegs (Thoroughbred in training fitted with a tongue tie, draw reins and being ridden in neck hyperflexion (Source: https://pxhere.com/en/photo/944322, Creative Commons CC0)).

5.6.3.2 Regulations of the Swiss Equestrian and the FEI

The FEI and the SE limit the use of aids

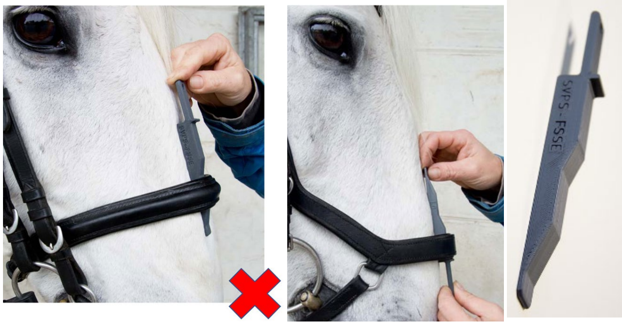

Figure 57 SE device for measuring the space between the noseband and the nose. On the left, the noseband is too tight, in the middle, it is correctly tightened. On the right, the measuring instrument is shown (Source: FSSE, 2020b)

For each discipline (dressage, show jumping, driving, etc.), the SE regulations and directives contain a specific list of authorised means, and limit or prohibit certain practices explicitly. They totally exclude the use of draw reins on competition grounds. *Ear bonnets are permitted in principle, but they must allow for free movement of the ears in driving events* (FSSE, 2021a). The SE has long defined the approved bits for dressage and no longer requires a full bridle and spurs. *During dressage competitions, the horse may wear a ear bonnet, but fly masks, fringes covering all or part of the head and ear plugs remain prohibited* (FSSE, 2018). The federation has commissioned a group to identify the various bits and equipment permitted in show jumping (FSSE, 2020c). The regulations came into force in 2021 (FSSE, 2021a). It should be noted, for example, that hind leg boots that influence the movement of the limbs over the obstacle due to their design and tightness are prohibited in competition. Rules on harnessing are currently being drawn up. The SE has followed the example of the FEI and mandated that a judge permanently supervise the warm-up area at competitions. They ensure that the event runs smoothly, respecting the welfare of the horse and offering the same conditions to all competitors by applying the FEI motto *"help, prevent, intervene"* (FEI, 2021; FSSE, 2021b).

For the most part, the SE regulations are in line with those of the FEI. The FEI has supplemented its list of prohibited practices (Art. 1004 Prohibited Methods) to include clipping of the vibrissae (FEI, 2022d). FEI Show Jumping Regulations (Art. 257 2.4 and 2.5.2) characterise the permitted hind leg boots (FEI, 2022c). The FEI has also regulated various items of tack in endurance competition. These include limiting the length of the bit shank to 8cm, blinkers, draw reins, chain nosebands, ear plugs, spurs, whips or any other object used as such (FEI, 2022b).

5.6.3.2.1 Noseband regulation

The SE has updated its regulations (FSSE, 2020b) concerning the noseband. These state that the noseband must be done up in such a way that a standardised measuring instrument provided by the SE can lift the noseband 1.5 cm above the dorsal nasal bone. This rule applies to all types of nosebands, except the cavesson. For dressage, jumping and, by analogy, eventing, the guidelines (FSSE, 2020a, 2020b) now contain comprehensive information on permissible bridles as well as various explanatory illustrations (Figure 57).

5.6.3.3 The regulation of auxiliary equipment in racing

The FSC and its members (Suisse Trot and Galop Suisse) have issued several regulations to preserve racehorse health, avoid abuse and, from the point of view of animal protection, to create good conditions for racing, also applicable to training (FSC, 2020, 2021a, 2021b). Annex V of the FSC rules allows for several types of ear bonnets which cover the upper part (excluding the nose) of the head of Trotters (ears, eye protection, blinkers), and regulates the minimum diameter of bits and bridles. It also specifies that all tack that is not included in the regulation is prohibited.

Figure 58 Harnessing of Trotters prohibited by FSC regulations include removable ear plugs, sheepskin noseband higher than the facial ridge, blinkers that excessively restrict vision such as the full cup, tongue tie, reins fitted with metal spikes (Source: JacLou DL, https://cdn.pixabay.com/photo/2017/08/21/23/11/horse-2667277_1280.jpg, Pixabay License; free for commercial use)

The document provided by Suisse Trot to the UET illustrates and describes some of the items that it prohibits – some of these tack items are also prohibited by a number of other foreign federations, and there are others allow them (UET, 2021; Svensk Travsport, 2019; LeTrot, 2019). For example, there are some bearing reins (for example the TSF and O'Mara check), tongue ties, reins or other tack items with prongs, electricity or remotely triggered, as well as earplugs that can be removed during the race. Blinkers may only reduce the field of vision by less than 50% and must remain fixed during the race, their opening must remain vertically oriented and forward facing (Figure 58).

An item that has long been popular to prevent trotters from hyperflexion of the neck (Rollkur) is now banned in most countries. A piece of wood, metal or plastic (a cylinder about 6cm in diameter and 25cm long) with spikes was applied under the throat and pressed on the trachea (Ger: Pullrolle; Figure 59, Figure 60). Today, this is replaced by a smooth, hard plastic plate (choke plate) that does not compress the airway and does not cause pain.

5.6.3.3.1 The regulated use of the whip in racing

Swiss regulations

For several years now, the relevant racing federations (Suisse Trot and Galopp Schweiz) have tightened the regulations on the allowed design, characteristics and use of the whip (Suisse Trot, 2021a, 2021b; Galopp Schweiz, 2021a, 2021b). The number of strokes is limited to three during the course. In harness racing, the driver must not raise his hand above his shoulder. The racing authorities consider the abuse of the whip as a serious case and sanction it with license withdrawal. Especially considered abuse of the whip are the following situations: when the reins are held in one hand during the race, if the whip is used before the start or after the finish, or when the horse does not fight to improve its placing in the race.

Figure 59 FSC-banned spiked anti-ducking device (Source: dee.lite, https://upload.wikimedia.org/wikipedia/commons/thumb/e/ea/Pullrolle.jpg/1280px-Pullrolle.jpg, CC0)

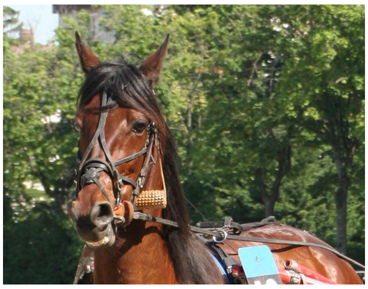

Figure 60 Trotter equipped with a spiked pullrolle (Source: dee.lite, https://commons.wikimedia.org/wiki/File:Pullrolle,_Schaumgummigebiss.jpg, license CC BY-SA 3.0)

In Thoroughbred racing, the jockey shall use the whip as little as possible and always at the same rhythm of the stride. In particular, he shall not whip a horse after the finish, to injure it, when it is clearly in a position to win or clearly beaten. Furthermore, the official veterinarian must report any whip marks, significant welts or lesions. It is noted that Galop Suisse rejected a proposal to ban the use of the whip on the hindquarters of Thoroughbreds in 2021 (Galopp Schweiz, 2021c, 2021d).

The use of the whip varies from country to country

Countries regulate the handling of the whip in Thoroughbred racing independently (France Galop, 2017, 2021; Garand, 2018). In 2021, the situation can be summarised as follows: its use is prohibited in Norway, lowered to three strokes in Sweden, limited to five in Germany and in France, seven on the flat and eight over jumps in Great Britain, and not defined in Ireland and Hong Kong. The general trend is towards a gradual reduction in the number of whip strokes allowed. In France, it is thought that "achieving zero strokes and keeping the whip only for directional purposes would considerably improve the image of racing [...]; Thoroughbreds could then develop their real competitive drive to cross the finish line in the lead, without being forced to do so;" however, the road seems long, as some renowned jockeys still consider it harmless (Hamon, 2019).

Harness racing regulations in Sweden

The Swedish trotting code is probably one of the most restrictive (Svensk Travsport, 2019; UET, 2021). Drivers may stimulate the horse slightly, but only during the last 400 metres of the race. The administration of repeated blows (whip, reins) on the animal, equipment or sulky is prohibited. If the trotter does not respond to the requests or cannot improve its ranking, the continued use of the whip is prohibited. In case of suspected misuse, the official veterinary service inspects the horse and may lodge a complaint of ill-treatment that then leads to legal proceedings.

Australian regulations

The Australian Harness Racing Society implemented new rules in 2020. The whip may only be handled by holding a rein in each hand with its point forward. Drivers may only use the wrist without the force of the elbow or shoulder and without raising the forearm more than forty-five degrees from the surface of the track. The use of the riding crop is also inappropriate and punishable if the horse does not respond to it to maintain or improve its position, if it is in the process of winning the race or if the reins and tack remain slack. A video illustrates these requirements (HRA, 2020a, 2020b).

5.6.4 Stakeholder interests and areas of conflict

Several parties support equine interests

When using aids and restraints, the horse's interest is to not be subjected to strain (pain, discomfort, harm, anxiety) that overpowers its abilities, bodily functions, behaviour or ability to adapt. People who are concerned with not undermining equine dignity and welfare support this concern. These include the animal welfare community, animal protection organisations and the followers of ethological equitation. The authorities responsible for legislation also protect equine interests in these situations (veterinary services, police, judicial order). Federations (equestrian sports, racing) and sponsors also take these values into consideration, as they promote a positive and exciting image of events and regulations that place the healthy equine athlete at the centre. In this way, they believe that they can avoid a predominantly profit-oriented staging.

Tension between ethics and economics

Ethical principles are still too often in conflict with the many economic interests of the equestrian population (athletes, federations, competitions). Economic interests prioritise performance and market value, especially of promising young horses, including the optimisation of their training and infrastructure costs, commercial attractiveness of events, financial contributions of sponsors as well as results (prestige, medals, social recognition). In this context, the attachment to the historical and virile culture of the equine sector plays an important role, even if this aspect declines with the sector's feminisation. The effect of the market for auxiliary equipment and the use of force must not be overlooked.

Safety and the ease of use of equids

The optimal safety of equestrian practices is an important value. The temporary use of the aids and restraints described above can reduce the dangers of handling a difficult horse and the risk of accidents for both human and equid. These aids are rarely questioned as they are part of an ancient tradition. These advantages are still valuable in many areas (stabling, breeding, using, selling, teaching, veterinary care, farriery).

For their part, breeders have an interest in selecting and marketing equids whose behaviour, skills and stress resilience - in short, talent - facilitates delicate handling without the need for strains. The sustained use of auxiliary equipment and force covers up the innate skills of young horses and slows down genetic progress. This is because the seconds or centimetres gained through improvement brought about by the use of auxiliary equipment is not due to genetic quality and is therefore not passed on to their offspring. However, economic factors may encourage the use of inappropriate or exaggerated pressure in order to accelerate training progress contrary to the fundamental principles of equitation.

In addition, it is observed that those members of the riding population who do not have the appropriate skills to control their horse or to obtain a good result from it, use tack modifications as an easy solution. It should be noted in this respect that a lack of knowledge about horses and how to treat and use them (riding, driving and general horsemanship) leads to the use of these aids.

In racing, officials, jockeys, drivers and bettors generally maintain that the whip allows for a smooth and transparent running and improves the safety of horses and humans. For example, in some countries, jockeys are not allowed to let their horse fall back in the race if it tires without using the whip on it. However, they also argue that a competitor may deviate or lean against another under the influence of the whip even if it remains static.

Finally, the interests of the manufacturers and sellers of equestrian equipment must be emphasised. They are all concerned about the safety and quality of their products, but do not always make clear the risks and impacts on animal welfare these products can impose.

5.6.5 Alternatives that achieve the same results with less strain

Special attention should be given to young horses

For short procedures, especially on young horses, modern sedatives are a less restrictive alternative to the twitch without compromising the results. A better habituation to manipulation also makes it possible to avoid any mechanical or chemical intervention.

For the training of young equids, it is realistic to renounce aspiring to brilliant performances only achievable through the use of auxiliary equipment that is disrespectful of an equid's natural abilities and the scale of training progression. In addition, the early selection of talented individuals and breeding them accordingly reduces the time and intensity of strain on subsequent generations. Selective breeding is more advantageous and sustainable.

A number of Trotters do not have the innate abilities required for racing and do not pass the qualifying tests. It could be conceivable that in the future, horses that require the use of bearing reins not be allowed to start.

The alternatives for breeding and sport organisations

The federations (sport and breeding) could first conduct an in-depth reflection on the hazards of auxiliary equipment and force and draw up a list of those considered harmful (ethics) or affecting equine welfare and dignity. Before banning them at the regulatory level, they should raise awareness and improve training (certification courses) to reduce the risk of undue strain.

Solutions that may reduce strain

A faction of the riding population considers the bitless bridle as an alternative that improves welfare (Doligez et al., 2014). However, this technique and similar variants[177] do not find consensus due to safety issues (horse handling), as well as problems caused by painful pressure and traction on the bridge of the nose (Geyer & Weishaupt, 2006). The force of the reins attached to the noseband is distributed to other facial structures, such as the nerves in the nasal and frontal bone areas, instead of being distributed evenly over the head[178]. This pressure is high enough to cause adverse effects on welfare (Pérez-Manrique et al., 2020; Robinson & Bye, 2021).

However, neither the complete removal of the noseband nor the type of bit completely prevents the development of lesions at the corners of the mouth in sport horses (Uldahl & Clayton, 2019) or Trotters (Tuomola et al 2019, 2021a, 2021b). This does not mean that there are no welfare concerns with bits. However, there is a lack of a scientific research on a few points: bridle structure, horse control, safety, performance level, and the transition from one system to another. (Mellor & Beausoleil, 2017; Mellor, 2020).

To reduce the risks of bits, it should be borne in mind that every horse has individual characteristics. One type of bit may work well for one horse and be unsuitable for another. The first step is to rule out any impediments to welfare: dental issues, bit design

[177] 5.6.2.1 Bits and reins, p. 128

[178] 5.6.2.2 The noseband and the tension on the reins, p. 129

and size (material, shape, length, diameter). The second factor that needs to be corrected is the person riding or driving the equid. Used the wrong way, a bit that is considered to be soft on the mouth can be severe and constraining (force exerted by the reins, sudden and untimely intervention). The reinforcement of the inspection procedure for lesions caused by bits at sporting events is an adequate solution to improve the welfare of equine athletes (Swoboda, 2021).

In the end, the idea of returning the horse to the wild has not yet been thoroughly analysed. It seems unrealistic for the time being in Western Europe with the current state of interests and present many disadvantages to equine welfare (lack of care, feeding difficulties, biodiversity).

5.6.6 Results of the balancing of interests and justification of strain

Administer a sedative whenever possible

Safety legitimises the restraint of equids due to the risk of dangerous reactions. It may also be justified when it can be used briefly as a signal in a process of habituation or to improve understanding between an animal and a human. Sedation is preferred to the use of the twitch for activities such as routine care, shoeing and hoof trimming, especially in young equids. On the other hand, restraint is unjustified when it is used as a punishment.

Purely economic interests are not paramount

The systematic use of means to modify natural abilities (during training or competition) or to compensate for insufficient abilities of the equine or human athlete remains unjustified for purely economic interests or if it causes discomfort, pain or irreversible damage likely to shorten the life of the horse or impair its welfare. These phenomena are observed when techniques or auxiliary tack cause an equid to become anxious, freeze, display an apathetic attitude or go against its functional capabilities (biomechanical, sensory).

When there is a lack of sensitivity for specific interests and needs of the equid, it becomes a mere instrument of gain and prestige. This is for example the case when auxiliary equipment such as the whip is used before the finish of a race to stimulate a horse that is unable to run faster[179].

Convenience is not a justifiable reason

If the use of auxiliary means is seen as a necessary addition that respects the principles described earlier in this chapter, they should be used with tact and discretion. On the other hand, they are not justified when they foster a dependence on easy solutions that undermine animal welfare and further enable ignorant horsemanship in people who are clearly lacking in adequate equestrian skills.

Carry out a detailed weighing of interests

Two examples illustrate the need for an ethical weighing of interests based on scientific knowledge. The strains of a whip applied in the home stretch to exhausted horses cannot be justified by the benefits to humans in these circumstances.

With regard to the use of bridles with or without bits, the interests of each individual should be weighed in each individual case, particularly in relation to the use of the horse and the type of equipment. This must take into account the safety of people and animal welfare. The scientific literature does not provide for a generalised recommendation.

5.6.7 Recommendations for implementation

- Intensify and promote research on biomechanics, pain perception and the effect of aids on equids, as well as on motivation and the possibilities of positive reinforcement in training
- Study and test the various bridling systems - with or without bits - in various types of use (leisure, driving, jumping, racing, various breeds and species). The main concerns are the ability to steer the horse, safety, the influence on performance, and necessary requirements in order to switch to a bitless bridle without unjustified strain (adaptation, individuality, consequences on the education of the population)
- Encourage the selection of equids with an easygoing character and natural dispositions favourable to starting and training without unjustified strain
- Re-evaluate and complete the regulations of federations in the light of ethical principles and scientific knowledge. Strengthen inspection and authorisation procedures for auxiliary aids
- Raise awareness in the equestrian community on the ethical aspects of dressage, leisure and competitive use of horses
- Encourage training and information on indicators of pain, suffering and harm caused by means of force
- Initiate reflection and discussion on adapting the use of the whip in racing and reserving it for steering the horse and light stimulation
- Establish a list of justified aids and restraints for each discipline, particularly for safety reasons. Supplement the legal provisions with analogies (Art. 76 Auxiliary equipment and devices AniWO). Their use must not cause injury, severe pain or irritation to the animal or put it in a state of anxiety.

[179] 2.3.6 Excessive instrumentalisation, p. 25

5.6.8 Thematic bibliography

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5.7 Hoof care and shoeing

5.7.1 Introduction

Shoeing horses' hooves has been practiced for centuries to protect them from intense and rapid wear. Shod or barefoot: this is a lively current debate (Cheval-Nature, around 2018). However, there is one proverb that is universally accepted: no hoof, no horse!

Wear and tear on hooves has a different meaning today

Previously, horses were worked for several hours a day (agriculture, transportation), today they are leisure or sport animals and exercised on average for only 90 minutes a day. The question of shoeing and the wearing of the hooves is therefore different. The slogans used to discredit shoeing are multiplying: "give the horse a natural hoof", "your horse will be better off without shoes, he doesn't need them" or "your barefoot horse can perform well." Some even talk about a paradigm shift. However, it is difficult to imagine equestrian sport without horses being shod (Figure 61). The regulations of certain disciplines even require that horses are shod.

Contradictory arguments in favour of shoeing or barefoot trimming

Barefoot trimmers (equine podiatrists, orthopaedic trimmers) put forward several arguments in support of foregoing horseshoes. Unshod hooves function correctly: the hoof promotes shock absorption and blood circulation by expanding and contracting freely. The horse feels the ground better, remains attentive and no longer slips on the tarmac because of the shoes. The gaits are more supple and the animal gets less tired. Finally, going barefoot reduces the risk of injury in group boarding (Dold, 2016a, 2016b; Donoho, 2017; King, 2008; Ranch des Noyers, 2011; St. Georg, 2017). Furthermore, they argue that a horse can work without shoes and that barefoot trimming and proper hoof care, as well as good feed, are sufficient. Their method is therefore forward-looking and respects the animal and its welfare. This approach is opposed to that of farriers, who are fervent defenders of their extensive professional training and expertise while the trimmers can often only claim to have been trained over a short period of time in comparison. The number of people practising one or the other method turns out to be equivalent. A survey (Doligez et al., 2014) shows that 41% of respondents believe that keeping the hoof unshod and trimming it naturally is good for equine welfare. However, there is little relevant and convincing scientific evidence to support either of these views. Indeed, few convincing studies have compared the effects of these practices on joint health, limb biomechanics and hoof morphology.

Figure 61 A correctly trimmed, shod and balanced forehoof (Source: Swiss Army (2021) - documentation - military farriery 64.010 f. Used with the permission of Colonel S. Montavon, Swiss Army Veterinary Service)

Does natural trimming always promote welfare?

The main objective remains to ensure long-term athletic ability while guaranteeing animal welfare. Protocols for assessing this condition include, among others, an assessment of the hooves[180]. Problems encountered may be related to diet, stabling, inadequate care or to diseases such as laminitis or hoof abscesses. A meticulous examination requires appropriate skills.

The physical properties of the hoof wall make the hoof vulnerable. The walls break spontaneously when walking on hard ground. Their uneven appearance does not always indicate a poor state of welfare, except for severe cracks or wounds. However, incorrect trimming or shoeing can negatively affect the welfare of the equid, even if the differences are imperceptible. In some instances, shoeing can be necessary, for example if the equid is moving on stony paths or roads, especially over long distances. On the other hand, shoeing may be unnecessary if the horse is on pasture and only used occasionally.

5.7.2 Description of the current situation, trends, strains and risks

5.7.2.1 Strains and risks

The hoof of equids forms the terminal part of the limb. This unique organ performs several vital functions (Château, 2007):

- Supports the weight of the horse
- Absorbs the energy of impact when it hits the ground
- Provides support during forward propulsion or pulling
- Protects the internal structures of the hoof.

From the moment equids are born, their health, physical condition and welfare must be a priority. This is why interventions on the hooves (trimming, shoeing, hoof care) do not only affect the visible part of the hoof, but also its interior. Care every six to eight weeks is essential. This should be accompanied by good stable hygiene including the stalls and turnout areas, daily turnout and appropriate feeding (Kunfermann & Ramseyer, 2015).

Preservation of the conformation and functionality of the hoof

In a natural environment, if the anatomical structures of the hoof are healthy, they offer the horse the best possible conditions for even strenuous and hard movement. The axis of the hoof and pastern must respect standards and the height of the heels should correspond to approximately half the length of the dorsal wall (Figure 62).

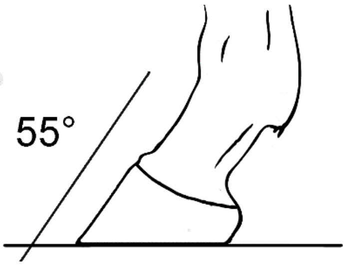

Figure 62 The axis of the hoof and pastern should be parallel to one another and form an angle of 50-55° (forelimb) and approx. 60° (hindlimb) to the ground.

Before trimming the hooves and making appropriate modifications, the clinician or practitioner pays close attention to the gait and conformation, comparing these with what he or she considers to be

180 2.4.1.2 Scientific principles of evaluation and perspectives, p. 26

correct. It is very important to trim the hooves according to these parameters. If necessary, the development over time should be documented by a series of radiographs and digital photographs.

Farriers in consultation with veterinarians play a major role in monitoring and maintaining the health and development of the hooves and limbs. The skills of equine veterinarians in farriery techniques enable them to improve and promote quality hoof care. These procedures require adequate training (Musterle, 2009). Both professional groups rightly claim that appropriate practices preserve the vitality of the hoof, its functionality and biomechanics. They prevent or treat a large proportion of lameness. In the shod horse, shoes are regularly removed, adjusted or replaced on the basis of the amount of growth of the horn[181] to maintain the efficiency of the hoof. The shaping (trimming) of bare hooves also takes this into account.

The structures and internal mechanisms of the hoof are vulnerable

The conformation of the hoof is rarely ideal and individual characteristics can be observed. When loaded, the heels often show a tendency to become underrun and to weaken, whether the hooves are shod or not. The heels wear out more than the toe. In addition, changes in the environment and the boarding of horses in modern facilities (stables, riding arenas, sand rings, paddocks, trail riding) generally make shoeing necessary to control and correct hoof abrasion and deformation. However, the anatomy and function of the hoof are closely related. Both can be weakened by genetic factors, excessive strain, injury, disease, the environment or various inappropriate practices. Problems arise, for example, if the heels can no longer expand during locomotion. With an increased hoof-pastern angle (upright pasterns), the horse has a shorter, choppier gait, blood circulation in the hoof is reduced, the sole becomes concave and the heel bulb and frog atrophy. The hoof then suffers from contracted heels and can no longer properly absorb shock.

5.7.2.2 Selection of scientific publications

5.7.2.2.1 Trimming techniques, shoeing and barefoot

The many books and articles on farriery describe shoeing practices and the biomechanics of the hoof. (Armée suisse, 2021; Floyd & Mansmann, 2007; Farriertec Suisse, 2018a, 2018b; Musterle, 2009; Armée suisse, 2015; Proske, 2017; Schwyter H, 1925, 1948). As for publications on how to trim the unshod hooves, these only began appearing at the beginning of the 21st century. It is mainly in the Anglo-Saxon countries that this issue has been the subject of methodological and technical reflections. The results of the first research publications are sometimes contradictory or lack rigour and consistency.

Several key parameters

Dr. Stephen E. O'Grady, farrier and veterinarian, author of practical, methodological and scientific publications, emphasises several parameters (O'Grady &Poupard, 2001; O'Grady 2009, 2011, 2016):

- The impact of trimming on the three phases of stride: landing, loading and breakover
- The physiological functions of the hoof
- Hoof length and angle
- Pathologies related to hoof loading
- The ability of the equine hoof to adapt, change form and repair itself.

Like others, Dr. O'Grady demonstrates the advantages of shoeing. However, he also deems it necessary to keep hooves unshod at times in order to improve their conformation. This objective requires a transition period to adapt the trimming, especially if the horse is to live permanently without shoes. The decision process takes into account the horse's ability to perform the function desired by the parties concerned (owner, trainer). In one analysis, the majority of horses presented with pain localised to the hooves, but few serious problems. The duration of the trimming process, six to 12 months, is longer if the horse has been continuously shod (Creighton & Jones, 2008). The method of trimming is different for unshod horses to that for putting on shoes. The horn wear and force distributions on a bare hoof represent a load of approximately 65% dorsal to the breakover point and 35% behind it. This ratio is 50%/50% in the shod hoof (O'Grady, 2011; Castelijns, 2012).

The conditions of use and stabling, as well as the climate and seasons influence trimming. The trimming or shoeing interval must take the individual speed of new horn growth into account. Unshod horses can be used successfully for leisure and sport purposes, but there is a lack of well-established methods, well trained professionals and studies on the nature of the exercises they can be used for.

The particular shape of the unshod hoof

The farrier or trimmer shapes the unshod hoof so that the forces applied are distributed evenly over the hoof as the horse moves (wall, bars, sole, frog). The horn should be trimmed so that it does not break off and so that the hoof growth continues without loss of functionality. In short, trimming requires less removal of the horn than for a horse to be shod. It aims at an even distribution of load in the hoof, a flat shape of the sole on the ground and a physiological adaptation to the coffin joint. Shortening and rounding off the toe is still necessary (hoof team, 2009). The healthy tissue of the sole and frog remains intact after cleaning with a wire brush. The hoof knife is only used to remove dried and loose outsole and frog and possible foreign bodies in the sulci of the frog. It is not necessary to use nippers or a farrier's cutting blade to shorten the hoof wall. For this purpose, Dr. O'Grady recommends

[181] New horn is produced at the coronary band and grows downwards

to rasp the solar surface flat and carefully, especially the toe to shorten it as required, then the heels, bars and buttresses. Finally, he bevels the edge of the outer wall almost to the white line (about 45° angle). Others file the heels to allow the frog to contact the ground (Clayton et al., 2011).

The trimming procedure has a few important points. The shaping of the hoof ensures continuous wear of the horn on the solar surface (sole, wall and frog). Thus, the sole becomes thicker, especially near the white line, and the frog widens and becomes stronger. The development of the hoof, especially its shape, the appearance of chipped off horn, cracks or solar bruises is also regularly monitored. It takes a lot of skill and experience to properly trim a hoof.

Horses hooves in the wild wear out in a particular way

Despite the growing interest in so-called natural farriery, these techniques are not comparable to the condition of horses kept in the wild without hoof care (Florence & McDonnell, 2006). The length and shape of their healthy hooves adjust mechanically through wear and tear and breaking of the wall. The intensity of the wear and tear depends on the type of soil (hardness, abrasiveness) and the weather, but is always accompanied by cracks and tears in the lower horn of the wall, as well as a shortening of the toe. During the months of June to August, abrasion is more rapid than growth. In domestic horses, cracked and ragged hoof walls are undesirable as they suggest weakness or disease that promotes lameness.

5.7.2.2.2 The specific impact of shoeing and trimming on the conformation of the hoof

The horseshoe is not a discrete extension of the hoof (Brunsting et al., 2019; Malone & Davies 2019; O'Grady, 2016; Ross & Dyson, 2011). It doubles the single interface (horn-ground) and has different physical properties than horn (Eliashar, 2012; Parks, 2011). Compared to unshod hooves, these substitutions lead to an increase in the intensity of impact on the hoof, increase the load on the hoof wall and reduce, but do not eliminate, heel movement (Benoit et al., 1993; Roepstorff et al., 1999, 2001). They also affect the shock absorption of the lower limbs. On the shod hoof, friction occurs between the shoe and the expanding heels. The heels wear out more quickly than at the level of the quarters and toes, which remain static. Over time, the morphology of the shod hoof changes significantly compared to that of an unshod hoof (Malone & Davies, 2019; Moleman et al., 2006). Certain characteristics can be observed in the shod hoof, including a decrease in the:

- Circumference of the hoof (measured at the coronary band) and the solar surface and
- Angle and wear of the shoe at the level of the toe.

After a six-week shoeing period of previously unshod horses, ultrasound also revealed a reduction in the thickness of the heel bulb and an increase in the volume of the carpal joint, which is suspected to be inflamed (Proske et al., 2017). In addition, traditional shoeing restricted heel expansion compared to barefoot by 36% in one study (Brunsting et al., 2019). Orthopaedic shoeing (e.g. egg bar shoes and wedges) also appears to decrease blood flow and metabolism in the distal limb (Mieszkowska et al., 2021).

As for hooves that have been unshod for three to four years, correct trimming (bevelled toe, support of the frog and bars) causes significant morphological changes after 16 months. An increase in the angle of the heel (+9° without an increase in height) and the distal phalanx can be measured (photographs and radiographs) as well as an increase in the amount of support. The adaptation of the plantar pad and the elevation of the heels are considered beneficial changes (Clayton et al., 2011).

5.7.2.2.3 The impact of the two approaches on locomotion

The results of the research on locomotion are sometimes diametrically opposed. Two teams (Proske et al., 2017; Stutz et al., 2018) examined the conditions of use and effects of farrier practices by alternating them. They show that stride amplitude increases when horses wear shoes.

Other studies (Bouwman et al., 2016; Mott & Ellis, 2014; Nahum & Attwood, 2014) do not confirm these observations but presented different results. They found that stride length was reduced in shod horses. Others find no significant differences in stride length at the walk or trot between shod, partially shod and unshod horses. After wearing shoes for at least 12 months, studies no longer show a significant difference and shod horses do not appear to have a competitive advantage.

It is still relevant to postulate that the weight of the horseshoe added to each forelimb influences the amplitude of the strides at first. Then, horses adapt their biomechanics, which eliminates the effects of the first few days after the initial shoeing. These observations contrast with the widely held belief that shoes improve gait quality. The majority of studies, however, conclude that farriery can be effective in correcting imbalances in hoof morphology. Gait modification can also be an objective. For example, Icelandic horses are shod with long toes and high heels and quarters. To improve the tölt, heavier and thicker shoes as well as pads are sometimes also added to the front feet. This type of shoeing causes deformation of the hoof and a deviation in the axis of the phalanges which can lead to a deterioration in health and welfare. This practice can be considered mechanical doping (Herbrecht et al., 2020; Iceland review, 2014; Waldern, 2014; Waldern et al., 2014a, 2014b; Weishaupt et al., 2014).

5.7.2.2.4 Unshod horses in equestrian competitions

In general, athletes competing at the highest level are shod, while many recreational horses and ponies, as well as young horses, remain unshod. In racing, Thoroughbreds remain shod. Today, the majority of Trotters in France run without shoes (Caure, 2012, 2013, 2014).

Trotters frequently race unshod

Trotters have been running barefoot since the best began to beat shod horses at the turn of the century. The lighter unshod hoof increases stride frequency (Chateau et al., 2012). The greater expansion of the outer hoof wall and its direct contact with the ground improves proprioception and performance (Moreau, 2017). Today in France or Sweden, it is often observed that the starters of a big race run without shoes[182].

The Trotter's hoof must be sound for running without shoes: with a solid wall and sole, bars and frogs in contact with the ground, an oval solar surface and alignment of the hoof-pastern axis. Additionally, optimal shoeing between races is necessary in order to remove the shoes without risk before the race. Farriers use a light shoe with a leather or resin plate. A period of one month between shoeing appears ideal to protect the health of the hooves (Duluard, 2018). In order to preserve the wall, a reserve of 7-8mm of horn allows for racing. Abrasion loss varies between horses and tracks. At the toe, an average wear of 2.6mm in the fore and 4.2mm in the hind is observed. This corresponds to the growth of the horn over a period of two weeks for the fore and three weeks for the hind. In Vincennes (a large racetrack for Trotters in Paris, France), the hoof wall abrasion can reach 4-6mm depending on the humidity (Caure & Cosnefroy, 2013; Duluard, 2018; Moiroud et al., 2014; Moreau, 2017). This strategy – training with shoes, pulling the shoes just before the race, racing without shoes and then replacing the shoes after the race - can weaken the hoof wall and the horn quality. The hoof structure is weakened if the sole and hoof wall lose integrity and no longer have sufficient thickness to offer protection to the sensitive structures. The sensitivity of the hoof increases after the first time the shoes are removed for racing and a discrete bone inflammation develops after the race. This inflammation becomes more pronounced with each successive cycle of shoe removal-racing-shoeing. At the same time, an increase in blood cortisol is observed (Moiroud et al., 2014).

5.7.2.2.5 The impact of shoeing on behaviour

One group (Daniel et al., 2020) observed the impact of traditional farriery (shoe removal, hoof trimming and reshoeing) on a dozen healthy light horse geldings (KWPN, AQHA or TB) that were out to pasture for 22 hours a day. The results show that after reshoeing, the animals spent more time recumbent and took more steps than before shoeing. These results indicate better comfort and well-being following trimming and re-shoeing.

5.7.2.2.6 Economic impact

One study (Telatin & Warren, 2014) tested the hypothesis that barefoot horses would perform better than shod horses in an economic management model. It was based on the number of working days wasted due to lameness and lost or loose shoes. It does not mention the sports disciplines practiced. The provisional results indicate that a barefoot horse does not lose more days of exercise than a shod horse. In addition, it would cost less to keep the horse.

5.7.2.2.7 Summary and outlook

It is surprising that there are not more scientifically sound studies on the role of barefoot hooves or hoof protection in various equestrian activities. The knowledge of basic biomechanics of the hoof is largely lacking, for example in the deceleration associated with sudden and ground-dependent braking, the effect of shoeing or lack thereof or the kinematics of the stride during a lameness examination. Research could also focus on the adaptation of the hoof to different farriery techniques and the development of indicators of defective locomotion. The variables are multiple (speed, surface, lateralisation of the horse). A better understanding of the factors that influence the morphology of the hoof, gaits and welfare would allow a more efficient weighing of interests to avoid strains such as inadequate hoof management and mitigate the risk of injury.

5.7.3 Policy and regulatory context

The legislation affecting hooves is mainly found in the AniWO (CF, 2020). It mentions the obligation to care for them and to trim them properly and as often as necessary and, if necessary, to have them professionally shod. The goal is to ensure a healthy hoof morphology and prevent hoof diseases as well as impediments to locomotion (Art. 5(4) and Art. 60(2)). Wilful trimming of hooves into unnatural positions, harmful shoeing and the placing of weights in the hoof area are prohibited in Switzerland (Art. 21, Letter b). Furthermore, hoof care in a professional capacity is subject to a system of authorisation, including initial and continuous training (Art. 101 Letter e, Art. 101c, Art. 102 Para. 5, Art. 190 Para. 2 Letter c and Coll. 3 and Art. 192 Para. 1 Letter a or b). An ordinance regulates the training, profile, requirements and procedures for obtaining the Federal Certificate of Vocational Competence for Farriers CFC (SEFRI, 2018). These specialists are grouped together in Farriertec Suisse (www.farriertecsuisse.ch).

The training of barefoot trimmers is less regulated, but they are required to show proof of training and register with the cantonal veterinarian in the cantons where they intend to practice. The interpretation of these requirements differs greatly between cantons. The Confederation of Switzerland recognises three training organisations for professional hoof trimming (OSAV, 2020). The VSHO (*Verband Schweizer Huforthopäden*, https://vsho.ch/) trains hoof orthopaedists at the Technical School for Equine Biomechanics and Integrated Therapy (*Fachschule für Biomechanik und ganzheitliche Therapien am Pferd - FSB*, www.huforthopaedie.ch). It is the only institution of its kind in Switzerland, there is also one in Germany and one in Austria. Barefoot trimmers can also join the

[182] The 18 starters of the 2020 Grand Prix of America ran with all four hooves unshod. Retrieved 24.03.2020, https://www.letrot.com/stats/fiche-course/2020-01-26/7500/7/partants/tableau

Swiss Association of Hoofcare Practitioners (*Schweizerischer Hufpflege Verband - SHV*, www.hufpflege-verband.ch). The SHV does not provide training.

In France, the company LeTrot regulates the practice of unshod Trotters for races and their follow-up in training. It only authorises unshod racing for horses aged four years and over, excluding two- and three-year-olds (LeTrot, 2021). For Icelandic horses, the FEIF (International Federation of Icelandic Horse Associations) has issued instructions for several years (FEIF, 2020a, 2020b, 2020c). They limit the length of the toe to 9.5cm (for large horses) and the weight of the additional hoof protectors to 120g. In addition, the axis of the hoof must be aligned with that of the pastern.

5.7.4 Stakeholder interests and areas of conflict

During hoof care and handling, every horse has a major interest in living without strain, especially when the strain can cause anxiety, pain, discomfort, harm or alter their abilities. Those who strive to reduce strain on equids also defend these interests on the basis of current scientific knowledge. That said, the interest of the owner or stable manager is to maintain the animal's functionality and to take measures to ensure the safety of the people and equids involved. Stable owners must recognise the relevant areas of tension in weighing the interests. The immediate effect of interventions on a young equid may have consequences later, especially on its behavioural development and abilities.

Avoiding anxiety, fear, phobias and accidents

Those who breed, keep, train or care for young horses should take care not to impose anxiety-provoking situations on them in order to respect their dignity as equids and their welfare but also to avoid compromising their future. For example, specialists in trimming and veterinary procedures take precautions and employ manual or medicated restraint to avoid unjustified strain (harshness, brutality, violence). Very early on, they gradually accustom foals to pick up their feet and to get used to grooming and care. If this preparation is omitted or if there are repeated difficulties, the equid will be less willing to be trimmed or shod in adulthood and fears and phobias are likely to develop.

In a group of equids, the damage from kicks from a shod hoof is more severe than from unshod hooves. It is necessary to implement measures to protect the health of the equine population and the interests of boarders and owners.

Recognise the signs of acute and chronic pain or seek professional help

It remains the responsibility of the owner or stable manager to recognise the early signs of acute and chronic hoof pain. They restrict equine welfare and generate negative emotions. These signs are difficult to identify and interpret if both forelegs or all four limbs are affected. Lameness is confirmation of pain. It can range from simple discomfort to severe lameness (non-weight bearing). Everyone can learn to spot abnormal heat or a sore spot. Professional intervention (veterinarian or farrier) is generally unavoidable. A professional can determine the cause of the pain and suggest measures to treat the condition and prevent further problems. Veterinarians are also able to judge to what degree these ailments affect the welfare of the horse, particularly whether the horse is able express species-specific behaviours and meet its natural needs. The animal must be able to move freely, feed and interact with other animals without showing signs of disturbance, suffering irreversible harm or placing excessive demands on its adaptive capacity. In addition, the specialist can ensure that measures are taken to ensure that no further damage is done to the structure and function of the hoof (supporting the weight of the horse and cushioning during the landing phase, protection of internal structures and function in the stance and breakover phase).

The interests of shoeing vs barefoot

The choice of which option is better for an individual equid depends mainly on the morphology of the hoof, the career of the horse, as well as the nature and intensity of the planned exercise. Only trained and competent individuals can trim or shoe horses. Inexperience can lead to lameness, muscular and locomotion problems including the risk of irreparable damage. Professionals are required to develop a critical mindset and adapt to technological and scientific developments.

The interest of professional organisations

Farriertec Switzerland believes that barefoot trimming is part of the competences of professional training. Experience and specific further training are good arguments for entrusting this care to such specialists. In the absence of a cooperation agreement, the organisation only mentions the link between the VHS and VSHO mentioned above[183].

5.7.5 Alternatives allowing the same results with less strain

Horse boots are now flourishing on the market and remain alternatives to traditional shoeing (Figure 63). They can replace a horseshoe in certain circumstances (illness, abrasive ground). Their good quality and the choice of sizes allow almost tailor-made comfort. A correct fit including measuring the length and width of the hoof will prevent rubbing and damage to the hoof and heel bulbs. Glue-on fittings (metal, plastic) can also be used as an alternative to traditional horseshoes. These are most often used in the case of a defective hoof wall if it is not possible to nail the shoe to the wall (Poupard, 2010). The adhesive properties of glues are now acceptable and not very toxic for the horn. However, there is a weakening of the glued areas that shortens the intervals between shoeing.

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5.7.6 Results of the balancing of interests and justification of strain

The results are based on the scientific studies published to date (Beale, 2021; Brunsting et al., 2019; Clayton et al, 2011; Creighton & Jones, 2008; De Klerk, 2021; Dold, 2016a, 2016b; Donoho, 2017; King, 2008; Malone & Davies, 2019; Mott & Ellis, 2014; Musterle B, 2009; Nahum & Attwood, 2014; O'Grady & Poupard, 2001; O'Grady, 2007, 2009, 2011, 2016; Pascal Dartevelle, 2015; Proske et al, 2017; Solé et al, 2020; St. Georg, 2017; Stutz et al, 2018).

There are advantages and disadvantages to both options

Current knowledge does not confirm that shoeing has a lasting negative impact on health, nor does it suggest that leaving horses barefoot guarantees the sound use of horses. From a welfare aspect, there are certain advantages to shod hooves in comparison to unshod. However, shoeing alters the angulation of the joints in the limbs and affects the cushioning capacity of the hooves. As much as possible, it is recommended to leave the hooves unshod or to use a period of barefoot trimming to correct hoof morphology. In short, both shoeing and barefoot trimming can improve locomotion if done properly. Depending on the circumstances, there can be a risk of increased shock in the shod hoof or other health problems if it is left unshod.

The conditions that justify either method

The horseshoe protects the hoof wall from wear and tear, as training on sand, especially silica sand, in riding arenas causes significant abrasion. It also protects the solar surface from shock due to uneven ground and avoids breaks and bruises in the sole. In addition, its anti-slip properties are effective on slippery ground (mud, ice) or in certain disciplines involving turns. Shoeing facilitates versatile and daily use under many conditions.

Figure 63 Hoof boot made of polyurethane. It is used to replace or supplement shoeing, as well as to protect a hoof (mainly the sole) that is injured, weakened or undergoing treatment (Source: Swiss Army (2021) - documentation - military farriery 64.010 f. With the kind permission of Colonel S. Montavon, Swiss Army Veterinary Service)

Shoeing does not completely disable the hoof mechanism if it is done properly. This requires that the natural shape of the hoof is respected and that there are no nails palmar or plantar to the widest part of the hoof. This technique requires the use of a farrier who will dictate the appropriate shoeing periods. Regular trimming and refitting of shoes, including putting nails into healthy horn allows the following adage: shoeing is a necessary evil. In case of problems, collaboration with a veterinarian is recommended to define adaptations. In the presence of lameness or deformity, orthopaedic shoeing is a decisive aspect of care.

The decision depends on the balance of interests and the circumstances of the equid

The choice of whether to keep an equid with or without shoes depends largely on the way it is kept and used, as well as the outcome of the weighing of interests. However, one rule seems to apply to both solutions. The hoof must remain balanced around the rotational point of the coffin joint. However, the horn growth between two interventions (shoeing or trimming) destabilises the distribution of forces in the hoof. The farrier or barefoot trimmer therefore needs to regularly rebalance the hoof according to the growth and wear of the horn. The intervals remain individual and are subject to wide variation. In order to ensure a natural balance of the unshod hooves, a more targeted use on suitable grounds becomes inevitable.

The transition from the shod hoof to barefoot requires some thought. Experience shows that the transition is not a problem with a conformationally sound hoof, but it takes up to a year to adapt. However, this change can be difficult, if not impossible, for horses whose hoof morphology has evolved. The riding population knows that a horse can be unrideable for a long time during this transition period. After the removal of a shoe, the soft tissue structures of the hoof may become painful due to sudden stretching of ligaments and tendons attached to the more mobile hoof structures.

There is a lack of studies to better understand the advantages or disadvantages of trimming barefoot for different breeds, types and situations (soil type, season, weather conditions, uses). Such studies are necessary to improve the longevity and welfare of horses sustainably.

5.7.7 Recommendations for implementation

- The requirements of the legislation will be strictly adhered to
- The legal framework for the field of practice of barefoot trimmers should be extended and completed
- It is still essential to consider the primary use for a horse and then to behave consistently and responsibly. A weighing of interests between the use of a horse and the way it is kept must be carried out. This responsibility lies with the owner, the stable owner and the user
- The choice of one variant over the other comes with obligations that one must be aware of and respect
- Scientific research should be continued, especially to answer biomechanical questions related to hoof health.

5.7.8 Thematic bibliography

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5.8 Transport

5.8.1 Description of the current situation, trends, strains and risks

Air transport of horses was developed from 1924 onwards, in particular for intercontinental transport. Transporting of equids by land (road from 1901 and rail from 1840) and sea transport go back further – transport by sea was already being done in ancient times (Küper, 2003). Today, the majority of equids travel by land.

The many reasons for transporting of horses

- Change of location (sale/purchase, move stables, import/export, boarding)
- Recreational sports activities (trail riding in remote areas), national and international competition
- Breeding activities (breeding, remote pasture, events)
- Participation in events (parades, shows)
- Veterinary care in a clinic
- Transport to a slaughterhouse.

41 million kilometres – the total distance that equids in Switzerland travel annually

There is little information available on the number of equids transported and the distances travelled by road. In 1992, 318,509 horses crossed the national borders of the European Community (Waran et al., 2007). This volume does not reflect the internal transport of each country. In Switzerland, more than 25,000 horses (20% of the total number) moved to a different stable in 2019 (imports, changes of ownership, relocations); almost 7,900 moved twice and more than 2,000 three times within that year (Identitas, 2020). It is estimated that the distance covered annually to transport horses to sporting competitions in Switzerland is 20 million kilometres, travelled by about 15,000 vehicles (Poncet et al., 2007). These figures are increasing. In 2012, 19,699 road transport vehicles were identified including 18,511 trailers, and these had covered 41 million kilometres and generated 18,750 tonnes of CO_2 (Schmidlin et al., 2013). There is a lack of statistics on accidents associated with these transports, but the press regularly reports such events.

The transport of horses for slaughter

Approximately 26,000 horses, mainly from Eastern Europe and Spain, are transported annually by lorry for slaughter to the Italian peninsula and to the islands of Sicily and Sardinia (Westen, 2010; World Horse Welfare, 2020). The deplorable conditions under which they are transported are detailed below[184, 185]. It should be noted that the transit of horses through Switzerland by road is prohibited for reasons of animal protection and prevention of epizootic diseases. These animals may however, travel through Switzerland via rail or air transport (OSAV, 2016).

Intercontinental movement

Intercontinental travel is preferably by air rather than by sea. This type of travel mainly concerns horses for competition, racing and breeding, rarely Trotters, as well as breeds from South America (polo horses, Paso Peruano) or North America. Each year, renowned Thoroughbred stallions have a spring breeding season in Europe or North America, followed by a second season in the southern hemisphere.

A Boeing B747 for example, can carry up to 78 horses and their grooms. For the 2021 Tokyo Olympic Games, eight flights carried a total of 247 horses, with one groom for every four horses and one veterinarian per flight (FSSE, 2021c). This type of travel is a major undertaking with complex and demanding logistics. Since the beginning of air transport, airlines have improved conditions, with larger and faster aircrafts and higher cabin pressurisation. IATA's Live Animal Regulations have encouraged the use of modern, safer aluminium containers for the horses. These guidelines form the basis for legislation governing this issue in several countries (Küper, 2003).

Transport requirements

Road transport requires a vehicle adapted and equipped to guarantee safe travel conditions (truck with trailer, horsebox, lorry). Depending on the model, a truck and trailer or a horsebox can take one to three horses, a lorry up to ten. European transport companies offer transport services and benefits. They ensure the welfare and safety of the equids: accident insurance, sedative administration if necessary, accompanying horse, HD camera to monitor the interior, trained personnel, administrative and customs formalities, donkeys and foals, emergencies, assistance, advice and training for loading.

In Switzerland[186] (OSAV, 2018a, 2018b), legislation sets out the conditions of transport and the responsibilities and requirements of the mode of transportation and responsible individuals (owner, driver, accompanying persons). Vehicles should be equipped for the loading, unloading and transport of equids (ramp, floor, bedding, partitions, tethering, ventilation, light, medicine and medical equipment).

5.8.1.1 Strains and risks

Transport has been shown to cause welfare and health problems in equids, including the transmission of contagious diseases and associated economic losses for the equine industry (OSAV, 2018a, 2018b). It exposes animals to a new environment to which they must adapt. Even in optimal conditions, they are subject to strain: restriction of movement, space and visual field, variable physical effort, noise and sometimes difficult climate conditions and stress. Serious problems (gastrointestinal and respiratory pathologies, death or euthanasia) are more likely to occur during long journeys, especially those lasting more than 24 hours (Padalino et al., 2017). Shorter journeys also carry risks, especially injuries. The equestrian population and transport staff are not always aware of this.

National competitions should not be overlooked either, where the horses, after a short journey, may spend part of the day in the parked vehicle at a standstill, often in the sun. In addition, travel is associated with high fuel consumption and environmental impacts (Schmidlin et al., 2013).

5.8.1.1.1 Shipping fever after long-distance travel

Pneumonia (shipping fever) is the most common complication associated with long-distance travel and can occur fulminantly and even be fatal at times. It occurs in 3-12% of horses after a journey of more than 1000km or longer than one day, especially in the

[184] 5.11 The end of life of horses: euthanasia or retirement?, p. 208

[185] 5.12 Meat production and hippophagy, p. 215

[186] 5.8.2 Policy and regulatory context, p. 153

spring. Several publications (Maeda Y & Oikawa M, 2019; Padalino, 2015, 2018; Padalino & Raidal, 2020; Padalino & Riley, 2020; Padalino et al, 2015, 2017, 2018a, 2018b; Waran et al, 2007) describe the causes and clinical signs already studied by various authors cited (e.g. Leadon, 1989; Leadon et al, 1989; Mair et al, 1989; Oikawa et al, 1994; Raphael et al, 1982).

Pneumonia is caused by an invasion of the lungs by microbes and environmental irritants (hay particles, dust, exhaust fumes). Equids of different origins being transported together, combined with insufficient breaks increase the risk of shipping fever. The practice of keeping horses' heads tied above the withers (for safety reasons) also promotes the development of pneumonia. This posture impedes the mechanism (mucociliary clearance) that removes contaminants from the lower respiratory tract. The proper functioning of this mechanism requires the head to be positioned below the withers. Stressed horses (increased cortisol and heart rate) lower their heads less frequently and show higher levels of tracheal mucus as well as increased inflammation scores and bacterial concentration (Padalino, 2015). Clinical signs include simple fever and subclinical to very severe pneumonia. A cough is often absent.

5.8.1.1.2 The spread of contagious diseases (biosecurity)

The transport of equids contributes to the spread of viral and bacterial infections, some of which are highly contagious (Herholz et al., 2008; OIE, 2019). Complications or mandatory confinement have significant economic consequences (abortion, death, care). Endemic and common infections in Europe include Equine Infectious Anaemia, Equine Viral Arteritis, Strangles, Equine Herpesvirus Types 1 and 4, Equine Influenza, Contagious Equine Metritis and Piroplasmosis. The transport of horses may account for some cases. In addition to these diseases, viral infections transmitted by vectors (vector-borne diseases), usually mosquitoes, may follow the movement of equids. They represent a new threat, as climate change has displaced their original biotope. These include African Horse Sickness (AHS) and several types of encephalitis.

5.8.1.1.3 Other impacts of transport on health and behaviour

Several studies (cited in Waran et al., 2007; Padalino, 2015, 2018; Odell et al., 2013, 2017; Padalino et al., 2015, 2018a, 2018b; Padalino & Raidal, 2020) present the strains related to road transport but few cover the subject of air travel (Küper, 2003). The main strains are loading (the most stressful) and disembarkation, restriction of movement and isolation, grouping horses together that do not know one another, vehicle instability and environmental conditions (noise, heat, humidity, inadequate ventilation). Young or inexperienced horses are particularly vulnerable. These conditions, particularly the sawhorse-like stationary position that horses can been seen to stand in when exhausted, for example at the end of a journey, activate the stress response (increased cortisol, heart rate) and lead to an increase in rectal temperature as well as muscular fatigue. Trips longer than eight hours may also decrease progesterone levels in pregnant mares and cause abortion and cause pregnancy termination (Baucus et al., 1990; Odell et al., 2017). Short distances are comparatively more stressful for equids than transporting over long distances. Horses are the most restless during the first hour of the journey and adapt after five hours. They can be aggressive, neigh, stamp their feet or buck. This behaviour, and rivalries between individuals transported without a partition, can cause injuries to the head, limbs and flanks.

Driving problems (sudden braking, jerking, turning too quickly) can cause the horses being transported to lose their balance. In addition, there are traffic accidents due to driving errors including driving at an inappropriate speed. Equids can also become dehydrated and lose appetite and weight. The stress of transport, especially for long periods, can also aggravate the situation, causing diarrhoea and colic and facilitating the development of gastric ulcers (Padalino & Raidal, 2020). Laminitis is an additional complication caused by overloading of the forelimbs or rations that are too rich in carbohydrates (grain) prior to a trip, which alters the gastrointestinal microbiota (Perry et al., 2018).

5.8.2 Policy and regulatory context

5.8.2.1 Swiss legislation on the transport of equids

5.8.2.1.1 The general legal framework

The Swiss legislation concerns practically only the land transport of equids. The AniWO, Epizootic Diseases Ordinance EzDO (CF, 2020a, 2020b, 2021) and Road Traffic Act (Assemblée fédérale, 2020) lay out the regulations to protect animals during transport. The technical regulations are decided by the Association of Cantonal Veterinarians ASVC and FSVO (ASVC, 2018; OSAV, 2018a, 2018b). In summary, the requirements apply to the owner (consignor), driver, staff, consignee, and the vehicles assigned to the journey.

5.8.2.1.2 Owner responsibilities

The owners are responsible for obtaining the necessary accompanying documents (equine passport, health certificate), record any injuries or illnesses, prepare the equid appropriately for transport and, if necessary, water and feed them. Only equids that can withstand the journey without harm are permitted to be transported. Mares in an advanced state of gestation, foals that are dependent on their dams and weak animals should only be transported with special precautions. In particular, animals with health problems may only be transported as far as necessary to facilitate treatment or slaughter (Art. 151, 155 and 156 AniWO).

5.8.2.1.3 Travel and transport time

Six hours of travel and a maximum of eight hours in the trailer

The journey shall not exceed six hours from the place of loading (Art. 15 AniWA). This time includes only the period during which the wheels are moving (driving time). The transport time (animal in the vehicle) shall not exceed eight hours (Art. 152a AniWO). In other words, a break of two hours is allowed. If the break is longer than two hours, the remaining journey time will be reduced by the same amount (OSAV, 2018b). The counter will only be reset to zero under certain cumulative conditions (Art. 152a Para. 2 AniWO):

a. The break lasts more than two hours in appropriate climatic conditions

b. The equids are kept in a space that complies with the AniWO regulations during the break (Appendix 1 Table 7 AniWO)

c. They are supplied adequate food and water.

The FSVO provides for exemptions from the requirements from Annex 1 of the Ordinance (Art. 165, Para. 3) where the means of transport may be used as temporary accommodation (special missions, sporting events, shows, exhibitions). If the horses have been unloaded, ridden, harnessed or otherwise moved, the calculation (travel and transport time) starts from zero again after loading.

5.8.2.1.4 Responsibilities of the recipients

The consignee (breeding facility, exhibition, sales barn or slaughterhouse) must unload the animals with the help of the driver without delay upon arrival and, if necessary, stable, water, feed and care for them (Art. 153 AniWO).

5.8.2.1.5 Responsibilities of the driver

To comply with the legal provisions (Art. 15 AniWA), any person transporting equids shall plan out the journey. They must carry out the journey carefully and without unnecessary delay, in short without breaks that are not absolutely necessary for either the animal or the driver (Art. 15 and 161 AniWO). The driver is to avoid the risk of injury, especially quick and unnecessary acceleration or braking and sudden manoeuvres that worry or frighten the animals and can throw them off balance. For equids being transported to slaughter, the driver (not the consignor or consignee) is responsible for a written record at the time of delivery that lists the duration and route of the journey and transport to the inspection facilities (Art. 152 and 165 AniWO).

5.8.2.1.6 The skills needed to transport equids

Only competent or adequately instructed persons may drive, transport, load and unload animals. They must treat them gently, check them regularly and if necessary, provide food and water and ensure that they are given necessary breaks. They may be assisted by auxiliary staff with these qualifications. The personnel of animal sale and transport companies (drivers, guards, managers) must undergo training specific to the task in hand; the details of the required training are recognised and published by the FSVO (Art. 150, 190, 197 and 201 AniWO). The professional transport companies organise training courses in cooperation with the umbrella associations (OSAV 2018, ASVC, 2018). In addition, individuals with a professional diploma, experience or specific training that has been objectively verified are considered competent:

- Diploma of veterinary medicine or a Federal Certificate of Proficiency (Ger: Eidgenössisches Fähigkeitszeugnis EFZ; Fr: Certificat fédéral de capacité CFC, It: Attestato federale di capacità AFC)
- Several years of professional experience or specific training (riding or driving license or certificate), or courses recognised by the specialised cantonal services.

Professional transporters

The SE has published an information leaflet on the subject of horse transport and transport companies, in particular vehicles registered as having a total weight exceeding 3.5 tonnes (FSSE, 2021a). Companies that transport animals professionally from Switzerland to a foreign country or vice versa must obtain cantonal authorisation (Art. 170 AniWO). Activities that qualify under the heading of professional include selling, boarding, supervision of, or breeding animals for profit for oneself, third parties or to cover one's own costs or those of a third party. The consideration does not have to be financial (Art. 2 Para. 3 AniWO), the decisive factor is the intention. Transport by private individuals for third parties in return for remuneration or service in return is also regarded as a professional activity. The transport is deemed to be private if the animal is transported by its owner, stabler (or an employee), by the person who looks after or uses it, or if the driver does not intend to receive, or will not receive, any compensation or service in return. For example, the driver may be accompanied by an owner or stabler who is unable to drive but cares for the animals during transport (ASVC, 2018).

5.8.2.1.7 Health and safety requirements for transport vehicles

Vehicle equipment and construction

The AniWO (Art. 159, 160, 163, 164 and 165 AniWO) and Swiss Cantonal Veterinary Offices (ASVC, 2018; CF, 2020b) regulations contain all the requirements for vehicles used for moving large livestock (including equids). They define the minimum height of the walls and devices that prevent animals from sticking their heads out of the vehicle and the design of vehicle parts (doors, windows, skylights, partitions, ramps) to limit the risk of injury. In addition, these instructions regulate the use of the vehicles (bedding, type of hitch, minimum dimensions). Vehicles used for the professional transport of animals must be clearly marked at the front and rear with the words "Live animals" or something to that effect.

Bedding and tethering

The floor of the transport vehicle should be non-slip and covered with bedding or equivalent material (soft, absorbent, non-slip, low dust, suitable for resting during breaks). Sufficiently strong tethering devices should withstand the normal stresses during transport. They should be long enough to allow the animals to stand normally, but short enough to minimise risks (injury, strangulation). Tethers should be placed at least at chest level. Equids are to be tethered during transport, except for young equids under 30 months of age or until they begin training and use. The use of a rope or knotted halter or a bridle is prohibited.

Minimum dimensions

In the vehicle, the equids shall have the minimum average space required for each animal. Partitions shall be installed where they have more than twice the minimum area (Art. 165, Para 1, Letter f; Appendix 4 Table 3 AniWO; Table 3). The size of the largest animal in the group (height at the withers + 40cm) determines the minimum height of the ceiling. In addition, the minimum heights should be adjusted appropriately according to the duration of the journey, the condition of the animal and the weather conditions. For professional transport, the effective available area inside the transport vehicle shall be indicated in m^2 in such a way that it is clearly visible from the outside (minimum font height 6cm).

	Area per animal m^2	Minimum compartment height cm
Foals	0.85	Height at withers + 40cm
Lightweight equids	1.40	Height at withers + 40cm
Medium-sized equids	1.60	Height at withers + 40cm
Heavy equids	1.90	Height at withers + 40cm

Table 3 Minimum space requirements for the transport of equids (Annex 4, Table 3 AniWO)

Other precautions

The interior of the vehicle should be well lit when loading, without blinding the horses. For inspection purposes, it should also be equipped with sufficient light sources, either fixed or portable. Animals that do not get along with each other should be separated, if necessary, into different compartments, grouped by species, age or sex. Animals should also be protected from the damaging effects of weather and exhaust fumes. Consideration should be given to the needs of each species and the climatic conditions (clipped or not, ambient temperature). The transport vehicle does not have to be equipped with a roof, but it is essential to protect the animals from the wind and weather. Carefully placed openings ensure a sufficient supply of fresh air. Finally, the vehicles should be thoroughly cleaned after each use and disinfected if the official control bodies deem necessary.

5.8.2.1.8 Measures for international transport (Art. 174 AniWO)

The SE has published extensive information, including a checklist, on the international transport of horses and customs clearance (FSSE, 2021a, 2021b). An official veterinarian[187] checks the fitness of horses for transport before they are transported for a temporary stay abroad. The official veterinarian issues a health certificate as required by customs between Switzerland and EU Member States. The health certificate must be entered into the European IT system TRACES database and the equine passport must be validated for the approved transport (OSAV, 2021). Mares in foal shall not be transported during the last 10% of the gestation period[188] and for at least one week after foaling. This requirement does not apply to transport to/from a summer pasture in the border region of a neighbouring country. Foals shall not be transported until the umbilicus has healed completely.

5.8.2.2 General information on international transport

Although the transport of equids is not the core competency of sports regulations, both the FEI and IFHA are aware of the issues involved in the transport of horses participating in equestrian competitions and races. In 2013 they established the *International Horse Sports Confederation* (IHSC) to look at the careful planning of each international movement of sport horses. Then in 2017, the World Organisation for Animal Health (OIE) and the IHSC established the OIE/IHSC Technical Committee. Their programme focuses on scientific advice, as well as the development, implementation and monitoring of standards. The aim is to establish effective risk management to facilitate the international movement of sport horses participating in competitions (FEI, 2013; OIE, 2019). Significant progress has been made in facilitating travel, but practical difficulties remain.

The difficulties of international transport affect the welfare of horses

The IHSC and other organisations[189] (IMHC, 2002) note that there are gaps in ensuring welfare in cross-border land travel. Horses sometimes wait for a long time at inspection posts that are rarely equipped for safe unloading. They cannot always be provided water and shade and are kept in quarantine or isolation. The presence of official veterinarians is often random. This organisation recommends better communication between professionals in the equestrian sector and the competent authorities, transporters and testing laboratories, particularly with regard to requirements, deadlines and health procedures.

[187] Designated by the cantonal veterinary service

[188] Gestation period: 335 days on average for mares and 365 days for jennies

[189] 5.8.2.1 Swiss legislation on the transport of equids, p. 153

5.8.2.2.1 European Union legislation

The European Union has set standards for the welfare of live animals during transport (EU, 1998, 2005, 2011, 2018a, 2018b, 2019) to ensure their safety and avoid injury and suffering. Directive 98/58/EC and Regulation EC 1/2005 define the responsibilities of the players in the chain, as well as specific rules and controls when entering or leaving the EU. However, these regulations mainly affect cattle for slaughter, although several good practices may also be applied to horses and donkeys. Equids are limited to a maximum of 24 hours travel time before unloading with a food and water break every eight hours. They should be kept in individual stalls, except for dams with foals. The regulations require bedding to be provided for transport longer than eight hours as well as for transport by boat, otherwise the floor must be non-slip. The regulations also require authorisation for distances over 65km, training of staff in handling horses, a certificate of professional competence for drivers and transport documents (animals and logbook). They provide exemptions for non-commercial transport and for competitions, races, cultural or breeding events (exhibitions).

Current transport conditions leave room for improvement

The European Commission (EC), as well as the veterinary and animal protection circles consider these provisions to be unsatisfactory. In particular, they disapprove of the diverging interpretations of the exemptions provided for sporting competitions or cultural activities by Directive 98/58/EC (EU, 1998). To remedy these shortcomings and respond to the criticisms, the EC has published a report, best practice guides and fact sheets for the main species, including equids (EU, 2011, 2018a, 2018b, 2019, 2022). In addition, it hopes to better address the gap between the requirements and the available scientific evidence. A platform composed of the major organisations in the European equine sector has developed a simple memorandum to assess the situation quickly and easily before departure and determine the measures necessary (Stakeholder Platform, 2015). However, athletes were opposed to the regulations when an EU member applied the requirement (EC Regulation 1/2005; EU, 2005; FN, 2019) to always maintain a temperature between 5 °C and 30 °C (±5 °C) in the transport vehicle.

5.8.3 Stakeholder interests and areas of conflict

In general, equids have a major interest in being able to behave as naturally as possible without being subjected to strains that are detrimental to their welfare and disregard their dignity. For example, their ability to adapt to stress must not be excessively restricted during transport.

Transport that brings a major benefit to equids is rare. A life-threatening condition may require treatment in a clinic. Removing an animal from a threatening situation – if it wanders into the public domain after escaping for example - remains essential. Relocation to better accommodation (summer pasture, boarding) can improve its living conditions (age, convalescence, rest). The animal protection community also defends equine health and welfare.

On the other hand, owners want to be able to transport their horses after a sale, for breeding (live cover, collection, competition) or various professional sporting or leisure activities.

5.8.4 Alternatives providing the same results with less strain

Only road transport is addressed. No real alternative achieves the objectives with less strain. However, several measures can be implemented to reduce strain. Wherever possible, the transport of pregnant mares can be limited to early in the pregnancy and the transport of newborn foals postponed. The first precaution is to set up good travel conditions. This prevents stress, injuries and fatigue of the musculoskeletal system in particular.

List of steps before departure

- <u>Acquire necessary knowledge</u> and skills (legislation, stress, fear, fatigue)
- <u>Accustom equids</u> to transport from a young age (handling, leading , loading without driving, repeating, several short trips, positive reinforcement, company of an experienced horse, lighting of the vehicle interior). Avoid bad experiences. No sedation, unless indicated and under strict veterinary supervision
- <u>Opt for the optimal time of departure</u> (early morning, evening or the day before in case of heat waves)
- <u>Choose experienced</u> and competent personnel to drive or assist the driver. Call in a professional if necessary
- Prefer the <u>transport of more than one horse</u> (advantage of a calm companion used to transport)
- <u>Prepare the route</u> (route, emergency numbers, stopping points and water on the route, fuel)
- <u>Study the requirements of each country</u> concerned, prepare and check documents (passports, health certificates, vaccinations)
- <u>Organise materials in case of unforeseen events</u> (panic, darkness, accident, return): first aid kit, extra leadropes, bridles, halters, safety carabiners, knife (to cut ropes or halter), fire extinguisher, blankets for body and head, torches, headlamps, flashing lights, LED sticks, reflective jackets, boots and gloves)
- <u>Choose a means of transport</u> (to which the horses concerned are accustomed if possible). A truck for a journey of more than eight hours or more than two horses. Preferably a vehicle with a front unload option and electric ventilation (air-conditioning) for hot weather and breaks. If necessary, rent or hire the vehicle from a professional company
- <u>Check the condition, safety and operation</u> of the vehicle and its equipment: trailer camera, electrical, lighting, hitch and braking systems, shocks, suspension, floor, ramps, side guards, sideboards, doors, ventilation, tyre pressure, spare tyre, total weight

(vehicle + horses), available space (Table 3), winter equipment (chains, shovel, sandbag, blanket). Test the means of transport before departure

- Prepare and load hay (dust reduced or steamed, quantity as desired), buckets, feeders or hay bags, bedding, water supply. Avoid conventional nets (safety risk)
- Prepare and load the tack.

Preparation of the horses

- Check each animal and its fitness to travel (condition, shoeing, hooves, stage of pregnancy, condition of the umbilicus in foals). Do not transport a horse with a health problem, except in case of emergency over short distances. Call in a veterinarian if necessary
- Equip the horse: Protect the horse's extremities (bandages, bell boots, shipping boots), its tail, carpi, hocks, and provide reflective equipment
- Do not blanket them (except in winter if they are clipped). The temperature rises quickly in the vehicle, even if it is well ventilated
- Loading: Loading can be difficult for the unaccustomed equid (stress, fear, panic). Light the interior of the vehicle in low light conditions and use positive reinforcement (words, physical contact, rewards)
- Do not use sedatives unless indicated and administered by a veterinarian. The use of magnesium-based substances or pheromones (sometimes without effect) is preferred by the Authors. It is essential to weigh the interests when making this decision
- Tether the horse away from the wall. Do not position the horse's head high (risk of secretion accumulation in the airways). Respect the blind spot of the horse's frontal vision so as not to force it to identify the wall with its vibrissae or by turning its head.

Precautions during the journey

- Drive smoothly, favour motorways (avoid jerks), drive defensively (change of trajectory and speed), brake gently and downshift before bends, keep calm
- Pay close attention during the first few hours of transport. Check the horses after a few kilometres
- Take breaks (minimum 20 minutes after two to four hours). Park in the shade, turn on ventilation (in hot weather)
- Inspect the condition of the vehicle and animals. Check that they are urinating, unload them if necessary. Offer water as necessary. At dusk or at night, leave the light on to calm the horses. Provide water in small amounts, control hay, do not give grain (risk of colic)
- Apathy in horses: take rectal temperature, identify signs of heat stroke. If necessary, unload to treat and cool down the horse
- In the event of an accident, especially on the motorway: call for help and do not intervene alone (risk of letting a horse escape or be injured). Secure the vehicle and traffic, wait for help.

Unloading the horse

- Exit from the rear: back the horse straight to prevent injury from the edge of the floor and ramp. Do not allow the horse to turn around (risk of getting stuck). Remove protective equipment, inspect and monitor the horse (skin, signs of apathy, rectal temperature, appetite). Reward, water, feed, provide shelter.

Physical exercise after transport

It is essential to allow the horse to rest and recover before exercising it. Travelling can fatigue its musculoskeletal system and psyche. The degree of fatigue depends on the individual (behavioural profile, age, habituation, physical condition) and on each journey (sequence and duration, number and length of breaks). It is recommended to walk the horse after transport. Watch for signs of weight loss. For horses that are used to travelling, a few hours rest is sufficient after a short ride without incident. Arriving the day before allows for better recovery after a long transport (more than eight hours) or a long distance. Monitor the temperature and general condition of the equid to identify the first signs of pneumonia (shipping fever). The same recommendations should be applied after air transport.

5.8.5 Results of the balancing of interests and justification of strain

No one disputes the principle of transporting equids. The abolition of equine transport would likely constitute an infringement of fundamental rights (economic freedom or property). However, its justification requires the satisfaction of several requirements. Any strain imposed on the animal remains unjustified when measures are available to lower the level of strain, but not implemented in order to facilitate rapid transport, or in the case of failure to comply with recommendations (safety, protection of health, welfare and dignity) or non-compliance with legislation. However, this result must be qualified. The investment in a well-equipped truck is disproportionate for transporting horses. As these equestrian activities are carried out without frequent transport, the use of a professional company is more economical, for example, to drive an equid to a clinic in an emergency.

On the other hand, it remains unjustified to drive (several times a year on weekends) equine athletes to horse shows or races in simple transport vehicles when they also serve as temporary accommodation without meeting the legal requirements (Annex 1 AniWO) even if exemptions are provided.

The administration of sedatives before transport is not justified

It remains unjustified to administer substances normally intended for the restraint of equids (painful interventions, anxiety, hoof care, in preparation for general anaesthesia) without veterinary supervision. Without appropriate control, this practice increases the risk of complications during transport: increased sensitivity (excitement, panic), thermoregulation disruption, penile prolapse in males. In addition, the muscle relaxation due to sedation can lead to incoordination, loss of balance, fatigue, lower airway disease or respiratory depression (Levionnois, 2007). Appropriate use of sedatives is the responsibility of the veterinarian (inadequate dosage), the person in charge of transport (poor supervision or driving, excessive speed) and the rider/driver of the equid (administration of products prohibited before competition - doping).

5.8.6 Recommendations for implementation

Sporting and breeding organisations could further develop a number of points with the aim of increasing the efficiency and safety of transport, reducing costs and improving equine welfare:

- Inform boarders and owners about the following issues, in particular pre-departure inspection of animals, the provision of breaks, the risks of transport, driving and vehicles
- Plan competitions, taking into account the distances to reduce the environmental impact of transport, especially for amateurs
- Improve accommodation (shade, water) of horses on the competition grounds to avoid the prolonged use of transport vehicles for this purpose
- Regulate the special equipment of vehicles intended for the transport or evacuation of injured equids (equine ambulances), as they are currently not subject to any guidelines or legal requirements
- Undertake studies on traffic accidents involving the transport of equids to improve safety.

5.8.7 Thematic bibliography

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5.9 Doping and the medication of sport horses

This chapter discusses the ethical regulatory and legislative use of substances and practices that influence the functional integrity of sport horses. It complements the discussions surrounding this topic in previous sections[190, 191, 192, 193]. Topics will only be revisited insofar as they refer to prohibited methods generally treated as doping or medication violations[194].

5.9.1 Description of the current situation, trends, strains and risks

5.9.1.1 Introduction

5.9.1.1.1 Definition

Doping is the administration, encouragement to use or facilitation of the use of substances, products or methods for the purpose of altering the ability of an athlete (other than through normal training and feeding procedures) or to mask their use in testing. In addition, the term medication covers the application of drugs to an equine athlete that are normally intended for the prevention or treatment of health disorders. Although authorised in medicine, several remain prohibited in competition. These procedures may be deemed fraudulent, negligent or ignorant.

Athletes, the general public and the press simplify and amalgamate these uses into that of doping. Indeed, in several countries, international federations and legislative or regulatory bodies group doping and medication together. This is notably the case with the World Anti-Doping Agency (WADA-AMA, 2021).

5.9.1.1.2 Brief history

Since ancient times athletes have tried to improve their performance or those of their horses through methods other than by training and hard work, notably using plants that contain drugs (alkaloids). Nowadays, those who cheat in competition by doping equine athletes follow the examples of various other disciplines closely when the media report on the highlights in cycling, weightlifting or athletics. They then shed light on the black market of amphetamines, anabolic steroids, testosterone, growth hormones or substances that modify blood oxygenation. The disloyalty, unfairness, stimulating effect and mysterious or miraculous use of doping have thus become part of the public and legislation since the end of the 19th century (Courtot, 1977).

[190] 4.4 The use of equids in sport, p. 56
[191] 5.5 Excessive or inadequate care of equids, p. 114
[192] 5.6 Auxiliary equipment and the use of force, p. 126
[193] 5.7 Hoof care and shoeing, p. 142
[194] 5.9.2 Policy and regulatory context, p. 166

5.9.1.1.3 The recent development of fighting against substance abuse

In 1988, the fight against doping was justified by three arguments: fairness of the events and betting, the reliability of breeding values and the law on animal protection (Gerber, 1988). Since 2008, the FEI (FEI, 2022b) has introduced the *Clean Sport* maxim, which gives a prominent place to the integrity of equine athletes (respect for their dignity, protection of their welfare and health). It notes the heightened societal sensitivity for vulnerable living beings used in competition and the accompanying risks of a negative public image[195]. Since then, efforts have focused on monitoring practices that conceal poor physical conditions, aggravate injuries and lead to overexertion (Montavon, 2020a, 2020b).

Today, equestrian and horse authorities, as well as testing laboratories are developing ways to track modern fraudulent doping methods that influence performance and endanger the integrity of equine athletes (dignity). In particular, they are now tracking autologous blood transfusions and their substitutes, erythropoietin (EPO) masking agents, stimulants, the application of anabolic steroid metabolites produced physiologically, transformed by the body, or present in traditional feed, genetic doping and manipulations of all kinds (Thevis et al., 2020; Tozaki & Hamilton, 2021). Longitudinal tracking and biological passporting of racehorses have been introduced, as well as qualitative and quantitative analysis and time tracking through hair testing. It is hoped that research will soon be able to distinguish between treated and control animals without necessarily knowing the metabolism of each active ingredient used.

5.9.1.2 Current views on the integrity of competition horses

The guiding principle

The equine athlete shall only participate in an event if it meets three conditions. Natural ability will be derived from functional conformation, proper training and education. The equid must be in good physical and mental health (*fit to compete*).

5.9.1.2.1 The notion of health

Good health is the result of an often binary and reductive socio-economic construction: healthy vs. sick individual. Health is also considered as the integrity of physical and mental functions (Bergmann, 2019). However, the vitality of a population presents a multifactorial picture characterised by several variable stages. The stages move gradually (Gaussian distribution) from animals without any suspicious signs (rare), to subjects with some minor pathologies (very frequent), and, at the other extreme, to equids with unusual symptoms.

Each specialist develops their own vision according to their role. The position of officials varies during the examination on arrival (medical and physical condition, fit to compete) at FEI events (Serra Bragança et al., 2020). The team vet or equine athlete will have their own notions. As for the veterinarians, they mainly analyse the diseases to be treated and prevented, but study good animal health itself and the determining factors for good health much less. Moreover, there is little explanation of this concept, except for the usual: basic care, hygiene and prevention.

Health: one of the fundamental aspects of animal welfare

A less therapeutic, but more systemic approach shows that health is only one of the fundamental components of animal welfare (five freedoms). Adequate adaptive skills allow equids to respond to the stimuli in their living space[196] (OIE, 2021). When vital functions are threatened, the veterinarian must also be concerned about stresses that overly strain these adaptive mechanisms. Accordingly, particular attention should be paid to the exercise environment and the deficiencies in convalescing patients. The success of the veterinarian depends on multidimensional skills (Hernández-Gil, 2019):

- Equestrian sciences and ethology: problems of biomechanics and adaptation
- Epidemiology: prevalence of conditions that affect physical fitness
- Surgery, internal medicine and sports medicine: treatments that affect healing processes and immune defences. Measures to be taken in the event that exercise capacity is threatened by deregulation of vital functions (metabolism, thermoregulation, musculature).

5.9.1.2.2 Equine sports medicine

This branch of veterinary medicine is not about treating and preventing disease, but rather supporting the performance of competition horses by managing their potential (Art & Lekeux, 1990). Several books and medical conventions (Hinchcliff et al, 2008, 2014; Hodgson et al 2014; ICEEP, 2020) provide new insights into exercise physiology, related pathologies and preventive measures. These form the basis of several guidelines for good practice and ethics (AAEP, 2010).

However, sports medicine is often seen as an aid to enhance the success of equine athletes without giving lasting importance to their dignity and welfare. Indeed, some veterinarians no longer place the welfare of the equid at the top but, opportunistically, become the servants of clients who want to make their horses win at any price, even that of their horse's health. It should be noted that some veterinarians had convinced the FEI to authorise the use of anti-inflammatories and analgesics to allow sick and

[195] 4.4 The use of equids in sport, p. 56

[196] 2.4.1 Approaches to defining and assessing welfare, p. 25

convalescing horses to compete (Horsetalk, 2009). In the face of strong protests from European federations, the FEI backtracked this decision (Poudret, 2009) and established a list of prohibited substances, a catalogue that is regularly amended (FEI, 2022c).

5.9.1.3 The interval between illness and resumption of work

The requirements of the FEI (FEI, 2022b, 2022f) and racing (IFHA, 2021a; UET, 2021a) define prohibited therapeutic substances[197]. Before advising a client to resume training, practitioners must use their expertise, discretion and ethics to discern individual biological and pharmacological variations. That said, many are primarily concerned with the risk of testing. Others, however, believe that the indicative published detection times allow for routine treatment planning without conflict with doping and medication regulations (Bachmann et al., 2016; Termine, 2016; White & Palmer, 2014). This is a sensitive issue. In this respect, a simple disinfectant (iodine solution) for a triviality - a graze - presents no problem. Treatment of a serious disease (infection, abdominal or musculoskeletal pain or metabolic disorders) must first raise the question of stopping exercise and immobilising the equid. After treatment, a period of convalescence should be followed by rehabilitation and the gradual resumption of exercise.

The delay before the resumption of training

Ethics require that there be an interval between the illness and the resumption of physical exertion so that the animal gradually regains its strength and health. First, *lege artis* treatment requires that veterinarians check that the administration of a symptom-masking drug does not worsen the clinical condition. This is not dependent on the presence or absence of prohibited substances during testing, even trace amounts with no pharmacological effect. It is more important to be able to determine when a horse is fit for training and only then to consider the possibility of resuming training and subsequently considering testing for a substance.

The ability to train and compete (*fit to compete*)

The physical condition of a horse is defined by its ability to withstand high levels of intensity and frequency in training without strain (stress, pain, overexertion). There are several phases that allow stakeholders to follow the progression from initial clinical signs to returning to a fit to compete state, set milestones and check the achievement of objectives:

- The disease itself and its consequences on the duration of rest (nature of the lesions and time needed for the remission of clinical signs)
- Convalescence (remobilisation and gradual recovery) essential to the process of complete healing
- The beginning of training when health and physical capacity are sufficient to allow exertion in successive stages
- Resumption of competition when the physical condition is adequate (*fit to compete*).

5.9.1.3.1 Management of convalescence

The consequences of a rest period

Immobilisation of a horse after illness or injury (limited support of a limb) reduces its physical condition. Negative consequences can already appear after a few days of stall rest. The intensity and severity of consequences depend on the stage of training before the insult and the system affected (musculoskeletal, cardiovascular, respiratory, nervous, metabolic). Studies provide relevant information. For example, atrophy, fibrosis and retraction of inactive muscles, joint ankylosis and reduction in bone density can be observed. These impairments also reduce the ability for a horse to exert itself. Nonetheless, just walking a horse allows the maintenance of factors related to exercise-induced aerobic capacity in comparison to strict stall rest (Art & Lekeux, 1990; Gysin et al., 1987; Hodgson et al., 2014; Jeffcott et al., 1988; McKeever & Lehnhard, 2014; Mukai et al., 2017; Patterson-Kane & Firth, 2014; Valberg, 2014).

Resuming exercise

The measures adopted should balance the danger of overloading the affected tissue and the need for remobilisation (rehabilitation). The exercise intensity should be compatible with the recovery from the specific injury or illness and should not subject the horse to undue stress (Stein, 2020). To achieve this, the type and duration of immobilisation (osteosynthesis, cast, bandage, stall, tether/net), the site of the injury and the age of the patient should be considered. In no situation should economic motivation or notions of prestige dictate a rapid return to competition.

Professional and relational skills

Immobilisation and return to exercise can be very long process (Hinchcliff et al., 2008, 2014). Common conditions such as bucked shins (dorsal cannon bone periostitis) can take up to 120 days to heal. Injuries to tendons or ligaments may require six months of rest. A rehabilitation plan, followed by controlled and progressive training can last up to 300 days after an inflammation of the superficial digital flexor tendon.

Veterinarians rely on their expertise and collaboration with the horse's entourage (responsible persons, owner). To do this, the veterinarian must also have the interpersonal skills to communicate common values in terms of perception of strain and the definition of objectives, in particular to specify an exercise programme after convalescence. Together, they will ensure that the

[197] 5.9.2 Policy and regulatory context, p. 166

following ethical principles[198] are observed: respect for dignity[199] and the protection of health and welfare[200], for example those of the Code of Ethics of the SE[201] (FSSE, 2018b, 2018c, 2018d).

In other words, to successfully return to competition after an illness or injury, the individuals concerned will adopt several appropriate attitudes:

- The observation of objective functional criteria for transitioning from the recovery phase to specific training (professionalism).
- A sense of duty.
- Resilience and patience to look ahead and accept changing situations.

Two parameters will then measure the success of the horse and the care. The animal will perform for several seasons at the same or higher level than previously without recurrence of the injury or illness, contralateral injury or a similar injury or illness.

5.9.1.4 The results of doping and medication testing

The regulatory mechanisms of the SE, the FEI (EADCMP), IFHA and UET are listed below[202].

5.9.1.4.1 A few rare positive cases per hundred tests in equestrian sport

In the disciplines governed by the FEI (show jumping, dressage, eventing, endurance, driving, para-dressage, vaulting) the SE carried out 100 to 200 medication controls per year from 2006 to 2014 (minimum 91 in 2007, maximum 202 in 2014). This figure then rose to 300, then to 339 in 2018. The SE also carried out random sampling during Western and Icelandic events at the request of its member associations (Poncet PA et al., 2011; Trolliet & SE, 2021). One study (Bachmann V et al., 2016) traces some aspects of the evolution of the number of positive cases (0-5) for the period 1999-2014. In recent years, there have been two to five per year, i.e., 2.0% in 2015 and 0.66% in 2018 (FSSE, 2016, 2017, 2018a, 2019, 2020a). At the international level, the percentage of positive cases - 4.3% in 2004 and 2.3% in 2005 and 2006 - has decreased and varied between 2007 and 2015 (the date of the last report) between 0.2% and 0.7% for groups I and II (Europe, Turkey, Cyprus, Israel). It fluctuates between 1.0% and almost 3.5% in the rest of the world. The negative results of the EADCMP and the ongoing cases of the FEI Veterinary Department and Tribunal are published and updated regularly (FEI, 2009, 2012, 2015, 2022a).

5.9.1.4.2 Few positive results in racing despite the high number of tests

Racing in Switzerland

Reports from the international federations show that almost 50% of Swiss races (Thoroughbred and harness racing) are subject to testing (IFHA, 2015; UET, 2021b). The number of infringements in these races remains low, as is the case for equestrian sports as a whole. Since 1997, the FSC (Swiss Racing Federation) has conducted more than 100 samples per year (min. 135 in 2007, max. 206 in 2010). A peak of four positives (3.0%) was recorded in 2007 (FSC, 2011). In 2018 and 2019, the FSC tested 328 horses at races and 67 in training with only one positive result (FSC, 2019c, 2020). For previous years, the reports still available for Thoroughbred racing also show rare positive cases (0.3%) for almost 1,000 tests (69-136/year) between 2003 and 2010 (IFHA, 2015). For harness racing, there were 10 positives (0.5%) for roughly 2,000 tests (Ø 137/year) from 2006 to 2019 (UET, 2011, 2012, 2013, 2014, 2015, 2017, 2018, 2019, 2021b).

Figure 64 Racehorses are tested during racing and training (Source: Softeis, https://commons.wikimedia.org/wiki/File:Horse-racing-1.jpg CC BY SA 3.0)

Thoroughbred racing abroad

IFHA published reports on prohibited substances tested positive for internationally from 2003 to 2015 (IFHA, 2015). Each year, 225,611 (2003) to 577,381 (2015) Thoroughbreds were tested in nearly 50 countries. Some racing authorities limit sampling to the most important events, others test after every race. The percentage of positive results (urine and/or blood) varied between 0.17% (2004) and 0.33% (2015). For horses in training between 2.2 % (2003) and 0.03 % (2015) were found to be in breach of the law. With the exception of the United Arab Emirates and some states in the USA, the racing authorities systematically disqualify horses with positive results.

Harness racing on the European circuit

For harness races in Europe, the publications of the UET (UET, 2011, 2012, 2013, 2014, 2015, 2017, 2018, 2019, 2020, 2021b) provide information on doping and medication testing from 2006 to 2020. During these 15 years, the UET member federations conducted a total of 541,405 tests (Ø 36,093/year, min. 18,480 (2019), max. 49,312 (2008). 2,149 (0.39%) were positive (<0.00% in 2020, max. 0.62% in 2019).

[198] 2.1 Ethics, p. 20

[199] 2.2 Dignity, p. 20

[200] 2.4 Welfare, p. 25

[201] 4.4.2.2 National and international regulation of equestrian sports, p. 72

[202] 5.9.2 Policy and regulatory context, p. 167

In France, the analyses are included in a report. 67 (0.23%) out of 29,576 (LeTrot, 2019) controls in 2018 and 35 out of 17,064 (0.2%) controls in 2019 detected a prohibited substance (LeTrot, 2020a, 2020b). This region carries out controls in particular during races, qualifying events, training and longitudinal monitoring of horses.

5.9.1.4.3 Prohibited substances discovered in equestrian sports and racing

The *Equine Prohibited Substances List* of the FEI (FEI, 2022c; FSSE, 2020b, 2021b) and racing authorities (IFHA, 2021a; UET, 2021a) includes more than a thousand products, not including similar or related agents. Harmonised between the testing laboratories, there are no major differences between equestrian sports and racing[203]. Equine athletes from all continents therefore remain subject to similar requirements in competitions. However, there are some differences in application. While the FEI implements a uniform testing and control procedure with the EADCMP (FEI, 2022d), this is not the case for racing. The use of some substances banned in Europe (phenylbutazone, furosemide[204]) is still tolerated in some North and South American states as long as their concentration does not exceed a certain threshold on the day of the event. However, the industry is beginning to realise the risks to equine health racing's image[205] (Angst, 2019; Zambruno, 2017).

Substances in equestrian sport

Category	Substances a), b), c)	N	%
NSAIDs and non-opioid analgesics	Salicylic acid, diclofenac, flunixin, harpagoside, meloxicam, phenylbutazone & their metabolites	42	18.8 %
Alkaloids and stimulants	Arsenic, atropine, demecolcine, heptaminol, mephentermine, scopolamine, strychnine, synephrine	37	16.5 %
Anabolics	Boldenone, boldione, GW1516, nandrolone, stanozolol, testosterone & their metabolites	35	15.6 %
Corticosteroids	Dexamethasone, flumethasone, isoflupredone, prednisolone, triamcinolone & their metabolites	20	8.9 %
Cardiotonic, neurotropic or psychotropic methylxanthines	Caffeine, theobromine, theophylline & their metabolites	20	8.9 %
Opioid analgesics	Codeine, morphine, **tramadol**, **oripavine** & their metabolites	19	8.5 %
Tranquilizers, sedatives, neuroleptics, hypnotics	Acepromazine, **clomethiazole**, detomidine, **reserpine**, **venlafaxine**, xylazine & their metabolites	13	5.8 %
Beta-blockers, bronchodilators, mucolytics	Atenolol, clenbuterol, dembrexin, **ractopamine**, salbutamol	12	5.4%
Vasodilators	Diisopropylamine	9	4.0 %
Local anaesthetics	Lidocaine, mepivacaine & their metabolites	4	4.0 %
Treatments for metabolic acidosis	Trometamol	4	1.8 %
Vasoconstrictors	Ergonovine	2	0.9 %
Progestagens	Altrenogest in geldings and stallions; permitted in mares for suppresion of estrus	1	0.4 %
Muscle relaxants	Methocarbamol	1	0.4 %
TOTAL		224	100 %

Table 4 Categories of prohibited substances detected in the 133 positive cases (as of 27 May 2020) handled by the FEI in 2019 and 2020. a) Banned Substances are marked in bold, b) Controlled Substances in normal type, c) Specified Substances underlined (Source: FEI, 2020b, 2020c)

For equestrian sports, the FEI communicates (https://inside.fei.org/news) the proceedings initiated for anti-doping rule violations and horses testing negative (FEI, 2022a). Table 4 is a status report (as of 31.05.2020) of the substances discovered. It covers 63 published cases and 62 decisions of the FEI Tribunal (first instance of appeal) from 2019 and early 2020 (FEI 2020b, 2020c). The oldest cases date back to October 2016. These 125 cases provide 133 samples (urine, blood or both) of 114 different horses at 100 international competition venues. In total, 224 prohibited products were found (Table 4).

In the FEI disciplines, the high infringement rate in endurance events (56%; 74/133) provoked reactions[206]. In comparison, 28% of the positive tests (38) were for show jumping and 16% (21) for other disciplines (dressage, eventing, driving, vaulting, reining). However, the total number of doping tests performed per discipline is not known. Endurance represents only 17% of the total number of events (FEI, 2020a). Thus, the likely presence of bias does not allow for any relevant conclusion at this stage. The judgements of the FEI court provide the geographical origins of the responsible parties. Studying them would make it possible to assess the role that culture might play in the use of prohibited substances and respect for equine dignity and welfare. As it stands, it can only be assumed that there are significant socio-cultural differences.

Substances in racing

The latest report published on testing in horseracing was published in 2015 (IFHA, 2015). The 1,913 infractions involved 159 prohibited substances identified on 769 occasions (Table 5). However, the records remain incomplete, as the US reported on only 107 cases out of the 1,371 positives. This shows the extent of the issue in terms of protection of equine athletes and the fight against doping[206]. With regard to harness racing, the UET does not publish a detailed report on the results of the analyses. Some information is leaked. For example, it was revealed that for the first time, four horses recently tested positive for CBDA (cannabidiolic acid), a hemp extract used as an analgesic and antipsychotic (LeTrot, 2019, 2020a, 2020b).

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[203] 5.9.2.2 Anti-doping regulations in equestrian sports, p. 167

[204] Diuretic to prevent pulmonary hemorrhage

[205] 5.9.2.3.2 Current discussions, p. 169

[206] 4.4.1.3.1 Despite new knowledge, there is still considerable room for improvement, p. 59

Category	Substances	N	%
NSAIDs and non-opioid analgesics	Salicylic acid, diclofenac, dipyrone (novalgin), DMSO, ibuprofen, flunixin, meloxicam, naproxen, phenylbutazone & their metabolites	149	19.4 %
Alkaloids and stimulants	Amphetamines, arsenic, atropine, cobalt, ephedrine, levamisol, kratom (Mitragyna), nikethamide, pemoline, ritalin, scopolamine, strychnine & their metabolites	122	15.9 %
Beta-blockers, bronchodilators, mucolytics	Atenolol, clenbuterol, dextromethorphan, etofylline, ipratropium, ractopamine, salbutamol, timolol, zilpaterol	103	13.4 %
Cardiotonic, neurotropic or psychotropic methylxanthines	Caffeine, theobromine, theophylline & their metabolites	85	11.1 %
Tranquilizers, sedatives, neuroleptics, hypnotics	Acepromazine, bromazepam, cannabinol, detomidine, romifidine, trimeprazine, venlafaxine, xylazine & their metabolites	59	7.7 %
Corticosteroids	Betamethasone, dexamethasone, flumethasone, hydrocortisone, prednisolone, triamcinolone & their metabolites	53	6.9 %
Opioid analgesics	3-hydroxy-N-methylmorphinan, butorphanol, codeine, levorphanol, morphine, tramadol, oripavine & their metabolites	50	6.5 %
Anabolics	Boldenone, ethylestrenol, nandrolone, stanozolol, testosterone & their metabolites	40	5.2 %
Local anesthetics	Lidocaine, mepivacaine, prilocaine, procaine & their metabolites	23	3.0 %
Muscle relaxants	Dantrolene, methocarbamol, orphenadrine	21	2.7 %
Diuretics	Furosemide, hydrochlorothiazide	20	2.6 %
Treatments for gastric ulcers	Omeprazole, ranitidine	14	1.8 %
Treatments for metabolic acidosis	Bicarbonate	8	1.0 %
Hemostatic agents	Tranexamic acid	6	0.8 %
Antihistamines	Cyproheptadine, chlorphenamine	4	0.5 %
Vasodilators	Minoxidil	4	0.5 %
Antagonists to muscle relaxants	Edrophonium	3	0.4 %
Various	Altrenogestcarboprotol, clanobutin, ergonovine, tribromethanol	5	0.7 %
TOTAL		769	100 %

Table 5 Categories of 159 prohibited substances detected 759 times in cases reported by IFHA member countries (Source: IFHA, 2015)

5.9.1.4.4 Substances are mainly used to mask pathologies

Prohibited substances (Table 4 and Table 5) that are most commonly used before competitions (a practice known as equine sports medicine) are primarily aimed at abusively, fraudulently or negligently masking clinical signs of disease. In many horses, they are given in the form of a cocktail (e.g. NSAID + local anaesthetic, corticosteroids, an anabolic steroid or a mixture of several drugs).

- Painful conditions, especially of the musculoskeletal system (NSAIDs, non-opioid analgesics, muscle relaxants, corticosteroids)
- Conditions of the respiratory system (beta-blockers, bronchodilators, mucolytics)
- Poor physical condition (amphetamines, anabolic steroids, cobalt, stimulants, strychnine)
- Behavioural issues (antihistamines, narcotics, neuroleptics or hypnotics rarely used for sedation).

These practices, which can cause damage and harm, therefore meet the legal definition of strain[207], including that of excessive instrumentalisation[208, 209].

5.9.1.5 Strain caused by medication and doping

The risks of doping and medication of equine athletes have several aspects. First, they include the direct toxicity of substances (Hertzsch et al., 2015; McKeever et al., 2020; Stout, 2005). In particular, anti-inflammatory drugs can promote the development of gastric ulcers. It is also known that an accumulation of bone micro-damage - often accompanied by clinical signs and sometimes subtle pathological changes - precedes fatigue fractures. If medication masks these signs during training, a complete fracture can occur. A similar phenomenon is observed for tendons and ligaments (McKeever & Lehnhard, 2014; Patterson-Kane & Firth, 2014; Zambruno, 2017, 2020).

Another significant example: The death of 21 ponies in the US in 2010 led to the implementation of regulations in polo. Selenium injected to enhance performance was accidentally overdosed (Desta et al., 2011). Very lax regulations tolerate the anti-inflammatory drug flunixin (USPA, 2018) at a plasma concentration (1.0 µg/ml[210]) 1,000 times higher than for racing (1.0 ng/ml). As for phenylbutazone, the allowed plasma concentration is 150 times higher for polo (15.0 µg/ml) than for racing (100 ng/ml) (IFHA, 2021d).

[207] 2.3 Strain, p. 20
[208] 2.3.6 Excessive instrumentalisation, p. 25
[209] 5.9.1.5 Strain caused by medication and doping, p. 165
[210] 1µg (microgram) = 1000ng (nanogram)

To use a horse at all costs presents a risk of excessive instrumentalisation

Using, training or competing a horse with concealed health problems carries the risk of dangerously damaging its physical and psychological integrity. An animal cannot be considered to be in good condition if it is convalescing or if prohibited substances can be detected in its body. Such stress can aggravate pathological conditions, slow down or even prevent the healing process and thus cause harm.

At the ethical level, the use of a sick horse represents excessive instrumentalisation. Humans use it as a pure tool, without any sensitivity to its physical and psychological interests and specific needs. This practice not only damages its health but also undermines the foundations of fair sport. The use of prohibited substances or methods is a breach of fair play (respect for the rules and equal opportunities) characterised by cheating and trickery.

5.9.1.6 The doping of tomorrow and its risks

The discovery of the CRISPR-Cas9 gene editor (Gaj et al., 2013) propels the fight against doping into a new era (Kusano, 2018; Maniego et al., 2021; Wilkin et al., 2017). Gene doping includes various molecular methods that modify the genes of the body's (somatic) cells. In theory, it allows the replacement of a horse's DNA sequence with one that carries a mutation altering the expression of performance-related genes to improve performance. This technique could result in stronger, faster and more resilient athletes. This would push them beyond their usual limits. This technology can also be applied to the germ cells that produce sperm and oocytes, which would ensure the transmission of new traits to the offspring.

The concerns of racing authorities are ethical and health-related because of the potential for harm to equine dignity and welfare. This type of doping represents a major risk of instrumentalisation. It makes detection difficult and threatens the integrity of equine athletes, the regularity of competitions and the sustainability of breeding. Furthermore, these manipulations affect the perception of the sporting image by the regular and betting public. In fact, researchers are already proving able to create transgenic equine embryos (Campbell & McNamee, 2020; Hisey et al., 2021; Moro et al., 2020; Vichera et al., 2019). These concerns follow the concomitant development of gene therapy, which may one day become part of the veterinary medical arsenal. In theory, gene therapy can be simply described as introducing a modified gene into a diseased organ, for example by intra-articular injection of a mutation that codes for therapeutic products. It would then support local administration of anti-arthritic agents (Evans et al., 2018; Levings et al., 2020). There are similar trials for the treatment of tendonitis (Kovac et al., 2018; Zakirova et al., 2020). The biological risks of this method are still not understood.

5.9.1.6.1 Prospects for combating doping

The discussions are just beginning. The IFHA established a Genetic Doping Control Committee in 2016, which was given several assignments[211] (IFHA, 2018, 2021c):

- Defining the scope of doping practices and gene and cell therapy
- Specify those to be prohibited in racing and breeding and provide guidance for the proper monitoring of those that can be legitimised
- To this end, make recommendations for detection regulations and policies.

Some drugs now pass as gene doping substances. For example, GW1516 improves performance due to its regulatory property of genes related to metabolism. Its metabolites are already used as effective markers in testing. AICAR (5-aminoimidazole-4-carboxamide ribonucleotide) also falls into this category. It modulates the metabolism and increases endurance (Thevis et al., 2010, 2020; WADA-AMA, 2021; Wong et al., 2017).

Doping of the future will go beyond the usual pharmacology (elimination time, detection thresholds). Combating it successfully will require knowledge of the links between performance and the genome and gene expression (Lee et al., 2020; Tozaki et al., 2022). The list of candidate genes for doping and gene therapy will grow. Laboratories will have to overcome the difficulty of developing a test for each gene modified for doping. It is beyond the scope of this paper to list them. However, these doping genes will change many phenotypes. Among them, muscle functionality (mass, strength, speed, endurance, recovery), locomotion, metabolism, resistance to pain and fatigue, behaviour and resistance to stress will certainly prove to be the favoured targets of manipulation.

5.9.1.6.2 The near future

The time for such practices to be marketed seems to be approaching. In Argentina, the company *Kheiron*, which has already produced a number of clones[212], recently announced its intention to obtain cloned and genetically modified horses (https://www.argentina.gob.ar/, http://www.kheiron-biotech.com/, www.perfil.com)[213] . It claims to have made progress in *"precision genetics."* A dystopian possibility to watch for in the near future.

The alteration of genes remains permanent and irreversible. Therefore, it may make it impossible to determine the timing of the genetic doping and, therefore, the identification of the person responsible to be prosecuted. Innovative measures for regulation

[211] 5.9.2.6 The ban on molecular genetic techniques, p. 173

[212] 6.6 Reproductive cloning, p. 247

[213] Websites Retrieved 07.06.2020 (unavailable on 01.04.2024)

and control must therefore be developed. A promising avenue is already open through the longitudinal monitoring of horses and the use of the equine biological passport. It is very restrictive, as it requires repeated analyses over several months (Bailly-Chouriberry et al., 2017; Cawley & Keledjian, 2017; LeTrot, 2019, 2020a, 2020b). Advances are also expected in several areas (markers, mRNA quantification, transcriptome examination, metabolomics). Doping will then enter a complexity that will go beyond the current binary approach: a horse, a moment, a substance, a negative or positive sample, and, if necessary, a sanction and a duration of exclusion. Instead of a positive test and a suspension, aberrant biological values will be detected and a rest period prescribed pending the return of normal measures compatible with the protection of dignity, welfare and sporting ethics.

5.9.2 Policy and regulatory context

The policy and regulatory aspects of equine sports use were discussed in Chapter 4[214]. As a reminder, Swiss legislation (CF, 2020) on animal protection (AniWA, AniWO) prohibits several practices in competition such as neurectomy, tongue-tying, poling during show jumping or neck hyperflexion[215] This section focuses on the issues of doping and medication.

5.9.2.1 Swiss legislation

Two provisions of the AniWO deal with doping and medication in sports events:

- Administering substances or products to animals that affect their performance or appearance, if these substances or products are detrimental to the health or welfare of the animal (Art. 16, Para. 2, Letter g AniWO)
- Participating in events and competitions with animals to which prohibited substances or products have been administered. The Equestrian Sport Federations or the FSVO (Switzerland) define what substances are prohibited (Art. 16, Para. 2, Letter h AniWO).

The OSAV has not issued a specific text on prohibited substances. For the time being, it leaves this to the sports organisations. The regulatory framework of the FEI and the SE[216] as well as the IFHA, UET and FSC for racing were presented in Chapter 4[216, 217]. This chapter therefore only deals with the specific points on doping and medication.

5.9.2.2 Anti-doping regulations in equestrian sports

On the international front, the FEI, IFHA, UET, AORC (Association of Official Racing Chemists), ARCI (Association of Racing Commissioners International) and IGSRV (International Group of Specialist Racing Veterinarians) are involved in the coordinated development of anti-doping regulations (http://www.aorc-online.org, https://www.arci.com/, https://www.igsrv.org/)[218]. The SE adopts the FEI principles[219]).

5.9.2.2.1 FEI regulations

The FEI (FEI, 2022d) has established an *Equine Anti-Doping and Controlled Medication Programme* (EADCMP). It is based on a list of prohibited substances EPSL (FEI *Equine Prohibited Substances List*) and a treatment log.

The EPSL list of prohibited substances

The EPSL contains the prohibited substances and any product with a similar chemical composition or biological effects. To qualify them, it applies three concepts:

- *Banned Substances*, as they influence performance and can and may cause harm
  Or
- *Controlled Medication*, as they are commonly used in the treatment of sick horses
  Furthermore, each (banned or controlled) may carry a particular label
- *Specified Substances*, as they are easily ingested for purposes other than performance enhancement, e.g. when they can been found in contaminated feed[220] (Table 4).

The mere presence of any of these substances in body fluids, even in trace amounts, is sufficient to consider it an offence and trigger proceedings. Banned substances carry the most severe sanctions. The FEI also publishes indicative *Detection Times* and sometimes *Threshold Substances* below which it does not prosecute (FEI, 2022f). This point will be discussed in more detail below, together with the issue of contamination[221].

The medication logbook

The FEI requires the rigorous maintenance of a *Medication Logbook* for all horses entered in international competition (FEI, 2022e). It supports the work of the FEI Tribunal to assess the difference between the fraudulent use of banned substances and the presence of products in a justified treatment. If a horse requires medication shortly before an event or during a competition an official form

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[214] 4.4 The use of equids in sport, p. 56
[215] 4.4.2 Policy and Regulatory Context, p. 71
[216] 4.4.2.2 National and international regulation of equestrian sports, p. 72
[217] 4.4.2.3 Racing regulations, p. 74
[218] Websites Retrieved 18.11.2020
[219] 5.9.2.2.2 SE regulations, p. 1685.9.2.2 Anti-doping regulations in equestrian sports
[220] 5.9.2.4.1 A significant proportion of feed contamination, p. 171
[221] 5.9.2.4 Detection thresholds, p. 171

must be submitted to the Veterinary Delegate of the event to request permission to use some of the permitted substances and treatments during the event, for example in an emergency situation. Banned substances remain totally forbidden. The event's Ground Jury approves the medication and departure of the horse on a case-by-case basis after consultation with the Veterinary Delegate. Treatment will only be carried out in designated treatment boxes. Articles 1060 to 1063 of the Veterinary Regulations (FEI, 2022e) provide guidelines for authorised and prohibited treatments, as well as for the use of form A (emergency cases, EPSL controlled substances) and B (parenteral treatment with substances not listed on the EPSL, such as liquids for rehydration or antibiotics).

5.9.2.2.2 SE regulations

The General Regulations (Art. 6.4 GR) of the SE (FSSE, 2021a) require that all horses taking part in an SE event must not be under the influence of prohibited substances as defined in the current FEI EPSL. It also characterises the offence (Art. 11.1 GR) as follows:

- Intentionally or negligently adminstering to a horse, attempting to administer, inducing someone else to administer, or assisting in the administration of any substance prohibited under the EPSL, that is present in an efficacious concentration at the time of the event
- As a competitor, riding or leading a horse at an event if the horse is under the influence of a substance on the FEI EPSL list, provided that the competitor cannot prove that he/she has taken all possible care to prevent doping
- As a competitor, refusing or failing a doping control.

In addition, the GR specify the sanctions that the legal bodies of the SE may apply if a horse is under the influence of a prohibited product (11.3 GR):

- Automatic disqualification of the horse from all events in the event concerned
- Not permitted to depart for any events in Switzerland and abroad.

The Veterinary Regulations (FSSE, 2021b) set out the technical guidelines for the organisation of medication controls (*MCP Medication Control Program*). They also introduce a system of declaration on the competition grounds for a horse that has been treated with medication (Art. 5.1.3 RVet). The medication must be listed on the FEI EPSL. If consulted, the competition veterinarian shall record his/her assessment on the form. This assessment relates to the clinical condition of the animal and its presumed fitness for sport, but not to the risk potential in the event of testing.

Violation of the rules: presence or influence of a prohibited substance?

There is a subtle - but important in terms of liability - difference in wording between the SE and FEI regulations. While the FEI considers that the discovery of a prohibited substance in urine or blood is sufficient to declare a positive case, the SE considers that the effect of such a substance on the horse during an event is decisive. Article 1.1 of the Veterinary Regulations, which lists the FEI Regulations as the basis for the document, seems to demonstrate the true intention of the SE to go beyond Swiss legal standards (FSSE, 2021b). In this regard, it should be noted that this provision does not comply with the legal provisions (Art. 16, Para. 2, Letter h AniWO), which prohibit participation in competitions and sports competitions with animals to which prohibited substances have been administered. The brochure "A heart for the horse" (FSSE, 2018d) addresses the ethical aspects and poses relevant questions:

- Is it acceptable from this point of view to use methods or to administer medication - prohibited in competition - for training, to improve performance or to use a horse that is weakened, for example by pain?
- Is it correct to participate in an intensive course or event with a horse without having carefully and systematically prepared it for the task through regular training at home?

The reader is expected to answer in the negative after questioning his or her own situation. Is my horse physically and psychologically fit to deliver the performance requested? Am I prepared to put the health of my horse before my own ambition or pleasure? The ethical principles of the SE provide a guide for the owners and riders to make these decisions (FSSE, 2018b, 2018d, 2021b).

The fundamental ethical principles

Annex I RVet (FSSE, 2021b) also includes the FEI welfare points (FEI, 2013; SE, 2018b, 2018d, 2021b). In short, equine welfare must prevail at all stages over all other requirements and will not be compromised in training. Participation in events shall be restricted to physically fit equine athletes. This means that any animal showing signs of illness will not be allowed to compete and will be given the time necessary to fully recover. In addition, those involved in equestrian sport are encouraged to develop their skills in the care and management of competitive equids.

As the SE does not publish the detailed results of the monitoring of the MCP and ethical principles, information as to the consequences of the reactionary subtlety of its philosophy and the effectiveness of its fight against doping will have to wait.

5.9.2.2.3 The sanction procedure of the person responsible (PR)

In equestrian sports, the person who rides, drives (driving) or vaults assumes responsibility for the horse (person responsible PR). He/she is responsible in the case of infringement (doping, medication) during the competition. The owner and the entourage of the equine athlete (employees, grooms, veterinarians, lungers) are additional PRs if they are present at the event or have made a relevant decision concerning the horse. The federation shall appoint an adult to represent a minor PR (under 18 years) during the competition. A parent, trainer, team manager, horse owner or third party may be involved. However, the minor remains the PR in the sense of the regulations; it is he or she who will be disqualified if necessary.

In a positive case, the FEI regulations provide for the disqualification of the horse and the PR, the return of medals and winnings and the condemnation of the PR (suspension, fine, procedural costs). The question of the Strict Liability of the PR in equestrian sports and racing is further discussed below[222].

5.9.2.3 Anti-doping regulations in racing

The FSC has issued anti-doping regulations in Swiss Thoroughbred and harness racing (FSC, 2021a, 2021b). It adopts the provisions of the agreements with the IFHA and the UET. Both organisations deal with these issues similarly (IFHA, 2021a; UET, 2021a).

5.9.2.3.1 General and ethical considerations

One chapter (Art. 6 IABRW and Chapter IV UET Agreement) deals with the biological integrity of the equine athlete. It begins with the obligations that guide the behaviour of the animal's entourage, including trainers and veterinarians. They apply to both anti-doping and prohibited practices (IFHA, 2021a; UET, 2021a):

- Horses may not take part in a race if a prohibited substance is present in their bodies. No horse may be subjected to prohibited practices
- On the day before the race, no substances other than water and normal feed may be administered to the horse, whether by injection, oral, inhalation, topical or any other method of administration, unless such treatment is authorised by the Equine Authority
- In the interest of the equine athlete (health and welfare), any treatment during competition or training must be based on a specific diagnosis and administered under the supervision of a veterinarian within the framework of a concrete and transparent relationship with the owner and trainer. The veterinarian will monitor the medication keeping a complete and accurate record of all treatments administered, including all veterinary procedures performed
- Before resuming normal exercise, a sick or injured horse shall be treated and rested or retired from training depending on its condition. After any intervention, sufficient time should be allowed to avoid the risk of giving the horse an advantage or disadvantage in relation to its own abilities or welfare
- Any heritable genomic alteration of a horse, at any time in its life, leads to its irrevocable disqualification from racing.

5.9.2.3.2 Current discussions

The regulations (doping and medication) have recently been the subject of intense discussions within the IFHA and ARCI. The IFHA President Louis Romanet has advocated drastic measures (Romanet, 2018). Indeed, horseracing authorities in the United States have proven to be deficient. The US Jockey Club, with the support of experts in anti-doping, scientific research and best practice, provided the judicial authorities with information on the existence of a vast global cheating ring. Various individuals (coaches, veterinarians, pharmacists, stablehands, owners) have been accused (Manhattan U.S. Attorney's Office, 2020; Redaction, 2022). Equine welfare societies have demanded regulatory reforms (Leite, 2021), including a ban on furosemide use, stacking (including the simultaneous application of NSAIDs and corticosteroids) and bisphosphonates in training (Thoroughbred Safety Coalition, 2020).

These efforts culminated in the federal Horseracing Integrity and Safety Act (HISA) passed by the House of Representatives and the Senate in December 2020. It will make racing safer and fairer for horses (HISA, 2022; House and Senate US, 2020; Jockey Club US, 2020). This will be achieved through a national programme (anti-doping and drug control), an independent authority (Horseracing Integrity and Safety Authority) and committees composed of experts and the U.S. Anti-Doping Agency (USADA). Uniform and effective standards will replace the different programmes between states (House and Senate US, 2020; Jockey Club US, 2020).

The latest IFHA provisions

The recent provisions can be found in Article 6 on the biological integrity of the horse in the International Agreement on Breeding, Racing and Wagering (IABRW). These include the paragraphs Prohibited Substances (6 A), Prohibition of Genetic Therapy, Gene Editing and Genome Editing (6 B), Prohibited Practices (6 C), Medication in Training (6 D) and Out-of-Competition Testing (6 E). Some of these are pending full ratification from a few members, including the USA (IFHA, 2021a).

5.9.2.3.3 Prohibited substances (IABRW and UET Agreement)

The IFHA, UET and FSC each established a list of prohibited substances (IFHA, 2021a; UET, 2021a; FSC, 2021a, 2021b, 2021c). Each has some editorial differences. They do not follow the substance structure of the FEI but rather classify them by categories of pharmacological effects. A short summary presents these lists with two categories.

[222] 5.9.2.7 The strict liability of the PR, p. 173

Prohibited substances of category I:

- Substances that may at any time act on or influence one or more of the mammalian body systems (nervous, cardiovascular, respiratory, digestive, urinary, reproductive, musculoskeletal, haemolymphatic and circulatory), the immune system (with the exception of vaccines approved for the control of infectious agents) and the endocrine system
- Endocrine secretions and their synthetic counterparts
- Masking agents
- Oxygen transporters
- Agents that directly or indirectly manipulate gene expression[223].

Prohibited substances of category II

In addition, the IFHA, UET and FSC provide a list of substances that may not be administered to a racehorse at any time in its career including outside of competition (*Out-of-Competition Testing*).

Several substances are included in this list[224]. It also includes any product with a similar chemical structure or similar properties:

- Any substance that has not been formally authorised as a veterinary medicinal product by a government authority or which has not been recognised by scientific authorities as a legitimate treatment
- All anabolic agents (androgenic steroids, SARMS (selective androgen receptor modulators), beta-2 agonists (except when prescribed as a bronchodilator at an appropriate dose)
- Peptide hormones, growth factors, hormones and related substances (erythropoiesis stimulants, EPO, proteins and synthetic peptides) not registered for medical or veterinary use
- Hormones and metabolic modulators (SERMS (selective estrogen receptor modulators), myostatin function modifiers, insulins, PPARδ agonists (e.g. GW 1516), AMPK activators (e.g. AICAR)).

The therapeutic use of these substances may nevertheless be authorised by the racing authority under certain conditions.

5.9.2.3.4 Extensive control procedures

There are differences in the legal requirements and testing protocols or medication control programmes (MCP) for the different racing organisations (Thoroughbred and harness racing) and national authorities, but the objective remains the same (IFHA, 2021a; UET, 2021a; FSC, 2021a, 2021b, 2021c). Sampling aims to protect the welfare of the horse and to control the use of products that may give a horse an advantage or disadvantage in a race, relative to its own abilities. The discovery of a prohibited substance means that the laboratory has detected the substance itself, a metabolite or isomer of the substance, an isomer of a metabolite or a prodrug[225] of the substance. The discovery of any scientific indicator of administration of or exposure to a Prohibited Substance is also equivalent to the discovery of such a substance.

For the veterinary treatment of horses in training, the IFHA, UET and FSC have introduced a code for trainers and veterinarians. The term treatment includes the administration of any substance to a horse and the administration or application to a horse of any procedure or physical therapy intended to produce an effect.

The traceability of equine athletes

The procedure for collecting samples to test for an infringement goes considerably beyond the collection of urine and blood after an event. Firstly, samples can be taken from any horse declared to be starting whether or not it races. Furthermore, each equine authority can set its own rules to ensure the traceability of the equine athlete. All changes to the location of a horse in training and to the trainer must be announced immediately. In principle, the aim is to be able to check on a horse at any time, starting from birth (IFHA, FSC) or from the beginning of training (UET). Finally, samples can be taken from any part of the body or in contact with any part of a living, injured or dead horse. This means that hair, mane, skin surface and mucous membrane swabs, sweat, saliva, blood, urine and various secretions can be analysed.

5.9.2.3.4.1 The person responsible in racing

In the event of an anti-doping rule violation in racing, the trainer shall be liable as the person responsible. The jockey or driver will only be liable for his own behaviour (improper use of the whip, irregularities during the race).

The trainer assumes responsibility for the feeding, management, protection and safety of horses in his care. In doing so, he/she shall take all reasonable precautions to avoid exposure to prohibited substances. Trainers are responsible for informing themselves of the possible consequences of veterinary treatment administered to their horses. They are required to keep proper records of all veterinary procedures and drug treatments. Furthermore, it is the responsibility of the trainer to ensure that no prohibited substances are present in the tissues, body fluids, excretions or any part of the body of the horse before training or racing it. To this end, he or she may, with the assistance of the FSC, request to carry out such biological tests and analyses as considered necessary. These screening tests enable the trainer to ensure that veterinary prescribed medication administered in the context of a treatment are completely eliminated or to check that a horse at its stable has not been administered prohibited substances (FSC, 2012).

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[223] 5.9.2.6 The ban on molecular genetic techniques, p. 173

[224] See FSC (2021a, 2021b), IFHA (2021a) and UET (2021a) for details and conditions

[225] A prodrug is pharmacologically inactive until it undergoes in vivo biotransformation – it then becomes an active drug and exerts a therapeutic effect

5.9.2.3.4.2 Sanction procedures

Even if it leaves some room for each country to manoeuvre, the proposed sanction procedure remains very restrictive. A horse will be disqualified whenever a sample analysis on race day shows the presence of a prohibited substance.

When a sample collected at a different time is positive for a prohibited substance (out-of-competition test), the equine authorities may, under their own rules, sanction the equine athlete, trainer, owner or other persons. In the event that there is evidence of the presence of a substance outside of competition, the horse will be ineligible to race (minimum six months according to the IFHA and UET) and may only be entered in a race following a negative doping test.

5.9.2.4 Detection thresholds

For many years, there has been talk in Europe of zero tolerance in the fight against doping and medication in equestrian sports and racing. The communication on this subject clarified the position of the sporting authorities to not tolerate the presence of substances in horses that could mask disease or influence performance in any way. It also served to differentiate the European position from that of the American continent, which, in addition to prohibited substances has long legitimised the use of a number of drugs before and during competitions.

This strict policy remains valid, but scientific advances have enriched it. Researchers have made sporting authorities and laboratories aware that stallions and mares secrete hormones specific to their sex. They are found in their natural form or as metabolites in body fluids at different levels than in geldings. These endogenous substances (boldenone, estranediol, testosterone) are now recognised.

The FEI's consulted decisions show that those responsible sometimes cite feed as the source of positive results (FEI 2020b, 2020c). They would have real difficulties in preventing horses from ingesting suspect feed. They also assume that competition and race organisers do not always prepare the stables provided (thorough cleaning, bedding) to ensure that they are free of residue from previous occupancy. The high proportion of opioids and alkaloids in the samples (Table 4 and Table 5) has raised questions.

5.9.2.4.1 A significant proportion of feed contamination

Taking into account contamination and sex-specific hormone levels

Traditionally harvested or grazed fodder can lead to the minute presence of prohibited substances in anti-doping samples. Raw materials containing certain plants (colchicum, poppyseed, coquelicot) may contain opiates or natural alkaloids. Secondly, a product for equids can be contaminated by feed made for other species during storage or transport. The industry struggles to ensure compliance, as the quality of the raw materials used in the manufacturing process can be poor. On the other hand, conventional quality control measures do not include sufficiently sensitive analyses. It is also suspected that the consumption of mouldy feed may explain the excretion of anabolic steroids by horses (Decloedt et al., 2016).

Various circumstances can lead to contamination of the equine athlete and its feed. Inadequately cleaned temporary housing has already been mentioned. Soiled bedding from a previous occupant, contaminated tools or buckets, or leftover food and medication in a feed trough. Finally, people or other animals undergoing treatment may be the source of contamination.

These problems have been described for a number of years (Barker, 2008; BETA, 2020; CNEF, 2015; Decloedt et al, 2016; Delaunay, 2011; FEI, 2019; Herholz et al, 2017; Hertzsch et al, 2015; Machnik et al, 2003, 2008; Machnik, 2009). Thus, international federations, advised by the AORC and the IGSRV, have adapted their regulations (FEI, 2022f; IFHA, 2021d, 2021e, 2021f; UET, 2021a; FSC, 2021c). They publish detection limits (*ISL International Screening Limits, Threshold Substances*) for endogenous substances (see above), those naturally contained in contaminated feed (atropine, caffeine, theobromine, theophylline) and in plants commonly grazed or harvested as fodder for equids.

Below the regulatory threshold, the case is not subject to investigation. However, if the limit is found to be exceeded in either urine or plasma, the qualitative analysis - without further quantification - is sufficient to confirm the presence of the prohibited substance and to open an investigation. The authorities do not consider these substances to be any less dangerous than other prohibited products, which is why they still disqualify the horse. On the other hand, their classification as *Specified Substances* allows the FEI Tribunal to impose less severe sanctions in such cases than those provided for in the EADCMP regulations.

5.9.2.5 The regulation of prohibited practices in equestrian sports and racing

To combat prohibited practices, the FEI has chosen the option of banning certain practices in an explicit and precise manner. Thus, in article 1004 *Prohibited Methods* of its Veterinary Regulations (FEI, 2022e), it prohibits participation of a horse whose sensitivity of a body part has been modified by hypo- or hyper-sensitisation, that has a tracheotomy, to which genetic modification techniques have been applied for non-therapeutic purposes or to influence its performance (genetic doping), that is genetically modified, has been given blood therapies, wears contact lenses, whose skin has been pierced (except for sutures), where the coat on the limbs has been clipped to less than 2mm without permission or whose vibrissae have been cut without medical indication.

The IFHA and UET authorities adopt a different philosophy. Their respective international agreements focus primarily on the intentions and effects of practices. Therefore, they impose obligations that cover their entire fight against doping and harmful practices[226].

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[226] 5.9.2.3.1 General and ethical considerations, p. 169

They prohibit the unauthorised use of any object, device, behavioural intervention or chemical substance at all times (competition and training) that is intended to achieve an inappropriate reaction. Specifically, procedures that are not intended to provide medical benefits or improve the welfare of the horse, as well as those that are detrimental to its welfare, or that mask disease, are prohibited. The IFHA and UET cite in more detail, by way of examples, some specific prohibited practices (IFHA, 2021a; UET, 2021a).

Even though how these issues affecting equine welfare in equestrian sport and racing are approached differ, the objectives remain similar. A compilation of the provisions and their explicit wording summarises the situation (Table 6). Some support and physiotherapy practices are permitted under the control of official veterinarians or prohibited by the FEI outside the stables, for example kinesiotaping (Art. 1067 Vet Reg). The application varies between countries.

Practices specifically prohibited [X], regulated directly or indirectly [R] or not regulated [NR] by the FEI, IFHA, UET, SE and FSC	**FEI**	**SE**	**Trot UET**	**TB IFHA**	**FSC**
Chemical castration or immunocastration (GnRH vaccine)	NR	NR	X	X	X
Surgery of the nostrils without therapeutic justification	NR	NR	X	NR	X
Cloning; registration of cloned horses	R	R	X	X	X
Visual control (monitoring) of all horses at the start of the event	R	NR	R	R	R
Visual and systematic control of each horse before, during and after the event	R	NR	R	R	R
Whip; misuse	X	X	X	X	X
Whip; limited number of strokes, regulated use, prohibited	NR	NR	R	R	R
Doping: prohibited substances present out of competition	NR	NR	X	X	X
Doping: prohibited substances present during competition	X	NR	X	X	X
Doping: horses under the influence of prohibited substances	X	X	X	X	X
Genetics, doping: the use, administration or application to any horse of any method or process that involves genetic or genomic modification	X	X	X	X	X
Genetic therapy: the use, administration or application to any horse of any <u>treatment</u> that involves genetic or genomic modification (for exceptions see 5.9.2.6)	NR	NR	X	X	X
Hyposensitisation, desensitisation	X	X	X	X	X
Hypersensitisation (application of a blistering agent that induces swelling or ulceration of the skin and/or underlying tissues)	X	X	X	X	X
Pregnant mare: prohibited to compete (days post insemination or mating)	>120 d	>210 d	>120 d	R	>120 d(TB) >60 d (T)
Mare after the birth of a live foal: prohibited to compete (days post-partum)	X	<90 d	<150 d	R	<180 (TB) <150 d (T)
Mare after an abortion/miscarriage: prohibited to compete (days post abortion or miscarriage)	NR	NR	<90 d	R	< 90 d (TB) <120 d (T)
Shock wave therapy to desensitise the limbs	X	NR	X	X	X
Deprivation of water before the race to the detriment of the health, welfare or safety of the horse	NR	NR	X	X	R
Subjecting a horse to medical or surgical procedures other than those intended for veterinary treatment or the improvement of its welfare	NR	NR	X	X	R
Thermocautery on the skin over musculoskeletal structures to produce an anti-irritant effect	X	R	X	X	R
All forms of handling of blood and blood components (except veterinary treatment)	X	R	X	X	X

Table 6 Summary of practices prohibited by specific provisions of the FEI and SE Regulations, the IABRW, the UET International Agreement and the FSC (FEI, 2022e ; SE, 2021b ; IFHA, 2021a ; UET, 2021a ; FSC, 2021b ; GALOP SCHWEIZ, 2021 ; SUISSE TROT, 2022) in addition to the general prohibition of mistreatment and legal prohibitions. TB = Thoroughbred, T = Trotters

The IFHA and UET regulate hoof care and shoeing of racehorses (IFHA, 2021a; UET, 2022). They encourage national racing organisations to publish clear illustrations to support their rules, so that practitioners understand the terms used and the characteristics of permitted and prohibited shoes. National racing authorities may prevent the use of fittings that could be dangerous or cause injury. Before a trotter is declared to be starting in a race, his trainer must announce whether the horse is shod or which hooves are unshod. For harness races, the UET publishes the requirements for horse shoeing and other equipment for each country (UET, 2022).

5.9.2.6 The ban on molecular genetic techniques

The FEI, UET and IFHA clearly prohibit the genetic doping of horses. In short, the non-therapeutic use of cells, genes and genetic elements or the modulation of gene expression with the ability to enhance performance is prohibited[227]. With regard to gene therapy, the position of these three organisations is more nuanced.

[227] 5.9.1.6 The doping of tomorrow and its risks, p. 166

Position of the FEI
Article 1004 Letters c and d of the FEI Veterinary Regulations (FEI, 2022e) prohibits genetic doping and the use of any form of genetic modification. The FEI does not take a position on gene therapy.

Position of the IFHA and UET
The IFHA and UET (IFHA, 2021a; UET, 2021a) prohibit the use or administration of gene therapy (nucleic acid or analogue, genetically modified cells, genome editing agents). More precisely, they consider the administration or application of treatments, methods or procedures that involve gene or genome editing as a prohibited practice. Any change in the heritable genome of a Trotter, at any time in its life, will result in its permanent disqualification. It may no longer participate in any race or other competition.

The IFHA and the UET do not completely rule out the possibility for veterinarians to use gene therapy in treating a disease. It may be used or administered to a specific horse with mandatory prior approval of a racing authority provided that it is used to treat an injury or disorder officially diagnosed by a veterinarian and that it:

a. is not capable of modifying the hereditary genome of the horse
b. does not pose a threat to the welfare of the horse
c. does not pose a threat to the integrity of racing or have the potential to enhance or detract from a horse's performance in a race.

In addition, the owner or trainer is responsible for informing and obtaining prior approval from the relevant racing authority for any proposed genetic therapy whether administered before, during or after training. The owner or trainer shall also keep full and accurate records of all such treatments, retain them for a minimum of five years and make them readily available for inspection by the regulatory bodies upon request.

5.9.2.7 The strict liability of the PR

5.9.2.7.1 A difficult concept to understand
In the law, there are several elements of liability. In the system of civil liability, an offence that causes damage or harm remains the easiest to understand. It can be characterised by a behaviour, an action or an omission qualified as reprehensible or illicit and presupposes discernment. The person who causes the damage is obliged to compensate for it (Art. 41 of the Swiss Code of Obligations), but it is up to the plaintiff to prove its existence. However, this provision does not apply to cases of violation of the anti-doping rules[228].

Strict liability is the foundation of anti-doping regulations
The so-called *Strict Liability* standard has been included in the World Anti-Doping Agency Code since 2004 (WADA-AMA, 2020a, 2021) and is the standard to which the FEI refers (Montavon, 2020a, 2020b). It provides a framework for the policies and regulations of sports organisations, as well as public authorities when the battle falls within their competence. The International Olympic Committee and, following it, the FEI with the EADCMP (FEI, 2022d), as well as the IFHA and UET (IFHA, 2021a; UET, 2021a) apply this principle. It is characterised by the abstraction of all culpability criteria.

It does not presume a person is at fault, but requires due diligence
This concept is used in Anglo-American legal systems in particular. Without it, the imposition of certain parts of the social order would be impractical (Merritt, 2017). It can be compared to the concept of causal responsibility. In Switzerland (aggravated causal liability), Germany and France, it does not presuppose any fault, but arises from a lack of due diligence (e.g., supervision), construction defects or lack of maintenance. This concept is based on the fact that a risk or danger may exist fortuitously because of the inherent nature of a thing (vehicle, building, keeping of animals) or its use. It is sometimes accompanied by the obligation or choice to insure against these risks. The terms innocence, presumption of innocence, appropriation of personality or violation of fundamental rights, which are used in particular in criminal matters, are therefore totally inappropriate for describing issues of strict liability.

In contrast to criminal proceedings, anti-doping regulations worldwide give the accused party the possibility to clear his/her name. Disqualification of the horse and withdrawal of the prize are inevitable. However, the sanctioning process for PR does not apply strict liability as an unqualified standard. Equine sports tribunals have a margin of discretion, especially when considering accidental feed contamination. However, the PR cannot easily avoid a conviction (fine, suspension), or hope for easing of consequences. Accused of breaking the rules, the PR must first explain how a specific drug entered the horse's system. They must then demonstrate very convincingly that the necessary steps were taken to prevent contamination and that they have not committed any significant fault. The PR may, for example, provide a guarantee from the feed manufacturer that analyses have ruled out contamination with prohibited substances. However, it is not admissable to simply state that all food in Colombia is contaminated with coffee (Tribunal FEI, 2019). This possibility therefore requires a high level of responsibility on the part of the PR. The PR may also commission testing[229].

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[228] 5.9.2.2.3 The sanction procedure of the person responsible (PR), p. 169
[229] 5.9.2.3.4.1 The person responsible in racing, p. 171

In equestrian sports and racing, the principle of strict liability applies on the basis of explicit anti-doping regulations. To this end, the wording must make it clear that the PR is liable if a sample analysis is positive for a prohibited substance. In this case, the sports authorities do not need to show intent, error or negligence. In other words, a doping case is established as soon as a prohibited substance is discovered, regardless of its actual effect on performance or any fault (Donnellan, 2019; Tribunal fédéral, 2007). The Court of Arbitration for Sport (CAS) systematically applies this principle (TAS-CAS, 2020). The Federal Court of Switzerland has also confirmed its validity[230].

The question of influence on performance

The SE declares that it bases its regulations on those of the FEI (Art. 1.1 RVet). However, as noted above[231], the SE's anti-doping regulations differ significantly from those of the FEI. Indeed, the SE considers that the regulations are only violated if the horse is under the influence of a prohibited substance during an event. It is difficult to know at this stage what the real intention of the SE is. Is the intent to punish the presence of a prohibited substance, which would seem logical since the SE adopts the FEI Regulations in principle, or does it only want to punish when the prohibited substance has an effect?

This difference creates legal uncertainty in the event of an appeal. The simple declaration of the SE that its regulations are based on those of the FEI Regulations may not be sufficient to accept that any FEI clause that contradicts the regulations of a national federation will prevail. Indeed, it is primarily the responsibility of the federation in question to ensure that it unquestionably incorporates the relevant FEI provisions. If this is not the case, the persons bound by the SE regulations can only be expected to understand what is written in the SE Regulations. In other words, for the SE, the presence of a prohibited product in an equine athlete does not lead to a penalty if said substance has not had an effect on the horse.

The CAS has already ruled on this aspect in 1995. It stated that "the performance of the horse must not be taken into account, as this would create great legal uncertainty and open the door to arbitrariness. Indeed, it must be assumed that a performance, achieved under the influence of a prohibited substance, has been artificially improved, even if this has not been scientifically proven. It is a matter of fairness to other competitors even if the athlete in question did not act intentionally or even negligently. Such a consequence may seem harsh for a non-culpable athlete and it is true that if it is established that the athlete did not commit any fault, it is even an unfair decision. But not to do so would create an even greater injustice. Indeed, one must balance the interest of the doped athlete through no fault of his own against that of all the other competitors who competed without the offending product in their bodies" (TAS-CAS, 1998, 2020).

The guarantee of the feed and fodder supplier

The horse feed industry has much to lose in the event of a positive test following contamination. It is in their best interests to thoroughly check raw material supplies and manufacturing processes. In France, for example, the *Laboratoire des courses hippiques* (LCH – Racecourse laboratory), in addition to doping analysis, detects contaminants in feed and supplements for competition horses (LCH, 2021). The French Equine Nutrition Club CNEF entrusts it with analyses as part of its Equine Nutrition Quality Charter (CNEF, 2015).

Today, PRs should demand a guarantee from the feed industry in advance. It should be noted, however, that this precaution does not seek to prevent the potential - toxic - dangers of contaminated products, but precisely to prevent a PR from being accused of negligence. This principle remains proportionate, as the strain for the PR is to forego the services of certain feed suppliers and accept a higher purchase price in order to take additional precautionary measures. On the other hand, in the event of a positive test result, it is disproportionate to require the PR to incur significant expenses for expert opinions and laboratory analyses to prove the contamination a posteriori.

Two Swiss athletes were able to avoid sanctions. They were able to prove after the fact and at their own expense that poppy seeds had contaminated the feed purchased and ingested by the horses. This undoubtedly explained the presence of codeine, morphine and oripavine in the samples (Tribunal FEI, 2015a, 2015b). These two cases had the merit (FEI, 2015b) to accelerate the introduction of the notion of *Specified Substances*[232] by the FEI for cases of contamination and endogenous substances. The WADA World Anti-Doping Code (WADA-AMA, 2020b) already uses this qualification. Very recently (FEI, 2021), the FEI has established an *Atypical Finding Policy*. It describes the procedure for determining whether a positive test result appears atypical or constitutes an anti-doping rule violation (*Adverse Analytical Finding*). The IFHA and the UET deal with these situations in a similar manner (IFHA, 2021a; UET, 2021a).

The role of the organisers

Among the precautionary measures, organisers should provide absolutely clean accommodation and contamination-free fodder. They should also draw up strict rules for stable management, staff behaviour and the keeping of treatment diaries in collaboration with veterinarians[233].

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230 5.9.2.7.2 Jurisprudence, p. 175
231 5.9.2.2.2 SE regulations, p. 168
232 5.9.2.2.1 FEI regulations, p. 167
233 5.9.4.2 Management of horses and stables, p. 180

In conclusion

There are still problems to be solved. The sports authorities sometimes hesitate to act because they are under periodic pressure from third parties who suffer, for various reasons, from the application of anti-doping regulations. However, two overriding principles remain the backbone of the fight:

- Protecting the integrity of equine athletes (respecting their dignity and improving their welfare)
- The regularity of competitions (fairness and equality of opportunity).

The priority of these two axes ensures the stability of this philosophy. It is reinforced today by the current and assiduous sensitivity of society, as well as by the legitimate desire of sporting authorities to preserve the durability of the sector. Thus, the BHA (*British Horseracing Authority*) has strengthened the principle of strict liability in its regulations to avoid the appeal commission weakening the obligation to impose sanctions in the event of an anti-doping rule violation. In doing so, it confirmed that the trainer remains the person responsible for any prohibited product found in a horse under his care, regardless of intent or motive. The burden of proof is on the trainer to establish that a prohibited substance was not deliberately administered and that he or she took all reasonable precautions to prevent inadvertent administration. If the burden of proof were placed on the sports federation, it would make the proper implementation of a robust anti-doping regime impossible (BHA, 2017).

5.9.2.7.2 Jurisprudence

The strict liability standard applied in equine doping cases is frequently discussed by veterinarians, riders, trainers and their lawyers. The case library is available online (FEI, 2020c; TAS-CAS, 2020) and allows the analysis of appeals in doping or medication cases handled by the FEI Tribunal as well as arbitration requests filed with the Court of Arbitration for Sport (CAS). It can be seen that these two courts have always respected this standard and have never considered an alternative. The protection of equine welfare and equality between competitors remain priorities in the application of the strict liability standard. In several cases, their decisions have removed ambiguities and inconsistencies that undermine the effectiveness of the EADCMP (FEI, 2022d).

Federal Supreme Court ruling sets precedent

One case in racing particularly attracted the attention of the equine industry (Tribunal fédéral, 2007). In 2002, the analysis of samples taken from a Thoroughbred revealed the presence of a metabolite of a prohibited substance used to treat colic six days before the race. In accordance with its regulations, the FSC Committee disqualified the winning horse, established a new classification and fined the professional trainer. It also deprived the horse's owner of the race winnings, which amounted to several tens of thousands of Swiss Francs. After an appeal was lodged, the FSC Sports Jury (the highest authority) upheld the decision. Following a civil suit, the courts annulled the FSC's decision. Subsequently, the higher court (Cantonal Tribunal of Canton Vaud) accepted the appeal lodged by the FSC and rejected the suit of the owner and trainer. The latter lodged an appeal with the Swiss Federal Supreme Court, which definitively rejected the appeal.

The grounds for the verdict given by the Swiss Federal Supreme Court are of interest to the authorities involved in the fight against doping and medication in several ways. The owner and the trainer raised several arguments:

- The sanctions imposed on them would unlawfully infringe their personality
- The automatic disqualification of the horse, together with the mandated return of the prize money, was based on the fact that a prohibited substance was detected in the horse's urine, even though the concentration found could not have had any influence on performance in this case
- The regulations defining prohibited substances are no longer in line with the evolution of detection and analysis technology. Substances can be detected in ever lower concentrations that may have no effect on performance
- Consequently, the appellants had no means of determining when a horse treated for therapeutic purposes could compete again without risk of disqualification.

The Supreme Court did not accept these arguments and, after weighing the interests, formulated several grounds to explain its verdict:

- The regulation is justified by overriding public interest. The fight against doping aims to safeguard the equality of competitors and the fairness of competitions, to protect the health of animals, to maintain the quality of breeding, to combat the use of dangerous substances, to preserve clean sport and to ensure its formative function for young people. Moreover, these objectives are unanimously recognised by sports organisations and state institutions
- The effectiveness of the anti-doping campaign depends on the associations having an indisputable basis. The examination of the possible effects of the detected substance on performance in each individual case would open the door to endless assessments and discussions and create disparities in treatment according to the particularities of the recovery phases and individual tolerances
- In addition, it is important to avoid lengthy debates on the effect that the substance may or may not have had on the performance of a particular athlete. Such an effect remains impossible to quantify.

This concern for effectiveness outweighs the interest of imposing a sanction that takes into account the influence of the prohibited substance on performance. Furthermore, it is up to the equestrian federations (and not the courts) - within the framework of their autonomy under the Swiss Civil Code (Art. 63, Para. 1 SCC) - to determine on the basis of consultations with stakeholders and serious scientific studies, for which substances thresholds should be introduced.

In conclusion, there can be no questioning of regulations that, in compliance with an international commitment, limit allowable thresholds to certain substances with which the animal may naturally come into contact (endogenous, fodder, contamination) in order to protect the individual. This is why prohibited substances with a therapeutic effect, which could be used before a race to treat a sick horse, do not fall into the category of products for which a detection threshold must be set.

5.9.2.7.3 The role of the veterinarian

The decision of the Federal Supreme Court (Tribunal fédéral, 2007) also shows that the veterinarian cannot blindly rely on the published detection times of therapeutic substances. The 72-hour elimination time of the drug in question (dipyrone) was only estimated on 10 healthy horses not in training (FEI, 2022f; IFHA, 2021f). The application of a dose of 30 mg/kg bodyweight (used to estimate detection times) is below the maximum dose (20-50 mg/kg bodyweight) recommended for horses (Clini-Pharm/CliniTox, 2019). Finally, the total dose administered to the horse concerned is unknown. Furthermore, a withdrawal time of five days is indicated for meat.

The IFHA (IFHA, 2021f) highlights some important points for treating veterinarians and trainers who need to estimate the appropriate length of time between illness and resumption of physical exertion. It should be remembered that this essential time period allows a horse to be fit for training and then for participation in an event[234]:

- The attending veterinarian will use his or her best judgement, taking into account all relevant circumstances and the latest scientific knowledge.
- The use of medication to treat unhealthy animals may result in longer detection times due to a number of factors (variable urine pH, altered metabolism and excretion processes).
- Training programmes, different diets and stable management may cause fluctuations in drug elimination.
- Repeated application of a medication leads to its accumulation in the body.

5.9.3 Stakeholder interests and areas of conflict

As the current context illustrates[235], the competition sector is very heterogeneous (FEI disciplines, racing disciplines, polo, Western riding). Thus, several circles defend contrasting and more or less extensive interests. In particular, there are organisers, judges, the public, animal rights associations, the authorities that apply the legislation, competitors and veterinarians. The federations control doping and medication in various ways. The majority of federations consider that infringements are primarily a threat to the health and welfare of horses, and that, in addition, they violate sporting ethics and fair play, distort the results of competitions, zootechnical selection and harm spectators and bettors. Furthermore, a number of highly relevant factors (economic, social, media and sometimes familial pressure), as well as longer show seasons and the increase in the number of competitions, put athletes and their entourage (trainer, family, owners, sponsors) under pressure and may encourage them to trivialise prohibited practices.

That principle that competition is legitimate as long as it respects the dignity of the horse and does not negatively affect equine welfare[236] will not be revisited in this section. In this context, the public accepts the ethical and humane use of horses in equestrian sports and racing. More specifically, the public accepts, for the purpose of its own entertainment, the possession, boarding, enjoyment, handling and usage of horses. On the other hand, many are quick to characterise doping practices and certain incidents at shows as animal exploitation, thus implying that equids are overused and instrumentalised. This can result in the expectation that the organisers put an end to the harm and suffering that the competition can cause.

Doping cases tarnish the image of equestrian sports and racing

The public and a large part of the sporting community have a very negative perception of doping. For them, achieving results without cheating is a core value. In addition, doping cases carry a high risk of damaging the image of equestrian sport and racing. Therefore, in various countries in Europe and the United States, competition organisers are concerned about animal welfare issues, maintaining the integrity of events and sustainability. The decline in general attendance and in betting on horse racing is explicitly linked to public concerns about these issues. The stakeholders are therefore under pressure. Even members of the industry are calling for change (Bergmann, 2015). Everyone may express different opinions about the health, fitness and resilience of equine athletes, including ethical issues in critical cases. A major conflict is regularly present between the interest of the horses to receive treatment in case of illness and to have adequate recovery time and those of the competitor, team, federation, sponsor and/or organiser to return to competition as soon as possible. These parties tend to trivialise the clinical signs as mere indispositions and, even when in doubt, always plead to allow the horses to compete (Meyer, 2000).

Regarding equestrian sport in general, stakeholder interests and areas of tension have already been presented[237]. This shows the need to examine competition situations on a case-by-case basis and to weigh the interests to avoid unjustified harm to the welfare and dignity of equine athletes.

[234] 5.9.1.3 The interval between illness and resumption of work, p. 161

[235] 5.9.1 Description of the current situation, trends, strains and risks, p. 160

[236] 4.4 The use of equids in sport, p. 56

[237] 4.4.3 Stakeholder interests and areas of conflict, p. 76

5.9.3.1 The interests of competition horses

The primary interest of the competition horse is to remain healthy in the long term and not to be in a degraded state of welfare in any way. This issue should be considered from a broad perspective. In other words, all aspects of an equid's life need to be taken into account from its breeding, acquisition, initial and higher training[238], engagement and performance at competitions, the length of the career, retirement and end of life[239]. The ethical codes and regulations governing equestrian sports and racing need to protect the dignity and welfare of equine athletes (FEI, 2013, 2022d, 2022e; FSSE, 2018b, 2021; IFHA, 2021a; UET, 2021a). In practice, horses benefit from close and continuous collaboration between veterinarians, owners and trainers. To this end, these specialists must take new scientific knowledge into account. The most important of these relate to exercise physiology and the various fundamental components of welfare such as health and fitness (fit to compete), boarding, exercise and transportation. Particular attention needs to be paid to early warning signs of pathologies. In addition, the horse's interests also include periods of rest and recovery. Equids should not be forced to exert themselves unjustifiably without proper preparation after a break, injury or illness.

During training, the administration of substances that influence locomotion or behaviour, as well as the use of prohibited non-therapeutic substances can also have a negative impact on health and welfare. Before implementing a therapeutic measure, veterinarians need to conduct a thorough examination to ensure that the therapeutic measure will not aggravate the clinical condition of the equine athlete by masking clinical signs.

In the field of veterinary care, risky practices are not always obvious when they are presented as acceptable and interesting treatments for the welfare of the horse. Abuses often observed consist in giving medication to a competition horse without allowing the horse the necessary time for convalescence, rest and recovery. In reality, the immediate aim is to keep the horse in training and competing, or even winning at all costs, for the sole purpose of gaining an unfair competitive advantage (Mitchell, 2011; White & Palmer, 2014).

In the interest of the horse, the inappropriate use of non-steroidal anti-inflammatory drugs, which are readily available, should also be avoided. The risk of injury or the development of complications increases in the absence of veterinary diagnosis or supervision. Analgesics prevent an assessment of the severity of an organic lesion and the potential for long-term damage.

The equine athlete should not be treated as a temporary sporting accessory that can be replaced in case of injury. Its ability to maintain its physical condition over several seasons is a part of the self-worth (animal dignity) to be respected. The risk is particularly high when the horse's entourage (owners, trainers, veterinarians) put the animal under pressure to obtain quick results (gains, success) and trivialise the risks of prohibited practices, particularly during training (doping, medication with prohibited substances).

Horses must not only be protected from such abuse during training but also on the day of the competition. To this end, sporting organisations need to regulate the assignment of the judges and veterinary services (emergencies, health inspections, medication and doping controls), accommodation, and equal opportunities during events.

5.9.3.2 Interests of sports federations in the fight against doping and for equal opportunity

It was discussed above[240] that sports organisations have a major interest to protect horses against disregard for their dignity and welfare. These guiding principles serve as the basis for handling cases of anti-doping rule violations. Although members of a federation may sometimes find the application of strict liability unfair, it ensures equine welfare to a large extent without jeopardising the regularity of competitions. These two aspects are not in opposition. Competitors have a strong interest in being able to understand what this concept entails.

Strict liability helps to protect equine welfare

Strict liability does not violate the fundamental rights of athletes, is justified by the public interest and is an appropriate standard to ensure the protection of equine welfare. This is clear from the CAS case law in equine doping cases and the Federal Supreme Court (Donnellan, 2019; TAS-CAS, 1995, 2020; Tribunal fédéral, 2007). On the other hand, the integrity of sport horses is a major factor in the regularity of events[241, 242].

This principle thus serves as an indispensable tool to ensure both the protection of horses as well as equal opportunity. These arguments for strict liability remain difficult to counter.

Equal opportunity is not an absolute standard to be met in cases of prejudice

There can be factors at competitions that can be seen as unfair. For example, variable experience of judges, the influence of spectators, weather conditions and unforeseen incidents that can affect the horses. They may be disadvantaged by shoeing or

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[238] 6.7 Training and selection of young horses, p. 255

[239] 5.11 The end of life of horses: euthanasia or retirement?, p. 210

[240] 4.4.3 Stakeholder interests and areas of conflict, p. 76

[241] 5.9.1.1 Introduction, p. 160

[242] 5.9.1.2 Current views on the integrity of competition horses, p. 161

equipment problems during or shortly before the event. Despite this, the sporting rules remain unchanged and organisers do not postpone the start to correct the effect of such incidents.

In fact, the concept of equal opportunity has never been understood as total reparation for an accidental injury suffered in competition. Indeed, it remains out of the question to intentionally create another injustice that would then affect all competitors. This would be the case if prohibited substances were to be tolerated on the grounds that they had simply been administered or ingested by carelessness or error (which is what many would like).

If this were to become a reality, voluntary administration of a prohibited substance would probably also escape any sanction, as the federations would be unable to prove intention. As a consequence, the fight against doping and the control of medication would be in very serious danger. It would paralyse or render such an initiative inoperative. Furthermore, the equestrian authorities would have to devote considerable financial resources, disproportionate for small regional and national federations, to prove the guilt of the person responsible. Attempts to discredit the application of the doctrine of strict liability thus undoubtedly run counter to the overriding objective of combating doping and protecting animal welfare.

5.9.3.3 The interests of owners, PRs and veterinarians

The debate remains open as to how long a PR (0 p. 166) can be suspended, particularly where there is evidence to suggest that the entourage is involved. The latest changes to the FEI EADCMR rules improve the situation for PRs, although the risk of what might be called a miscarriage of justice has not been eliminated. However, this report does not intend to open the debate on charges and evidence, this would require intellectual and legal gymnastics (Merritt, 2017) that are beyond the spectrum of this document.

Mitigation of the penalty remains the only possible course of action today, given the principle of strict liability. A sports tribunal can use its discretionary power when the PR puts forward credible arguments. Therefore, it is in the interest of the PRs to remain clearly educated about the policy, philosophy and objectives of anti-doping regulations, as well as the procedures in place. To this end, the application of rigorous rules will avoid the impression that only a small group of insiders understand them or that they are the result of obscure bargaining. The regulations must therefore remain intelligible, consistent and transparent.

Owners, competitors and veterinarians justify the use of medication by the need to treat sick horses. Sporting activities present risks to the health and welfare of the equine population, in particular musculoskeletal system disorders, which manifest themselves as lameness or locomotion disorders[243]. Such clinical signs normally lead to the exclusion of the equine athlete, particularly at the time of the Horse Inspection at international competitions.

At first glance, veterinary intervention may appear legitimate in the event of a problem. Medication could be administered that directly affects the ability to compete (anti-inflammatories, sedatives), while other therapeutic substances are not known to have a direct effect on a horse's fitness to compete (wormers, antibiotics). However, in order for this use not to be abused, a number of conditions must be met. A treatment must not be detrimental to the health, welfare or self-worth (animal dignity) of the animal and, above all, the horse must not be forced to compete so long as it is not cured and in good health and form.

Some veterinarians protest against the measures that prevent them from treating competition horses (Bühler, 2008, translated from the original French): "We don't know what to use anymore [...] soon we won't even be able to give them an aspirin. The racehorse veterinary profession is fed up. We are no longer allowed to treat them. Soon, it will be better to let them die if we don't want to get into trouble."

5.9.3.4 Economic interests

Economic benefits are not an overriding interest in the ethical process of weighing interests, unless it is a matter of protecting fundamental rights such as economic freedom or freedom of ownership[244, 245]. However, it remains very difficult to isolate the protection of the dignity of animals used in competition from the financial context. Controlling the integrity of racehorses and the integrity of betting go hand in hand. In the face of significant competitive pressure from the rise of legal and illegal sports betting and related crime, particularly in the US[246], it can be seen that the horse racing industry is situated at the intersection between strict anti-doping regulations (or lax, depending on one's point of view) and the very significant financial incentive (winnings, betting, money laundering). In this field of tension, the integrity of the horses and the events must be examined in light of the effectiveness of the standards governing the organisation of veterinary surveillance, the procedure for granting and withdrawing licenses in cases of infractions and the knowledge level of professionals in the sector.

The economic interests (money earned, market value added) of the owners those in charge of leading the horse to victory (riders, drivers, jockeys) are added to other benefits (personal development, mental and physical health) and to the feeling of sporting satisfaction (notoriety, medals, qualifications). The organisers and federations also defend the positive spin-offs, mainly revenue and prestige. These benefits are substantial in high-level events. Therefore, the spirit of competition requires the danger of

[243] 4.4.1.4 The risks of strain on equids in sport, p. 61
[244] 2.6 The various interests, p. 30
[245] 2.7 Weighing the interests, p. 31
[246] 5.9.2.3.2 Current discussions, p. 169

demanding that the equine athlete surpass its physical capacity (overexert) and imposing strains on the horse, in particular in cases of negligence or violation of sporting rules. When they are unjustified, these strains risk degrading the horse to the level of a sporting device, thus causing excessive instrumentalisation[247]. This is especially the case when fraudulent methods are employed (prohibited practices, doping and abuse of medication). However, riders, drivers, owners, sponsors, organisers and breeders all have an interest in having only healthy horses compete in events, without the use of substances or interventions.

As for the functional gain from genetic doping, the CRISPR technique is of great interest to those who breed, train, compete and profit from the millions of animals that contribute to the multi-billion dollar industry (legal and illegal economies) around the world (Neuhaus & Parent, 2019).

5.9.4 Alternatives that achieve the same results with less strain

5.9.4.1 Possible alternatives when weighing the interests

Options favourable to the dignity and welfare of the horse	Options unfavourable to the dignity and welfare of the horse
For the good of the horse, to accept the situation and give up the immediate satisfactions of leisure or competitive activities	Do not stop working the horse immediately and pressure the horse's entourage and veterinarian to reduce the period of treatment and rest as much as possible
Support the return to adequate health and fitness through basic care and relying on the natural recuperative abilities of the horse over an appropriate period of rest and convalescence	Administer medication that the horse will have to metabolise in the hope of accelerating the healing process for a quick return to normal work
Accept that the horse should remain on stall rest or immobilised to maximise the chances of recovery during rest and convalescence	Resume training the horse as soon as the clinical signs have disappeared, risking incomplete recovery
Accept that the horse will be in pain if analgesics or anti-inflammatories are not administered	Consider that the treatment of pain in order to continue to work a horse is ethically justified, as pain should not be imposed on it
Understand that pain is a useful signal to prevent a situation from getting worse	Consider that the risk of aggravating the situation by masking subtle signs (e.g. microfractures, tendon microlesions) is acceptable
Reject the risk of side effects (e.g. gastric ulcers) and other deleterious effects of analgesics or anti-inflammatory drugs	Accept the risk of negative effects of analgesics or anti-inflammatory drugs
Do not take the risk of competing with a horse whose system may contain traces of prohibited substances	Take the risk that the administered substance or its metabolites are detectable in the horse's system due to individual differences in metabolisation

Table 7 Attitudes to be ethically assessed when weighing interests in the case of treatment that results in strain on a competition horse

The weighing of interests involves a detailed analysis of the situation, ethical questioning and the search for alternatives to reduce the - at times unjustified - strains to which a competition horse is subjected, in particular those that affect his physical and mental health and physical conditioning. This phase also involves seeking help from specialists. After considering these issues, the stakeholder interests (individuals, organisations, equids) and the nature of the issue of equine health and fitness, the following alternatives (including intermediate solutions) can be evaluated in the event of a health or fitness problem occurring (Table 7).

In order for a responsible person to be able to make a decision, he or she must have the tools to assess the situation - sports federations provide training, further education courses and publications to help individuals gain these tools. The regulations also set the framework for decision making. The federations must provide a framework for the reflection of athletes who are active in competition to find preventive solutions in the field of stable and competition horse management.

5.9.4.2 Management of horses and stables

In a high-tech century, efforts are needed to curb the belief that medical interventions of all kinds can correct and rehabilitate failures of health, fitness and ability.

Acting in the interest of the horse in training

During training, the attending veterinarian and the PR must act in the best interests of the horse. If medication is used, professional judgement, discretion and ethical competence will be employed to account for biological and pharmacological variations in drug clearance times[248]. These individuals need to be more resistant to pressure from those around them seeking easy gains or quick gratification that would take precedence over protecting equine welfare. These skills also help with communication. They can emphasise that the diagnosis and early treatment of conditions followed by a period of adequate rest increases the chances of recovery and reduces convalescence time. In this way, without rushing, they are able to prevent a further deterioration in health, the strain of which can significantly limit a horse's sporting capacity, the length of its career and its economic and social value.

In general, the improvement of all prophylactic measures, including those relating to care and feeding, will serve to keep the competition horse healthy and fit for longer. Better planning of training and events also avoids the need for certain treatments.

Necessary risk analysis for medication use

Strict risk management defined in a robust protocol should accompany the equine athlete, particularly if the administration of medication is required. It starts with an analysis of the risks of temporary accommodation during competitions. Stalls and means of transport previously occupied by unfamiliar horses, especially during treatment, should be avoided. The appropriate action is to

[247] 2.3.6 Excessive instrumentalisation, p. 25

[248] 5.9.1.3 The interval between illness and resumption of work, p. 161

decontaminate the facilities. If in doubt, the PR is to prevent the horse from consuming feed and straw (fasting) and rolling while awaiting new feed and bedding.

Then the PR will supervise the staff, instruct them on good practices to be observed at all times in the stable and establish rules and regulations. The training should include periodic hand washing (hygiene) to prevent contamination to the horse with substances intended for humans or other animals. The PR should also explain the risks of consuming food, drink or anything else that may contain prohibited substances. Only one person should be responsible for therapeutic treatments. This person should wear single-use gloves when applying ointments or lotions. Stablehands should not be allowed to decide on their own to move a horse to a new stall. Each horse and its equipment should also be unambiguously identifiable (name, sex, markings). The stable manager will keep all the equipment under strict organisation. He or she will designate individual equipment for each horse (buckets, feeders, halters, ropes, brushes, bridles). In the case of a horse on medication, the bedding should be changed frequently to avoid recontamination by ingesting metabolites eliminated in the urine.

Finally, the PR will discuss the possibility of administering the drugs by injection with the veterinarian. Powdered formulations have been shown to be a major source of contamination to other horses. In addition, the PR should inform the veterinarian of the exact schedule (training and competitions) and ask for recommendations on the time limits to be respected. The PR must update the treatment log without delay. If third parties are allowed to enter the facilities, optimal supervision must be exercised to prevent the malicious administration of any substances or the giving of treats. Ideally, visitors should not be allowed into the stables. As a precautionary measure, the distribution of medication without a prescription should be avoided at all costs. All employees must inform the stable manager and/or PR if they are being treated with any medications.

The importance of managing hay, bedding and feed

Precise management of hay, bedding and feed is part of good practice to avoid doping violations (Barker, 2008; BETA, 2020; CNEF, 2015; Decloedt et al, 2016; Delaunay, 2011; FEI, 2019; Herholz et al, 2017; Hertzsch et al, 2015; Machnik et al, 2003, 2008; Machnik, 2009).

Hay should be monitored before harvesting or feeding. The same precautions should be taken for bedding. The presence of plants likely to contain prohibited substances (datura, belladonna, henbane, poppies, colchicum) makes them unsuitable for sport horses. Particular attention should be paid to grain feed, as some contaminants are much more widespread today than in the past. If feed and bedding is purchased from third parties, a macroscopic examination should be carried out before feeding. An official analysis is possible but involves higher costs. Preference should be given to suppliers who provide written guarantees on the absence of prohibited products in their bedding or industrially processed feed. Labels or delivery documents with batch numbers should be kept. In addition, ensure that manufacturers keep control samples and follow a quality control and traceability process to avoid contamination of production lines. The distribution of feed and supplements poses risks due to the potential presence of the plants (or their seeds) mentioned above. A thorough examination of the grain or bulk delivery is an essential preventive measure. The supplier should also provide a guarantee for grain mixes and complete feeds and the label of each batch should be kept by the PR or stable manager.

5.9.5 Results of the balancing of interests and justification of strain

Several events affect dignity and welfare unjustifiably during a equid's sporting career:

- Substances, processes or practices are likely to impair physical and mental health
- The conditions for training and competition cause pain, aches, harm, anxiety or fear
- The activities do not take into account the natural needs of equids and can reduce the animal to a sporting tool.

Therefore, the weighing of interests must start with an analysis of each situation.

Questions to ask:

- In what state of physical and mental health should the athlete be in order to be trained and to perform the envisaged activity?
- Who will determine the health status of the animal and answer the question above; which specialists will provide support?
- Can an amateur horse be considered differently than a professional sport horse with a high market value? How should the equestrian qualification of the PR be assessed (child, adult, person with disabilities)? If these cases are to be treated separately, what common criteria need to be applied?
- Can arguments of an economic nature (veterinary costs, cost of the horse), prestige, cultural norms or widespread technique be considered acceptable?

The answer to all of the above questions can be summed up in a few words: the fundamental ethical principle places the equid at the centre of concern, regardless of its level of competition or the profile of the PR.

5.9.5.1 Ethics towards the horse

Ethics give precedence to the protection of the dignity, welfare and health of horses. In short, horses must be fit for the competitive activity desired (breed, conformation, ability, physical condition, state of training) without being under the influence of medication or manipulation of any kind.

Masking signs of ill health during training constitutes undue hardship

Any intervention designed solely to mask symptoms of illness during training, let alone during a competition, will be considered undue hardship[249], or even excessive instrumentalisation or debasement depending on the case. For example, the application of hormonal substances to suppress the normal oestrus of mares to improve performance (it remains prohibited in racing) or anti-inflammatory drugs that conceal musculoskeletal lesions.

The AniWA states that pain shall not be unnecessarily imposed on an animal. Analgesics are available to relieve pain. Proponents of a controlled authorisation argue that a horse could take part in an event under the influence of such drugs, as they reduce suffering, which is in turn detrimental to welfare. They could even, in a way, restore equality of opportunity in competition. However, if one respects the dignity of equine athletes, the opposite argument is made. If physical exertion causes pain, for example during transport, the only defensible method of avoiding it is to reduce the risks. This can be done by arranging more breaks during the journey, using a more comfortable vehicle, or bringing forward the date of the journey to allow the horse sufficient time to recover. In terms of preparation for competition, the alternative is training according to regulations and making respectful commitments to equine athletes[250].

Veterinary treatment must be followed by a period of rest and convalescence

Lege artis veterinary treatment requires accurate diagnoses and the development of evidence-based treatment protocols. Treatment must be followed by a period of rest and then rehabilitation that takes into account the nature of the treatment and the course of the injury or disease.

If the condition is curable, the animal should be given a sufficiently long break from exercise before resuming training and movement should be facilitated only to the extent that it promotes or does not impair the healing process. On the other hand, as soon as an injury or disease has no remedy, a solution should be sought that provides comfort for the horse without the risk of aggravating the condition or causing concomitant damage. The continued use of the horse, if envisaged outside of competition, must be weighed against the interests of the horse.

5.9.5.2 Gene therapy and genetic doping

In the first part of this chapter, the issue of new advances in molecular genetics was introduced, which, in short, allows genetic therapy and doping[251]. These carry the risk of a race for biotechnological tools, for example to create embryos with a modified genome (Campbell & McNamee, 2020; Neuhaus & Parent, 2019; Vichera et al., 2019). Today, few scientists are able to estimate the impact of these manipulations. Ethics, fame, economic opportunities, the constant search for funding and conflicts of interest are at the heart of the tensions. The debate has only just begun. Even if these procedures still seem to be reserved for laboratory research, equestrian sports enthusiasts and animal rights activists must already be concerned about the inevitable use of CRISPR and the level of risk to equine athletes. Although in principle the technique is intended to improve equine welfare, it is unlikely to remain so in practice. In this respect, international regulation of safety measures within a public and transparent framework is essential.

Several authors provide food for thought on this subject in scientific journals (Campbell, 2013a, 2013b; Campbell & McNamee, 2020; Neuhaus & Parent, 2019; Tozaki & Hamilton, 2021). They do not permit the justification of gene editing. The first argument is that not all breeders or owners will be able to benefit from these inevitably expensive technologies. This argument alone is not decisive, as the equestrian and racing industries already tolerate considerable economic inequalities. These include the purchase of top equine athletes at exorbitant prices or access to the best breeding stock for those who can afford the highest stud fees. Secondly, they do not support the idea of separate events for horses with manipulated genomes. This would require a complex and expensive classification system. It would reduce the attractiveness of the competitions and probably lead to a reduction of the number of events. On the other hand, a regulatory barrier based on a principle of fairness would also have to be based on reliable tests to identify modified sequences. Such tests are not yet available.

The hereditary basis of several pathologies of the musculoskeletal, respiratory or nervous system that affect performance is known[252]. A ban on technology that would correct this situation would, at first thought, run counter to the priority given to the equine welfare. However, this approach overlooks the unpredictable risks that the procedure may miss its target and, for example, cause deleterious effects or simultaneously promote other inheritable diseases. Furthermore, it allows, at least theoretically, better results to be achieved through the procedure, which meets the definition of doping.

The clear distinction between therapeutic methods and genetic doping remains very problematic since the correction of any pathological condition simultaneously changes the sporting abilities of an individual (human or animal). After gene treatment a horse could be capable of performance that exceeds any natural abilities. In view of the enormous individual variations, it would be difficult to discriminate between an intervention that simply restores a normal level of performance and one that enhances it (doping).

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[249] 5.9.1.5 Strain caused by medication and doping, p. 165

[250] 4.4 The use of equids in sport, p. 56

[251] 5.9.1.6 The doping of tomorrow and its risks, p. 166

[252] 6.2 Selection and occurrence of hereditary diseases, p. 223

The question of the age at which genome editing should be prohibited is also worthy of discussion. This ban should be accompanied by stringent provisions requiring short-, medium- and long-term monitoring and reporting on the health and welfare of genetically modified animals.

Conclusions on genome editing

From an ethical point of view, the use of techniques that modify the genetic material of living organisms is a very serious change to the inherent value (dignity) of humans and animals (Lehming, 2018). Undoubtedly, future debates will remain lively; ethical demands and the perspective of profit will continue to clash.

The weighing of interests must take into account the strains that may be imposed on equids. The fundamental fear is that humans will perform these manipulations, not that genes will be modified by spontaneous mutation (the origin of hereditary diseases). The ethical question is whether or not gene manipulation is justified to optimise the animal. If the answer is yes, which is more legitimate: human intervention or nature? This question will not be decisively answered for a long time. In the meantime, only legislation can provide a solution.

Given the current state of knowledge, the nature and extent of the negative and unforeseen effects of these techniques present a real risk to the treated equids and their offspring. In the Authors' view, the imperative of respecting the dignity of horses is the overriding argument for a general ban on gene editing. Even though validated tests for genome manipulation are still lacking, this measure makes sense to counteract a possible race for biotechnological treatments.

Sports authorities, veterinarians, owners and breeders should always act in the best interests of equine athletes, their dignity and welfare[253]. These stakeholders must remain vigilant and carefully follow the scientific recommendations. This is why the FEI, UET and IFHA unequivocally prohibit the use of gene therapy and the participation of horses whose genome has been edited (FEI, 2022e ; IFHA, 2021a; UET, 2021a). As it stands, the application of molecular genetic techniques (CRISPR or similar developments) is therefore totally unjustified.

5.9.6 Recommendations for implementation

The COFICHEV strongly recommends that sport, racing or breeding federations that do not yet have regulations on health, medication or doping controls correct this deficiency. The aim is to at least define practices that fully comply with Art. 16 Para. 2 Letter h AniWO, which addresses the participation in competitions with animals treated with prohibited substances or products. The publication of specific annual reports on these controls and their results (monitoring and reporting) should complement this approach.

Swiss law prohibits germline gene therapy in humans, but not in animals. The COFICHEV recommends adding a ban on molecular genetic techniques to the AniWO, to conform with the regulations of sports authorities[253] and to discuss the scope of the ban with stakeholders.

Based on the topics discussed in the above sections[253, 254] and in addition to the previous recommendations on the sporting use of equids[255], the COFICHEV advocates a formal implementation of ethical principles and the following measures to manage medication and doping issues:

- The protection of the dignity, welfare and health of equine athletes trained and entered in events shall be a primary ethical imperative. In this sense, the COFICHEV encourages federations to strengthen the regulations for sport horses on anti-doping, medication and prohibited practices (genome editing, practices threatening the integrity of equids) to go beyond the minimum legal obligations.
- Stakeholders should work together to develop international and multi-sport regulations on the use of gene editing of embryos including mandatory reporting of health and welfare data of genetically modified horses.
- Horses should only be allowed to train and compete (*fit to compete*) if they are naturally fit for the intended exercise, in good physical condition for the activity required and properly prepared. Medication or manipulation of any kind must not affect these abilities.
- Federations may also explore the possibilities of improving the knowledge base of the PRs, organisers, officials and veterinarians. The information could be in the form of a guide on how to prevent medication and contamination violations. It would also explain the principle of strict liability and its consequences, especially for PRs.
- The procedure for checking the fitness of each equine athlete before a competition (*fit to compete*) as carried out by the official veterinarian and the judges should be intensified and applied more systematically. This includes guidelines on the definition of competencies, the frequency and type of testing, the examinations by the veterinary service before, during and after the event, the athlete's level of fitness and the conditions under which the horse will compete.

[253] 5.9.2.6 The ban on molecular genetic techniques p. 173

[254] 5.9.4 Alternatives that achieve the same results with less strain, p. 180

[255] 4.4 The use of equids in sport, p. 56

- In equestrian sports, the strict monitoring of the use of medication out of competition (training) seems unrealistic at first glance. Moreover, it is not so much the use of medication that causes the greatest problem, but rather the use of a horse undergoing treatment or in recovery.

However, as in the racing federations, the organisations that regulate top level and prestigious competitions that have high financial stakes should adapt their regulations. Only horses that are in good health and possess the necessary physical condition (*fit to compete*) should be eligible to prepare for that level of competition.

- Traceability measures (treatment diary), allocation of responsibilities and official health, fitness and medication checks can help in this regard. The daily or at least weekly logging of administered medication in an official register for horses in training would be an appropriate solution. This should be completed by an authorised or approved veterinarian. Such a register would be the first step in a longitudinal follow-up to be developed for equine athletes before major events.
- As stakeholders demand transparency, the potential of new technologies (*blockchain*) should be explored. They are able to store information in a clear way, and provide secure access without a controlling body. In the future, this technology could help to spread the image of clean sport, especially in racing (betting) or in high-stakes competition.

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5.10 Shows, exhibitions and other events

5.10.1 Preamble

The COFICHEV considers it morally defensible to use domesticated equids and work them. The organisation considers that the ethically relevant issue is how to keep and use them in a way that respects their animality (their dignity) and their welfare. Therefore, the assessment of public demonstrations is no different from that of, for example, equestrian sport, even though in many cases these activities do not support the survival of humanity but serve its needs for exercise and entertainment. On the other hand, livestock events contribute to the preservation of animal genetic resources. The diversity of breeds in Switzerland is a socio-cultural asset.

There are several events – shows, films, parades, parades, exhibitions, presentations - in which horses participate. Most often, they take the form of cultural, historical, folkloric, religious, military or political. This report will not deal with all known events in Switzerland and abroad (Palio di Siena, circus, brewery draught horses, representations of European national stud farms). A few examples illustrate the measures that improve the living and working conditions of equids that provide these services and the justification for practices that may be restrictive.

5.10.2 Description of the current situation

5.10.2.1 Parades in folk or cultural events

The intensity and duration of the strains caused by the nature of a parade can be compared with those of competitions. Both are punctuated by the strains inherent in their practice - opening umbrellas, applause, high-decibel music, contact with fellow riders. Generally, equine athletes are well trained for this type of exercise and environment. However, the parallels with riding in a group are difficult. The latter does not carry the same risks, although it also requires good preparation. Moreover, group rides are usually not held in an urban environment, but in the countryside, avoiding road traffic.

As with equestrian sports, public events remain under close scrutiny by various animal rights groups. They criticise them in particular because of their management, which is sometimes more focused on results and economics than on equine dignity and welfare or means to improve their condition.

5.10.2.1.1 Various types of events

In Switzerland, there are a number of occasions when horse troops are paraded and tacked according to military tradition - Milices vaudoises, Dragons bernois, Cadre Noir et Blanc, Schwadron 1972. The long-standing custom of using horses in festivals and the memory of the cavalry units disbanded in 1972 are still alive. Switzerland is no exception. European countries also cultivate beautiful equestrian rituals at their national events.

The vast majority of these solemn parades are without incident, as these experienced units train for this type of event on public roads. They are well aware of the risks of noise, the excitement of the event and the nervousness of the organisers. This is why the troops and horses prepare themselves accordingly, for example by scouting the terrain beforehand and regularly practising tricky situations.

Several public events present risks:

Festivals in large cities on traditional dates, with a historical, folkloric or religious background, in some cases with the participation of riders and horse carriages, attract crowds. Guests come from neighbouring regions with their horses and meet on the same day for these local events, some of which are quite large. The organisers rely primarily on individual skills to deal with problematic situations. Usually, the setting and route are known, but everyone is left to shoulder their own responsibilities. In addition, coordinators and guests very rarely inspect the route in detail to identify any potential accident risks and stressful situations for the animals. An inspection would be useful to identify certain sources of danger - the nature of the terrain, the presence of dangerous surfaces (metal plates, slippery surfaces, steep slopes), construction work in progress, motorised vehicles, sources of unusual noise, bottlenecks along the parade. Horse-drawn carriages (or floats) pose a particular risk, especially when they are carrying people (VIP guests, accompanying persons). In addition to these difficulties, the noise generated by the festival needs to be considered (music, firecrackers, horns). Some participants may also face an additional challenge due to inexperience, lack of preparation or insufficient supervision.

5.10.2.1.2 An increasing number of issues?

Since the beginning of the 21st century, the number of incidents reported by the media seems to have increased. It is difficult to say whether the frequency of accidents has really increased or if their visibility is increased by a magnifying glass effect that draws more scrutiny onto the usual events during this type of event (illnesses, falls, stress). Without an in-depth study, there appear to be multiple factors that explain this impression of an increasing number of issues.

The presence of horses in the urban space has become unusual

The presence of horses is no longer as familiar in an urban environment as it was in the past. The public and many riders and drivers are no longer used to sharing space and recognising the risks of their proximity to each other. By including animals primarily as extras intended to enhance a festival, less importance is given to their animality. However, horses have a natural instinct to move forward, sometimes with great enthusiasm. Any slowing down can be seen as an obstacle and a strain opposed to its natural needs. The subjective perception of an unexpected and unfamiliar situation can then translate into agitation and anxiety[256] or fear[257]. Therefore, not all horses are suitable for participation in parades. Whether or not they are suited to participate depends largely on their individual temperament, preparation and how they deal with circumstances where they have to stop and stand still.

Stopping and standing still is difficult for some horses

In the art of equestrianism, the stop is a difficult figure to execute well. The horse must not only stop, but also remain still, wait a long time (without trampling or backing up) and remain attentive before resuming motion. Most leisure horses or those involved in show jumping are not always well trained to stop on command under all circumstances, even urgent ones. On the other hand, carriage horses are trained to stop in a more methodical way. They learn to obey the voice and the guides, and then to stand still in front of the carriage, especially when embarking and disembarking passengers or when loading goods. Experienced drivers anticipate obstacles that may hinder the journey and slow down in advance.

Riders and drivers often encounter circumstances that force them to stop quickly because of the accordion effect of the parade. However, they are often also asked not to leave too much space between themselves and the group in front. As the group behind them is also close, they cannot execute a small circle to maintain tempo. The route also is not always designed to prevent bottlenecks. It often lacks the possibility to turn or avoid upcoming issues further ahead or does not improve areas of risky footing with sand, for example. All of these points increase stress and the risk of incidents, including horse agitation, falls and slips.

5.10.2.1.3 The Zurich Sechseläuten and the Basel Carnival

Since 1904, the Sechseläuten (six o'clock bell ringing) has traditionally celebrated the arrival of spring on the Equinox in Zurich. A costumed parade of guilds and celebrities with the participation of around 550 horses (riders and carriages) and brass bands marches through the old town. The Böögg, a snowman symbolising winter, is the main character burnt on a bonfire - the highlight of the festival. The faster the fire blows his head off, the better the summer will be (Figure 65).

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[256] 2.3.2 Anxiety, p. 22

[257] 2.3.2.1 Fear, fright, phobia, p. 22

Accidents meet with negative public opinion

While waiting for the Böögg's head to explode, mounted guilds gallop around the fire to traditional music. A hundred or more firecrackers placed inside the Böögg explode as they go around. In 2015 and 2018, two horses died during this event. Similarly, riders and carriages are the main attraction of the Basel Carnival parade. In recent years, several animals hitched to carriages have slipped and fallen during the parade. Both events were criticised by animal rights groups (Anonymous, 2015; Gerber, 2015; Haefeli, 2016; Hilzinger, 2019). The majority demand protective measures, but others demand the banning of animals at such events, arguing that their instinct is to react by fleeing.

Figure 65 Horses circling around the burning and exploding Böögg at the Sechseläuten in Zurich in 2007 (Source: Fortunat Mueller-Maerki (Horology at de.wikipedia), https://upload.wikimedia.org/wikipedia/commons/f/f2/UmrittSechselaeuten2007.jpg, CC BY-SA 3.0 license)

Stressful conditions

Criticism focuses on the particularly stressful conditions that the horses are subjected to and the sedatives administered to some of them, as one experienced veterinarian admits (Fassbind & Hässig, 2016). The factors that explain this situation and that prove to be constraining are multiple. They include the loud noises of the music, explosions and shouting, circumstances to which the animals are not accustomed, as well as the nervousness and lack of preparation of the riders and drivers due to the challenges of riding in public. The doctrine of the most extreme activists, the abolitionists[258], states that animals do not live to be used as entertainment or exploited. The Swiss Animal Protection SAP does not agree with this view but notes that having to administer sedatives to horses demonstrates that the animals are not comfortable under such circumstances. On the other hand, horses were observed in some cases to be psychologically depressed after sedation or very nervous or anxious when they returned to the stables. Generally, fireworks and explosions cause anxiety in equids, sometimes severe (panic), or lead to injury. This is a well-known problem for owners, especially in stables close to the source of the noise. Owners sometimes attempt to prevent these reactions by administering sedatives beforehand.

Differing views on the nature and intensity of stress

Numerous observations (Novotny et al., 2017a, 2017b) show that horses have to respond to several stressful stimuli of varying frequency and intensity - music, clapping, commotion, firecrackers and other loud noises. In addition, hazards along the parade route, such as bottlenecks that cause traffic jams, increase the stress and anxiety of the animals, as well as the danger of slippery roads or various obstacles that can cause accidents (slips, falls, collisions, accidents with the public, escape). Although a number of horses cope well with these strains, some equids clearly do not, for example those who are participating for the first time. A study from the Veterinary Faculty of the University of Zurich (Novotny et al., 2017a, 2017b) attempted to show that the stress experienced during the Sechseläuten was only moderate. The results are controversial because the horses that took part in the experiment (outside the context of the festival) were not representative of the horses participate in Sechseläuten (Frei & Manz, 2017).

5.10.2.2 Equids involved in film and entertainment

5.10.2.2.1 Film and television

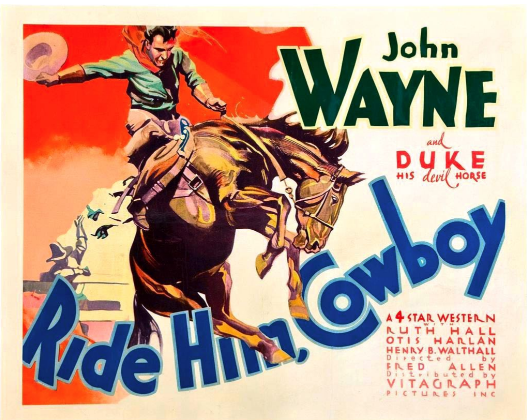

Figure 66 Film poster (Ride Him, Cowboy), 1932 (Source: Wikimedia Commons, https://commons.wikimedia.org/wiki/File:Ride_Him,Cowboyposter.jpg. Public domain (USA))

Horses have been part of the cinema since the beginning of the 20th century and play an essential role in historical scenes, westerns (Figure 66) and swashbuckling films. Together with the dog and the cat, they are the most frequently encountered animal in film.

Some scenes impose particularly high strain

Many of the horses only play a role as extras, in the wild, under saddle or pulling carriage. For the most part, their activities do not differ from their usual uses. However, spectacular scenes put them under stress for which they are not always adequately trained. This is particularly the case when falls are induced or when animals are sedated for stressful or dangerous scenes with stunts and special effects (smoke, pyrotechnics, various equipment). Veterinarians are faced with an ethical dilemma when a film company calls on their services to ensure the safety of the horses, to sedate them, or induce general anaesthesia.

Hollywood films remain controversial

The mistreatment of animals on Hollywood film sets has been a controversial has been a controversial issue for several decades (Figure 67). The oft-repeated legend concerning both versions of

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Ben-Hur (Fred Niblo 1925 and William Wyler 1959) is that the chariot race scene resulted in the deaths of 100 horses. As the accuracy of this legend could not be verified; despite research, it remains a myth.

Effective measures have been taken

Since 1939, the *American Humane* organisation has monitored the treatment of animals on the sets of thousands of films (http://americanhumane.org). It grants most films a statement in the credits that no animals were harmed during filming. The association sometimes distributes the *Pawscars Awards*, an award for the best animal actors (AH, 2016). This control is now becoming less important due to the increasing use of trick shots and CGI. However, many live horses are still involved in scenes that are dangerous to their welfare, especially for reasons of cost and the credibility of certain sequences.

Horses are no longer forced to fall under dangerous circumstances. For film purposes, many professionals specialise as stuntmen to train horses and coach actors, e.g. teaching them to ride. To maintain their physical condition, they prepare these equine athletes throughout the year with adapted equipment and techniques. The horses learn quite easily to perform tricks (fall, rearing, sitting) using classical conditioning processes. In many cases they are being replaced by digital doubles (Dehlinger, 2004).

5.10.2.2.2 Equestrian shows

Entertainment events (leisure market) involve the use of equids in purpose-built venues in the open air, auditoriums or tents. These performances are essentially derived from civilian, military and circus traditions as well as the performing arts. There are still four known schools of equestrian art: the Spanish Riding School in Vienna, the Cadre Noir in Saumur, the Portuguese School of Equestrian Art in Lisbon and the Royal Andalusian School of Equestrian Art in Jerez (Henry, 2012).

Figure 67 Sidney Alcott's *Ben-Hur* (1907), postcard (1908), Sears, Roebuck and Company (Source: Steven R. Shook Collection, https://www.flickr.com/photos/shookphotos/4326161155/in/photostream/, Creative Commons Attribution 2.0 Generic)

The wide variety of acts include dance, music, theatre and circus arts, and are based on the classic disciplines of dressage under saddle or at liberty, vaulting, driving and stunt riding. Some very popular troupes have gained international fame. Zingaro (France) and Apassionata (Germany) are the best known in Europe. They regularly present their stunt acts, haute ecole dressage and equestrian cabaret during the Equitana fair in Essen (Germany) or during Cheval Passion in Avignon (France) with a gala atmosphere and represent a market that is often able to evade the rules of ethics and animal protection. In addition, there are a number of famous circus families, such as Bouglione, Grüss and Knie. The performances of horse whisperers (the new behaviourist masters of American horsemanship), who boast their equestrian talents as much as their labelled and lucrative merchandise, can also be described as shows (Poncet et al., 2007).

Strains that are difficult to identify

It is often difficult to objectively detect violations of equine dignity and welfare during a performance. The first question is whether they are really faced with these strains[259, 260]. At a distance, the signs of discomfort (pain, aches or harm) remain slight, as the animal usually appears only briefly and in motion (a few minutes). Veterinarians and well-trained individuals recognise lameness more easily. Signs of anxiety, fear and stress can also be detected by typical body language that can be identified in only a few seconds (ear position, tail swishing, facial mimics, manure, musculoskeletal activity). If a strain is suspected, an attempt should be made to understand its cause and then the animal's interest should be examined so that alternatives can be evaluated[261]. This requires special knowledge of ethology and explanations and warnings to the audience.

5.10.2.2.3 An example of a group of stallions in a performance

During an equestrian performance, a group of stallions run free in the arena (Zingaro, 2018). They chase each other, confront each other, rear up, threaten to bite and kick each other, strike each other with their front hooves. The audience reacts: *"Most of the scenes are meant to represent the horse in the wild, biting its fellow horses. What is the point of forcing horses to reproduce these behaviours?"* (Infoconcert, 2019). Others, attentive to signs of unjustified strain and cruelty, see it as an act of "rare atrocity" or an organised fight between mistreated animals who attack each other and seek to injure each other (which would be prohibited by Art. 16 Para. 2 Letter d AniWO).

The evaluation of the behaviour of free-roaming stallions

This report will not comment on the artistic value and interest of such a staging, nor on the emotions of the spectators. But what about the natural behaviour of stallions in the wild? Are they fighting or enjoying themselves? It is difficult for the layperson to see the difference. The ethological answer sheds some light (Briefer Freymond et al., 2013; HNS, 2018, 2020). In the wild, even outside a harem, stallions compete and adopt ritual body language to gain dominance in a group. They also play with each other and simulate fights. These are signs of gaiety and liveliness, sources of pleasure. In this mock battle, the mimics remain controlled

[259] 2.3 Strain, p. 20

[260] 2.4 Welfare, p. 25

[261] 5.10.5 Alternatives that allow the same results with less strain, p. 202

threats. The characteristic phases of the game are repeated in an incoherent manner without reaching their conclusion. In a group of stallions destined to live in the wild under domestic conditions, the competitions aim to establish a hierarchical order essential for lasting social cohesion. The establishment of summer herds on vast pastures allows for interactions that these equids would establish in the wild (Briefer Freymond et al., 2013; HNS 2020; Salzburgwiki, 2020). This is the case, for example, when Noriker breeding stallions are brought together after the breeding season to be kept together on summer pastures in Austria. This traditional gathering is a popular public event (Figure 68). There is no public criticism from the vigilant Austrian animal protection organisation.

Figure 68 Noriker stallions clash at the annual meeting on the summer pasture in Rauris (Austria) in June 2018 (Source : Alf Altendorf, https://www.flickr.com/photos/alfaltendorf/42269418294/, CC BY-SA 2.0 license)

In the case of the performance in question, the stallions did not seek to injure or mutilate each other but were displaying the specific ritualised social behaviour of play that is fundamental to stallion interaction. These traits (nipping, simulating bites, rearing) belong to the normal behaviour of stallions and express their basic needs for interaction and their animality (HNS, 2018, 2020). The expression of typical and innate equine attitudes does not constitute an infringement of law (the prohibition to organise fights during which animals are mistreated or killed) (Art. 16 Para. 2 Letter d. AniWO). Furthermore, the dignity of stallions must be respected. To this end, Article 13 of the AniWO requires that stallions be given more opportunities to show their gregarious nature to each other, even if it appears formidable to the untrained eye. The superficial wounds they might cause each other are only of aesthetic relevance. They are far less stressful and harmful than permanent social isolation, a strain much harder to justify[262].

5.10.2.3 Live pony carousels

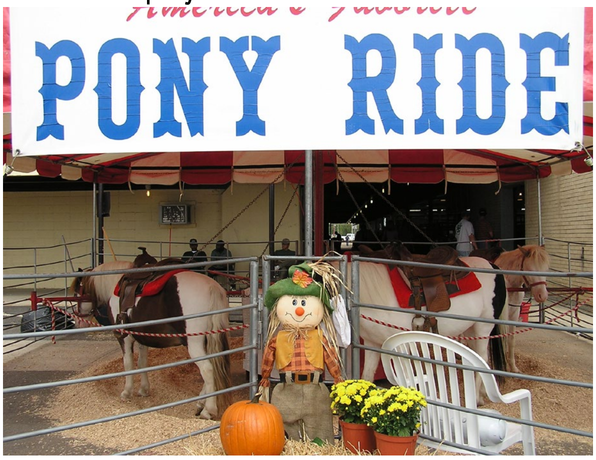

Figure 69 Tethered pony ride. Note that they can only turn in one direction on a very small circle (Source: Shawn Rossi from Brandon, MS, US, https://commons.wikimedia.org/wiki/File:Pony_Ride_(50273721).jpg, CC BY-SA 2.0)

Figure 70 Carousel at the amusement park Wurstelprater in Vienna (Source: Jeremy Thompson, US, https://commons.wikimedia.org/wiki/File:Wiener_Prater_114_(4482849100).jpg, CC BY-SA 2.0)

Pony or donkey rides are often offered to children (or more precisely to their parents) at fairs and exhibitions to offer them the opportunity to come into contact with these animals. The conditions and facilities vary from country to country. In Switzerland, rotating musical carousels with tethered ponies either pulling carts or being ridden are not known (Figure 69, Figure 70). These rides are the subject of fierce criticism in Europe. An ordinance of the Brussels Region has introduced a ban on amusement fair ponies (Belga, 2018). Many German, Spanish, Dutch and Austrian municipalities have also taken a similar position.

Sometimes archaic conditions of use and stabling

The famous live pony carousel in Vienna began in 1887 (Figure 70) and was closed in 2016 (Sladky, 2016; Association Stéphane Lamart, 2021). The operator complied with the minimum legal requirements: the ponies were only allowed to work a maximum of six hours per day and had to be given rest and food after four hours. In addition, they were allowed to move freely in a paddock for two hours daily. The public considered this kind of facility as an archaic way of presenting horses. The ponies were walking continuously for six hours in one direction inside a building, without being watered, sometimes in stifling heat that could rise to over 30°C in the summer. In addition to the monotony and one-sided strain on the joints, noise pollution was an additional criticism. The aim of bringing children and animals together was very commendable. However, the ride conveyed a distorted image of reality; it only gave an instrumental view of living beings.

In Switzerland, riding schools or owners travel to events lasting a few days with ponies and staff members, where children can ride the ponies in tents or outdoor pens. The main strain on the ponies is the one-sided load, as the ponies turn for hours, often

[262] 5.1 Conditions for keeping stallions, p. 92

in the same direction, on a circle of less than 10 metres in diameter. The noise and bustle of the environment can be distracting for the ponies. However, they seem to get used to the ambient noise, especially if it is reduced by a tent or marquee. The weight and size of the children do not pose a risk. In general, the farmers handle their animals in a calm, gentle and sensitive manner. Back at home, the ponies enjoy daily exercise in group turnout (Schaefler, 2016).

An educational role not taken seriously enough

There is also the extreme impatience of some parents who do not understand that the animals need rest and protest when their children have to wait while the ponies are given a break. This reveals a lack of understanding of the animals' needs. In this respect, these equestrian events should be used to better inform the public about animal nature.

5.10.2.4 Shows and breeding competitions

Horse shows and competitions are common in Europe and serve the needs of breeding and trade. The best horses are presented and offered for sale. Institutions (authorities, national stud farms) and specialists (agricultural advisors, juries, scientists, researchers, elected representatives, military, professionals) show their support for the industry and demonstrate their expertise and knowledge. In a festive atmosphere punctuated by controversy, they debate the animals, as well as selection methods and their adaptation to market requirements. The spectators, on the other hand, are reminded of old traditions. There are several examples of mixing horse experts with more or less informed audiences - Fieracavalli in Verona (Italy), Salon du Cheval de Paris (France), Foire de Libramont (Belgium), Equitana in Essen (Germany), Eurocheval in Offenburg (Germany), Marché-Concours de Saignelégier (Switzerland) or BEA Cheval Berne (Switzerland).

5.10.2.4.1 Contrasting visitor expectations

Many of these events and competitions are characterised by provisional or long-standing stabling areas, due in part to their historical and traditional uniqueness. This context can pose problems in terms of respect for animal dignity and welfare.

Sometimes questionable living conditions

Like regional horse shows, breeding events often provide very basic and minimal boarding for horses, either tethering outside of or standing in the trailers in which they were transported. In Switzerland, legislation justifies several restrictions that will be discussed below[263]. Furthermore, the animals participating may express natural behaviour (seeking interaction, confrontation, agitation), particularly on arrival when they meet other animals, which, depending on the case, may not correspond to the expectations of certain spectators.

Tensions between tradition, pragmatism and idealism

During these events, the main actors (breeders, riders, organisers) remain attached to their traditions and historically constitute a relatively male and closed social milieu. Nevertheless, they have gradually opened up their activities to a larger public, which was once essentially rural and popular, but is now more urban, curious and eager to rediscover its roots. This modern public observes the relationship between horses and humans with a new eye, particularly due to the transition of equids from livestock status to that of companion and partner. Each visitor then compares what he or she sees with their own representation of the horse. Their expectations are diverse, but they highlight the growing gap between the role of the working horse and that of the companion equid[264]. This is why such exhibitions have become the scene of friction between several worlds which, in the best of cases, have long ignored each other, or - more worryingly - have begun to despise or ostracise each other. On the one hand, professional practitioners, under ever-increasing economic pressure, are claiming technical know-how and their own way of being with the horse, a useful working and leisure animal that can be trained, ridden, harnessed, raised and raced. In this context, the majority of visitors enjoy observing them, smelling the odours (hay, manure, sweat, leather) in a characteristic acoustic setting (hoofbeats, neighs, snorts, calls, squeaks, grunts, sighs, breaths). They rediscover their emotions and memories.

On the other hand, a minority (for the moment), is calling for a world of free horses, an ideal to be achieved. Fuelled by animalism, the fashion for American horse whisperers and so-called natural horsemanship[265], they denounce the conditions of use and stabling presented as inhumane[266]. They are nauseated, as exhibitions and demonstrations confirm what they had feared: horses remain, in their eyes, martyrs and slaves exploited with brutality and cruelty. They can, however, claim some progress, notably the abolition of the long-criticised harnessing and driving of Franches-Montagnes weanlings at Saignelégier in Canton Jura, Switzerland (Jezierski T et al., 1999 and Nicol CJ, 2002, 2005, cited by HNS, 2017; RFJ, 2018; Swissinfo, 2018).

As a result, pragmatists face two fronts. On the one hand, adherents to a traditional culture are quite resistant to change, even to ensure their survival. On the other hand, animalist movements, the hubris of the most extreme militants[267] is insupportable. Between the two, the realists have no other reasonable option than to propose an adaptation of the equestrian world to societal requirements

[263] 5.10.3.1 Swiss legislation on events, p. 198

[264] 4.2 Equids: livestock or companion animals?, p. 42

[265] Ethological equitation, or natural horsemanship, is misleadingly referred to as taking into account the natural behavioural characteristics of the horse. The principles of this practice have been popularised by the new masters, horse whisperers, with their demonstrations and shows.

[266] A term revealing the easy slide towards anthropomorphism

[267] In the worst case, in the eyes of the COFICHEV: the loss of a sense of reality, the excessive pride of wanting to impose a self-proclaimed universal philosophy on everyone, intolerance and fanaticism in discussions, a taste for brutal and senseless actions.

that are favourable to effective use, but vigilant about the dignity and welfare of animal welfare. *"The 21st century will certainly have to choose between returning to a respectful but intensive use of horses or resigning itself to the extinction of the species equus caballus"* (Digard, 2007, 2018).

5.10.2.4.2 The specific position of Swiss Animal Protection (SAP)

Exhibitions, sporting events and other public events involving animals are increasingly being discussed in individual cases. Enforcement authorities and animal protection organisations, as well as various associations of owners and breeders, have called for regulations (OSAV, 2016). Since 2018, the AniWO contains new legal requirements in this regard[268]. The SAP remains highly vigilant and representatives have been visiting exhibitions since 2014. Their observations and assessments are included in several illustrated reports (PSA, 2017, 2020a, 2020b). These illustrate the search for common dialogue and objectives to create the conditions for better animal welfare –a win-win situation for all parties.

The SAP is not opposed to animal exhibitions, but would like to see improvements

The association is not opposed to the principle of these exhibitions but emphasises the great responsibility of the stakeholders when they present their subjects to the public. The SAP also recognises that these exhibitions play an important, even indispensable role in society, as a place for equine lovers, professionals, breeders and other interested parties to meet. However, they believe that the educational impact should show visitors what exemplary stabling and treatment looks like. The presentations should serve as a model, with emphasis on the natural appearance of the animals, respectful behaviour and stabling conditions in line with the needs of the species. In their review, the SAP concedes that they often see animals that are comfortable, relaxed, occupied and able to interact with other animals or the public. The exhibitions are therefore not just stressful and tiring for them, but also entertaining and enriching. In 2019, they highlighted the western show at the LUGA or the horse demonstrations at the Marché-Concours, which were great to watch (PSA, 2020a, 2020b).

The Marché-Concours in Saignelégier

This horse festival in the Franches-Montagnes attracts 40,000 to 50,000 people every year for two days in early August. The public attends a large exhibition of more than 400 horses, various demonstrations, races and a large folk parade. It features young horses from yearlings to three-year-olds, dams with foals at foot and two dozen young adult stallions. The SAP stressed in 2019 that improved stabling conditions are becoming essential, especially in the old stables. For over half of the horses present, the stall sizes do not comply with the minimum legal requirements. Some of them have only one-third of the minimum area stipulated by the AniWO. Although the AniWO allows for slightly smaller stalls for short-term shows, the SAP expressed their concern at the extent of their findings. Their representatives describe cramped accommodation that is very distressing for the horses. Tethered much too short, they frequently displayed defensive behaviour including biting, kicking and lunging. However, it should be noted that the SAP visited the Marché-Concours in Saignelégier on Saturday. This is the day all horses arrive at the stables and are presented one by one to the judges.

After a meeting with the SAP, the organisers stated that they were considering measures to improve the welfare of the horses as a result of the criticism (Erard-Guenot, 2020). However, the exemplary and educational function that the SAP would strive to attribute to these exhibitions does not seem to be fully compatible with the restrictions imposed by the very nature of these events.

5.10.2.4.3 The strains

The presentation of horses, most of them young, to judges is a stressful experience (transport, being in a new environment, unknown animals, training and handling). Moreover, the selection is not only based on aesthetics. It also takes into account appropriate behaviour with humans, and the equid's capacity to adapt to changes in the environment that will be useful to them later on.

5.10.2.4.3.1 Assessment of specific strains

To analyse the strains faced by equids at an exhibition, the person responsible must have a broad ethological knowledge to weigh the interests. In addition, the person in charge needs to take sufficient time to examine all the variations in behavioural traits that the animals concerned may exhibit. To this end, the impact of the stabling systems on the equid's natural needs must be objectively and thoroughly studied. Ways to limit the negative effects and promote positive emotions should be sought out. A quick assessment based on the verification of preconceived ideas or subjective opinions is not enough[269].

5.10.2.4.3.2 Unfamiliar equids in a new environment

The exhibitions are characterised by the gathering of young horses from different farms into a small area within a few hours. They do not know each other, but naturally seek out contact with one another. At the same time, they are adapting to a new and strange environment (music, loudspeakers, neighing of fellow horses, agitation, members of the public).

Assessment of strains when meeting young equids

To determine whether these circumstances cause undue hardship, the legal requirements, interests of the equids, the familiarity of the visiting public with equids, the specific aims of the event and the educational objectives of human-animal contact should be

[268] 5.10.3.1 Swiss legislation on events, p. 198
[269] 5.10.4 Stakeholder Interests, p. 201

taken into account. The key is to study and understand the nature, intensity and duration of the stimuli on the one hand, and the way the animal experiences the context and responds, on the other. In this way, the animal's point of view must prevail over human emotions and perception.

Initially, in order to understand the horses' responses to the new environment to which they have to adapt, they should be monitored for a sufficiently long period of time, particularly on arrival and in the days that follow. It should be investigated whether the observed reactions are part of the usual or abnormal ethogram in the eyes of an equine ethologist[269].

Behaviour that is sometimes shocking to the layperson

Visitors, and occasionally even the semi-knowledgeable (those who know a little, but not enough), find it difficult to draw the right conclusions. They may find themselves very impressed, even shocked, by the sometimes spectacular intensity of certain behaviours. When unfamiliar equids meet, their need for social contact does not manifest itself in a quiet and calm manner as in well-behaved humans. On the contrary, they express themselves through varied and loud body language of ritual confrontation designed to establish a hierarchy between them. There are threats of biting, kicking or striking with the forelegs, the dissuasive posture with the ears pinned back, neighing, squealing, roaring, increased vigilance or increased musculoskeletal activity (Figure 68).

All equids exhibit these behavioural traits, which vary according to their sex, age or the way they are kept. These behaviours can be observed during the introduction of a new conspecific to the stable, when forming a group (grazing, open stabling), standing a number of horses next to each other at a breeding exhibition or in natural settings such as a harem or a bachelor herd. The frequency of ritual interactions decreases rapidly during the first few hours and affiliative interactions are gradually established during the first few days. The time required for the return of calm depends on age, sex and breed of the individuals being housed together, as well as the way they are raised. For example, young mares or geldings are observed to be quiet after 24 to 48 hours. Stallions will intermittently continue their confrontational games for the duration of a show. This corresponds to their normal behaviour in a group (see the example above[270]; Briefer Freymond et al 2013; HNS, 2018). Older stallions, who are usually kept in individual stalls during the breeding season, also exhibit these typical behaviours, especially when looking for a conspecific, or seeing an unknown stallion.

5.10.2.4.3.3 Be aware of signs of anxiety

The person responsible for monitoring the horses at these events should be alert to signs of fear and anxiety[271]. The PR must use his or her skills to distinguish between natural adaptive behaviours, which become less acute on the day of arrival, and anxiety, which does not lessen with time. Their duration depends on the adaptive capacity of each individual and the intensity with which they are tested. If an animal feels trapped, it can lose self-control and enter a state of panic, hyper-reactivity and sometimes aggression. This state requires immediate removal of the anxiety-provoking stimuli. To this end, alternative accommodation should be sought in a suitable structure away from sources of stress. The equid should be kept in the vicinity of a conspecific that it knows well. Situations that result in expression of these behaviours should be avoided at all costs, as they increase the likelihood of overexertion, injury and harm, not only to the equid, but also to those around them. Manifestations of claustrophobia[272] are known to occur in transport vehicles, during confinement, as a result of the use of severe restraints or painful treatment or in a horse that is forced to remain tethered. At an exhibition, these reactions affect young horses that are unaccustomed to handling or do not have sufficient coping skills.

5.10.2.4.3.4 Public impact

Potential audience behaviour

Some behaviours attributed to the presence of the public may raise some questions. The most commonly observed traits that are suggestive of strain include fear, increased musculoskeletal activity and avoidance behaviour that is restricted through stabling conditions. To assess these, the nature, level and duration of the signs should be monitored, as well as changes over the course of the event (improvement, deterioration). Typically, these signs diminish within a few hours of the horses' arrival in a new environment. The intensity and persistence of potentially stressful stimuli alone are not usually sufficient to cause a severe response such as flight or sustained anxiety.

Possibilities to remove the animal from public view

The first solution mentioned for keeping horses out of the public eye at events and exhibitions is to convert the stable to a private area. The law does not require this for equids kept in groups, especially young horses after they have entered regular training, at the latest at 30 months old (Art. 59, Para. 5 AniWO). It does not apply to stabling and is primarily aimed at protecting lower-ranking equids. Nevertheless, it may be in the interest of an equid not to be exposed to the strain of the public area at an exhibition. Stress can be caused by the presence of the public, noise (music or announcements), the movement of other animals or a hectic environment.

Technically, it is possible to imagine partitions that allow the animals to be hidden from the view of visitors. However, these may deprive the horses of social contact with other horses and of a link to their environment. This impoverishment is not always

[270] 5.10.2.2 Equines involved in film and entertainment, p. 193

[271] 2.3.2 Anxiety, p. 22

[272] 2.3.2.1.2 Fright and phobia, p. 22

desirable as it inhibits the expression of natural behaviour. Furthermore, from a young age, equids gradually become accustomed to handling and shows. They are not as shy, fearful or sensitive as birds, poultry or small pets. They generally do not show aversive reactions when humans look at or observe them. Finally, the audience at horse shows is less intrusive than in petting zoos. Piglets, lambs and goats are frequently disturbed, intimidated and chased by children. They may be deprived of rest, quiet meals and opportunities to express species-typical behaviour (PSA, 2020b).

However, it is often observed that visitors try to stroke the head or neck of the horses as they walk by. The horses withdraw if they do not appreciate the intervention or accept such familiar contact. This type of contact is indispensable and normal during grooming, care, tacking (halter, bridle) or to reassure, praise or reward them. The COFICHEV is not aware of any studies that have demonstrated the existence of strain caused by placing a hand on a horse's head (pain, aches, harm, anxiety). On the contrary, these gestures are part of the basic training of horses.

5.10.3 Policy and regulatory context

5.10.3.1 Swiss legislation on events

At events[273], the dignity and welfare of equids is protected by the principles of the AniWA - Article 3 of the Act requires the justification of strains imposed[274], the provisions of the AniWO, and the fact sheets and guidelines published by the FSVO, which detail all aspects of keeping equids and the minimum requirements for the various stabling systems and their assessment (OSAV, 2020, 2021, 2022). In the order of their appearance, the following are the major points that are relevant to the subject at hand:

- Animals shall be kept and treated in such a way that their function and behaviour are not impaired and their adaptability is not excessively strained (Art. 3, Para. 1 AniWO)
- The housing and pens must be equipped with feed troughs, drinking troughs, defecation and urination areas, covered resting and retreat areas and opportunities for activity (Art. 3, Para. 2 AniWO)
- Feeding and care are considered appropriate if they meet the needs of the animals in the light of experience and knowledge of physiology, ethology and hygiene (Art. 3 Para. 3 AniWO)
- The use of animals for exhibitions, advertising, filming or similar purposes is not justified if it clearly causes the animal pain, suffering or harm (Art. 16 Para. 2 Letter e AniWO)
- It may be noted that the article does not expressly mention anxiety as an assessment criterion
- Administering substances or products to animals that affect their performance or appearance is not justified if these substances or products are harmful to their health or welfare (Art. 16, Para. 2, Letter g AniWO)
- The events shall be planned and carried out in such a way that the animals are not exposed to more risks than are inherent at such events. They shall avoid pain, suffering, injury or overexertion (Art. 30a Para. 1 AniWO)
- The organisers will respect their obligations: an updated list of participants and animals including identification, rest and recovery periods. Animals overwhelmed by the situation shall be accommodated and cared for in an appropriate manner (Art. 30a, Para. 2, Letters a to c AniWO)
- The organisers of events involving animals (exhibitions, sporting competitions) must ensure that a competent person is in charge of their care (Art. 30a Para. 3 AniWO). However, the owner remains the person primarily responsible for the welfare of the animals
- Participants must also comply with the following obligations (Art. 30a Para. 4 Letters a to c AniWO):
    a. Only healthy animals may participate in the participate in the event. Their welfare will be ensured
    b. The term "*healthy*" means that an equid does not show any clinical signs of disease or stress. Its coat or skin appearance is normal and its behaviour is appropriate to the equine species and situation
    c. The fundamental principles of equine welfare are observed at all times (Art. 3 AniWA):
    d. No animals that do not fulfil the breed specific breeding goals shall participate in the events[275,.276,.277]
    e. Foals that have not been weaned will only be shown together with their dams
- The event organisers will take action if participants do not fulfil their duty of care (Art. 30a Para. 5 AniWO)
- The AniWO allows the minimum stall dimensions to be disregarded for up to four days, but only to a limited extent (Appendix 1, Table 7 AniWO). If the animals are given sufficient movement or training every day, the period during which they may be kept in such accommodation and pens may be extended to a maximum of eight days (Art. 30b Para. 1 AniWO). In addition, the layout and lighting of the stabling must correspond to equine needs (Art. 30b Para. 2 AniWO).

[273] In its current meaning, the term event refers to non-permanent events, therefore of a temporary and one-off nature.

[274] 2.3 Strain, p. 20

[275] 2.3.4 Interventions that profoundly alter the phenotype, p. 23on page 23

[276] 2.3.5 Examples of interventions that profoundly alter capacity, p. 24

[277] 6.2Selection and occurrence of hereditary diseases, p. 223

5.10.3.1.1 Conditions of temporary stabling during demonstrations

The FSVO does not specify exactly how this temporary exception is to be understood. The exemption for stalls built before September 1st, 2008 provide an indication. They do not have to be adapted if their dimensions are within the tolerance values. These vary between 11.1% (8m^2 instead of 9m^2 for horses with a height of 148-162cm at the withers) and 14.3% (9m^2 instead of 10.5m^2 for a wither height of 162-175cm). These measurements can be considered to be slightly below the minimum requirements. For a short period of time, they do not substantially prevent an equid from satisfying its basic needs and expressing natural behaviour. In the opinion of the COFICHEV, a stall that is too small and has a higher deviation in percent from the requirements (depending on the size of the horse 12-15% or more) would no longer fulfil these conditions. This is even more true if one ignores the required increase of at least 30% for a mare accompanied by a foal older than two months.

The balancing of interests is not straightforward, as horses may be kept tethered (in standing stalls) during an event (Art. 59, Para. 1 AniWO). At first glance, however, they could be tethered in a standing stall that is too small, since the AniWO does not set a minimum requirement for such accommodation. However, at an exhibition, the restrictions temporarily imposed by the size and layout of accommodations are only justified if each horse can express its natural behaviour:

- Does not injure itself, is able to rest, lie down and get up again without difficulty
- Establish social contact with its neighbours, at least visually, audibly and olfactorily
- Is able to eat and drink regularly, is stimulated by the environment, and benefits from daily exercise movement through turnout or training.

5.10.3.1.2 Clarification of terminology

Article 2 AniWO defines what exactly is meant by stalls, stabling and enclosures. These terms are of general application and are further defined in the FSVO's animal protection fact sheets (OSAV, 2018a, 2018b, 2018c, 2022). It may also be noted that the AniWO does not characterise the terms feed manger and watering area (French: *mangeoire et celui d'abreuvoir*). According to the German version, they refer to places suitable for feeding or watering (*geeignete Futter-, Tränkeplätzen* or *Tränkestelle*). They therefore do not refer to automatic feeders or drinking troughs, systems that are covered by the terms feeding and watering devices (*Fütterungs- und Tränkeeinrichtungen*; Art. 66 Para. 1 AniWO).

Furthermore, feeding and care are appropriate if they meet the animals needs in the light of experience and knowledge of physiology, ethology and hygiene (Art. 3, Para. 3 AniWO). A number of principles can be derived from this legislation (AniWO) that must be observed:

- Equids shall be provided with sufficient and regular feed and water (Art. 4, Para. 1 AniWO)
- The AniWO does not specify what is meant by *receive regularly*, but it is considered that equids should be offered water at least every six to eight hours, using transport conditions as a reference[278]
- Demanding permanent access to water, which would allow them to drink ad libitum, is disproportionate. Offering equids water in a bucket on a regular basis or taking them to a watering point fully satisfies their natural need to drink and does not cause them to suffer from thirst
- The animals must be able to express species specific behaviour as relates to food intake (Art. 4, Para. 2 AniWO)
- Equids should have sufficient roughage, such as straw fodder, to satisfy their need to stay occupied, except when they are out to pasture (Art. 60, Para. 1 AniWO).

Not all exhibitions and events require a permit

Swiss federal legislation on animal protection does not require a permit for exhibitions and events where domestic animals are shown or used. On the other hand, events at which animals are bought and sold and where live animals are used for advertising purposes are subject to authorisation (Art. 13 AniWA). The AniWO specifies the conditions and the procedure (Art. 103 to 106 AniWO). For its part, the Epizootic Diseases Ordinance (Articles 27 to 31 EzDO) regulates the notification requirements and supervision of animals taking part in an event and the procedure to be followed in the event of an epizootic disease (CF, 2020). In addition, the cantonal authorities may require the organisers of competitions and sporting events to carry out doping controls on animals or to request such controls from the national sporting federation. The costs are to be borne by the organiser (Art. 16 Para. 3 AniWO).

5.10.3.1.3 Interpretation and practical consequences

Animals may be subject to justifiable strains at an event

Animals should not be exposed to more risks than are inherent to the nature of the events. This means that equids may be subjected temporarily to a limited number of strains justified by the event itself without affecting their dignity. For example, they exert themselves during a sporting event, are deprived of free movement (tethered, stalled) or social contact, or are exposed to noise, the presence of the public or sources of fear. These situations occur when animals from the same farm are separated for presentation to a jury and spectators. For this purpose, they are grouped according to age, sex or breed, and have to face unfamiliar conditions or animals.

[278] 5.8 Transport, p. 151

Measures in case of undue hardship

Exposed and overwhelmed animal exhibits signs of undue stress, including behavioural disturbances or persistent signs of stress. Where appropriate, the organiser or owner shall adopt appropriate measures to accommodate and care for the animal. In order to protect the animal from the public, the organiser or owner should provide additional possibilities for retreat including allowing for the animal to be removed from the event, moved to another location or for it to refrain from participation in certain activities (OSAV, 2016). Each case must be analysed in detail when weighing the interests.

5.10.3.2 The regulation of events

In general, event organisers issue regulations for the participation of animals, but their priority is to ensure the fairness and smooth running of the event. With a few exceptions, the provisions communicated on the sites concerning the health, welfare and control of equids are reduced to a minimum, even for exhibitions and auctions.

5.10.3.2.1 Parades

Parades are usually conducted without special guidelines to ensure the health and welfare of the horses. The organisers rely primarily on the individual responsibility of the participants. If they do issue regulations, they do not make them public. To avoid problems and respond to criticism, several organising committees have started to initiate certain measures. The tendency is to require basic riding skills and regular training. At the Sechseläuten in Zurich, officials have been requiring riders to have a riding certificate (brevet) and a blood alcohol level that does not exceed 0.5 ‰ (0.5275 g/litre of blood) since 2015. A person on foot must accompany a maximum of three horses to sedate them in case of need. A veterinarian must also supervise the horses participating in the event, the parade and the burning of the Böögg (SRF, 2016). The Carnival in Basel has also taken steps to improve the situation. Together with the authorities, it has set new requirements for the smooth running of the parade and for animal protection. The press reports mention the training and licensing of drivers, registration of carriages, accompaniment by a veterinarian, random health checks, the creation of several rest areas along the route, prior scouting of the route and disseminating information on the appropriate behaviour expected from spectators (Baslerzeitung, 2018; Janutin, 2019; Rédaction, 2018).

The example of regulation in North Rhine-Westphalia

Following a horse-drawn carriage accident in 2018, the Ministry of Agriculture of the German State of North Rhine-Westphalia developed guidelines for the involvement of horses in carnival parades (Hofmann, 2018; Landtag NRW, 2019). These aim to minimise the risks to horses, prevent accidents and ensure a uniform approach in the State. A fact sheet of the German Society of Veterinary Surgeons for Animal Protection contributed to this development (Beyer & Schwarzer, 2019). After evaluating and testing these guidelines in 2020, the carnival associations committed to implementing them starting in 2022 (Leszinski, 2022).

These measures are aimed at safety and welfare

These guidelines go further than the arrangements made thus far in the usual parades. Stimuli that cause physical and psychological stress reactions and that impair welfare and safety should be avoided or reduced as much as possible. Among other things, the regulations stipulate that the route must provide several places for the horses to retreat or take an alternate route. A veterinarian must be able to attend to a horse as quickly as possible, within maximum 10 minutes. The key to a safe and animal-friendly parade is careful pre-planning for qualified riders and drivers with properly trained horses, especially for special events (involving items such as projectiles or firecrackers) and without the use of sedatives. The horses should be either at the beginning or end of the parade and not near a marching band. At least one person must accompany each horse. The consumption of alcohol and other drugs is prohibited before and during the parade. The weight of the rider must not exceed 15% of the weight of the horse, while the total weight of the carriage being pulled must not exceed twice the weight of the horses.

5.10.3.3 The codes of conduct for filming and performing

Several organisations have developed strict guidelines to improve the treatment of animals used in film, performing, advertising and television. There are websites and codes of conduct in English-speaking countries, including England (RSPCA, 2020), Australia (NSW, 2020) and the United States (AH, 2015). They offer targeted support and guidance to those considering the use of animals in any production environment. The world's leading institution for the ethical use of animals in film (AH *American Humane*) devotes over 150 points to this topic in a lengthy chapter on equids and livestock (AH, 2015, 2018). It gives strict and very detailed recommendations on the handling and stabling of equids. In general, these codes ban the use of sedation or general anaesthesia for the sole purpose of filming a sequence, as these procedures pose risks to the health and welfare of the animals. Instead, they advocate the use of special effects and CGI (computer-generated imagery).

5.10.4 Stakeholder Interests

5.10.4.1 General

The legal and fundamental requirements are not discussed, as the neglect of the equids interests has been legally ruled unjustifiable. A weighing of interests is therefore superfluous[279]. Therefore, it is essential to first ensure that the legal requirements are met.

[279] 2.7 Weighing the interests, p. 31

The weighing of interests is needed to clarify some of the details of application

In weighing the interests of justifying strain at public events, the relevant issue is how horses should be stabled and used to respect their animality (dignity) and ensure their welfare. However, this is not a straightforward process, as the context varies according to the type of event. There is usually a major change of environment compared to the equine's normal living situation. More often than not, they are also far removed from the optimal conditions one would expect in a new, sustainable facility.

In order not to draw the wrong conclusions, a sound knowledge of equine ethology is essential to assess the signs of stress in an objective and reasonable manner. Emotions, instant impressions and prejudices should be avoided. In this context, it is essential to use the correct terminology - fear, dread or anxiety cannot serve as synonyms to characterise a situation[280].

5.10.4.2 The interests of equids

The previous section[281] has illustrated that Swiss legislation protects the interests of equids (Art. 3, 30a and 30b AniWO). During shows, exhibitions and other events, equids shall not be subjected to stress including pain, discomfort, harm or anxiety[282]. To prevent the threat to animal dignity and welfare, organisers should take measures to meet the basic needs of the equid participants:

- They shall be fed and watered taking into account their normal feeding behaviour
- They will be given sufficient movement and safe rest periods
- They will remain active and stimulated by their environment
- They are able to express species specific behaviours (social contact, unhindered movement)
- Their coping skills will not be overtaxed.

Furthermore, any use will be adjusted to the individual needs of each animal. It should be borne in mind that inactivity promotes obesity and metabolic disorders, especially in ponies and donkeys.

5.10.4.3 Human interests

5.10.4.3.1 The public

The organisers will take into account the interests and sensitivities of the public

Several human interests are identified when engaging equids in shows or events. The first interest is the public, who like to see equids and be entertained. However, humans will renounce these pleasures if they feel that the animals are being mistreated. Moreover, there is a growing social interest in this issue, which is reflected in the media and social networks.

For their part, the organisers do not always explain why the use of animals is necessary. They often do not convincingly publicise the measures taken to respect and ensure animal dignity and welfare. These measures are not only related to the event itself, but also to the conditions for accommodation, training, transport and rest, as well as to the natural needs to be met. As for the persons responsible (both for the event and for the equids), it can be easy to focus on the success and benefits of the event, which can then be used to their advantage in terms of reputation and finances. The great temptation is to focus too much on these benefits and to leave the equids in the background. It is easy to understand why a lack of communication and transparency raises feelings of curiosity, mistrust and criticism in concerned, adversarial or maladroit circles. Moreover, the negative images conveyed result in prejudice towards the whole sector. Finally, the equine sector defends the interest of seeing equestrian events become an opportunity to promote appropriate relations between them and a new public – in particular young people.

5.10.4.3.2 Event organisers

Organisers of traditional events want to perpetuate customs. They generally react with reservations to requests to improve the conditions for equine participation. The stakes seem so high that they find it impossible to abandon the customary contribution of animals. For the time being, the defence of the dignity, welfare of equids and their usefulness does not suit the interests of traditional events.

The appeal of tradition may not be enough to sustain an event

In the long run, the lure of tradition alone may not be sufficient to maintain public tolerance of what may be perceived as abuse. A growing number of spectators show their opposition by deserting cultural events that do not take convincing steps to improve the welfare of equids. The effort of education and communication is proving to be very important. Indeed, a certain number of organisers have long let people think that animal welfare issues were not among their priority concerns or that they did not address them in a substantial and thorough manner.

5.10.5 Alternatives that allow the same results with less strain

There is no real alternative to correcting the extreme conditions of use, except to give them up completely. Moreover, the numerous examples of exhibitions and events do not allow all of the possibilities to reduce the strains and achieve the same objectives to be detailed within this document. However, organisers can take measures to improve conditions. The choice of horses and their

[280] 2.3.2 Anxiety, p. 22

[281] 5.10.3 Policy and regulatory context, p. 199

[282] 2.3 Strain, p. 20

training are opportunities to define ways of reducing stress and pressure to a level that justifies the involvement of equids in public shows and events.

5.10.5.1 Alternatives in parades

5.10.5.1.1 The choice of horses and their partners

Selecting equids that are suitable for a public event can weaken responses to stressful stimuli (Bohnet, 2020). Prior to selection, equids should be subjected to a thorough veterinary exam to determine the health and physical condition of the horse. Healthy and fit horses should be able to provide and withstand the envisaged exertion. An individual behavioural test can then take into account the level of expected distress factors. In the case of parades, it is intuitive that stallions should be avoided. Geldings are preferred to mares due to the regular heat cycles of mares. Young horses under six years of age are unlikely to have sufficient behavioural maturity. Horses over 20 years of age should not be considered but if their participation is required, selection should depend on the results of the test.

Undoubtedly, a number of equids are not suitable for all possible types of exercise. Those responsible will therefore concentrate on the most appropriate procedure that safely identifies those individuals that are unfit and those that could be fit with appropriate training.

Assessing the competence of people

The skills of the people who care for, ride or drive the horses should also be checked regularly and repeatedly, particularly in the selection and training of the horses. The successful completion of a sports certificate or license remains a prerequisite but is not sufficient to ensure the ability to withstand strains caused by the event itself and any unforeseen events.

5.10.5.1.2 A behavioural test

Figure 71 Illustrations of various activities during a behavioural test (Source: Hartmann E et al, 2021, https://www.mdpi.com/animals/animals-11-00457/article_deploy/html/images/animals-11-00457-g003.png, Creative Commons Attribution License (CC BY))

The organisation of such a test requires knowledge of different equine behaviours (Rankins & Wickens, 2020). In summary, each individual is distinguished from its conspecifics by gradual variations in several behavioural traits, not just one in particular. The sum of these traits constitutes the individuality of an equid, and therefore its self-worth (animal dignity) to be respected. This behavioural profile[283] remains fairly stable as the horse ages, even if it is progressively modulated by experience and the environment. This relative constancy makes it possible to predict to a large extent the interesting characteristics of adults, for example during events.

Today, ethologists have developed a number of tests to help breeders choose the most suitable animals for certain people and practical conditions (Figure 71). These tests are also useful in assessing the most important traits for participation in public events. Examples include the reaction of fear to an unfamiliar object, startled reaction to a surprising stimulus (opening an umbrella) or how a horse reacts to a one-off social isolation. This selection process should be repeated at regular intervals, ideally before each event, with a record kept of each result.

5.10.5.1.3 Individual training to reduce stress factors

Once the right horses have been chosen, the horses and the riders and drivers for the event will be ideally prepared. The training should be based on the mechanisms of reaction to stressful stimuli.

[283] Some call it character, temperament or personality of a horse. There is no universal and consensual definition.

Accustoming a horse to a new environment without the use of sedatives

When a horse is faced with a certain level of stress from a different environment than it is familiar with, it calls upon its individual capacity to adapt. This type of learning is called habituation. The objective is to gradually reduce the amplitude of the reaction (for example fear, then flight) by repeating the stressful stimulus in successive stages. It is then abolished when the nervous system no longer processes the information. This process is reversible, however, and the response may reappear if the stimulus has been absent for a long time. It therefore requires patience, especially in the case of strong stimulation.

In concrete terms, each horse will be confronted with all kinds of situations that it may encounter during the event in which it will participate. In addition, all necessary safety measures must be taken and exercises should be adapted to the type of event planned (parade, show). This training will teach the equid to naturally cope with stress without the influence of substances, particularly sedatives or practices normally prohibited in equestrian sports and racing.

However, exposure to a stressor is not enough for all horses to become acclimatised and no longer react to it. The more the environmental conditions deviate from their normal routine (number and intensity of changes), the greater the effort required and the more likely it is that their welfare will be compromised. The equids adaptive capacities are then overstretched. Different equids respond in different ways depending on their temperament (flee, freeze or attack). This is why such horses should be identified during training in situations that are as close to reality as possible, and if they are unable to adapt, they should be assigned to other activities.

5.10.5.1.4 Example of training for a parade

When participating in a parade, horses should be prepared step by step for the noise, different smells, proximity of the crowd and unaccustomed agitations of an urban environment. There are many sources of sudden noise to which the horses must become accustomed: firecrackers, fanfare, loudspeakers. At first distant and of low intensity, these gradually increase in intensity until they become thunderous. The horses must also be used to being targeted with various projectiles on the legs or body (confetti, water balloons), smoke bombs, unknown people or vehicles. This training can be compared to that of mounted police horses (Feray, 2019; Lelláková et al., 2021).

In addition, the most stressful situations specific to parades, such as slowing down and bottlenecks that can cause stoppages, should be trained. As horses calm down when they are still moving, walking in a small circle must also be practiced. Special preparation of horse-drawn carriages should be organised with the help of competent trainers.

5.10.5.1.5 Alternatives for parade organisers

In order to make the training more effective under real conditions, those responsible for the parade need to take appropriate organisational measures. How they prepare for the parade often allows room to reduce the psychological burden on the equids. Examples of guidelines from other countries can be used as a basis[284].

In short, precautions should include arrangements to avoid the stressful effect of a stop and keep the groups moving (no bottle-necks, appropriate distance between groups, enough room to allow the horses to turn, alternate loops). Even if the horses are equipped with appropriate hoof protection, slippery areas on the route or areas that pose danger (manhole covers, streetcar tracks, pedestrian crossings, confetti) should be identified. In addition, organisers should provide a professional team of veterinarians competent to authorise the departure of the selected equids, monitor them and treat emergencies as necessary. Finally, they need to develop an information and communication concept to underline the importance attached to the dignity and welfare of the animals. In particular, they should emphasise the fact that they do not consider the animals as mere value-adding elements of the parade, but that measures are being taken to ensure that the animals are not negatively affected.

5.10.5.2 Alternatives for filmmaking and performing

The *American Humane* (AH, 2018) guide contains advice on keeping equids. In particular, it covers exercising, training (humane training methods, level), equipment (saddles, harness, bits, spurs, shoeing), monitoring and veterinary examinations, the sex of the animals (geldings are recommended), reserve horses, recommended season and time of day, prevention of thermoregulation disorders and safety measures. In addition, no medication (anaesthetics, sedatives, laxatives, analgesics) should be administered to any animal for the purpose of filmmaking.

There are special rules for stunts, falls, the use of vehicles with animals, water scenes, races, rodeos, jumping, and the use of simulation (branding, death of an animal) and computer-generated images. In summary, the level of detail in the requirements goes far beyond what is usually found in sports regulations or legislation.

5.10.5.3 Alternatives to live pony carousels

If abolition is not an option, the only alternative to carousels is to have them run by competent people. Those in charge need to adapt the infrastructure so that it is appropriate for horse riding (generous dimensions, good quality footing, change of direction). In addition, they should provide the animals with living and working conditions that guarantee the satisfaction of their basic needs

[284] 5.10.3.2 The regulation of events, p. 201

(provide hay and water, regular rest periods, social contact, a stimulating environment, opportunities for retreat). The AH guide[285] also contains precautions that reduce strain, do not cause undue stress and respect the dignity of the horses.

Furthermore, operators should fill the information gap for the public not only on how to behave towards equids, but also on their natural behaviour. Targeted communication would also communicate the measures taken to protect their dignity, ensure their welfare and reduce the effects of the environment.

5.10.5.4 Alternatives at shows and breeding competitions

Unavoidable strains

The very nature of the circumstances of a show or breeding competition imposes certain strains for which there is no real alternative[286].

Identify and correct stressors

In practice, the alternatives consist first of all in analysing the sources of strain and then correcting them. It should be noted whether the disturbance poses a risk to the dignity and welfare of the equid, particularly if the strains place excessive demands on the animal's coping skills. In this respect, the legal provisions requiring improvement (Art. 4, 5, 7, 8, 11, 12, 13, 16, 21, 30a, 30b, 34, 59. 61 AniWO) should be considered. As far as equine specialists (veterinarians and ethologists) are concerned, their responsibility could be extended to advising other stakeholders in order to ensure that all those involved participate in the search for alternatives to reduce strain. The conditions for keeping an equid must be improved in the following situations:

- An unsuitable tethering system (too long, too short, rope or knotted halter, bridle) or insufficient space prevents the horse from resting, standing up or lying down
- The floor is not provided with sufficient clean and dry bedding. It is not hard and non-slip
- The equid is not able to establish social contact with another equid and express natural behavioural traits. It is deprived of movement or exercise
- It is not fed and watered enough
- It is not sufficiently stimulated or kept occupied by its environment, it does not have roughage or straw
- The stable/stall contains objects or areas where the animal can get stuck or injured
- There is insufficient light and the stable climate is inadequate, particularly due to toxic emissions and abundant dust
- It is exposed to excessive noise for a long time
- The animal has not been examined by a veterinarian to ensure that it is in good health and good physical condition. It is not protected against the risk of disease.

5.10.6 Results of the balancing of interests and justification of strain

5.10.6.1 Comparison of parades to equestrian sports

To compare parades and other types of processions with equestrian sports, the Code of Ethics and the Veterinary Regulations of the SE (FSSE, 2018 a, 2018b, 2018c, 2018d) can be used as a basis. The clear hierarchy of values emphasises that equine welfare always takes precedence over personal pride and commercial interests.

5.10.6.2 Preconditions for justifying the strains of a parade

Flight instinct cannot be used as the only argument to justify criticism

The public and some observers at shows or competitions regularly use the flight instinct of horses as an argument. They argue that any situation is unjustified if it is potentially uncomfortable, embarrassing or dangerous for the horse and the public, or if it impresses or shocks them. It should be remembered that the horse will only flee in response to a sudden, negative emotion of a certain strength, such as fear. An unpredictable, rapid and energetic change in its surroundings or a sudden and violent noise from an unidentifiable source may provoke it. However, when a stimulus is felt less strongly (because of distance, lower intensity or habituation), it is less effective. As a result, the reaction is expressed only as a simple startle, an avoidance movement (sideways or backwards) or an unsuccessful attempt to escape.

Strains are only justified if several conditions are satisfied

The choice of what horses to use is based on their ability to withstand stress. The organisers will provide information on this process – as discussed in previous paragraph[287]:

- Persons responsible nominate horses according to their favourable behavioural profile
- Horses are prepared for the event in a targeted, gradual and repeated manner, to respond weakly to stresses and not to show aggression or try to run away. Properly prepared equids pass the tests without the use of sedatives or aids
- The training sessions and tests are documented. The results are communicated publicly
- Veterinarians check the physical condition and health of the horses either on the day of their participation or the day before

[285] 5.10.5.3 Alternatives to live pony carousels, p. 205
[286] 5.10.2.4.3 The strains, p. 197
[287] 5.10.5 Alternatives that allow the same results with less strain, p. 202

- Horses not selected after failing to respond to training or due to poor health are assigned to other activities
- The organisers study the places on the route that can cause slips or slow downs in detail - these can be a source of stress or accidents - and take appropriate action to eliminate these risks.

5.10.6.3 Administration of sedatives

The administration of sedatives (especially neuroleptics) causes undue stress in horses undergoing physical exertion. Central psychomotor inhibition (e.g. acepromazine) leads to reduced alertness, impaired motor activity (hypokinesia) with muscle relaxation and a transient fall in blood pressure (hypotension). The substance thus depresses respiratory functions and exerts a toxic effect on the muscle cells (Courtot et al., 1975). In stallions and geldings, it can also cause a prolapse of the penis.

Side effects and undesirable paradoxical reactions of acepromazine

According to veterinary practice, a horse should be allowed to rest for 36 hours, without being ridden or driven, after the application of acepromazine (CliniPharm/CliniTox, 2019). There are also dangers associated with its side effects. Increased sensitivity to loud noises and rapid movements can lead to an interruption of sedation and paradoxical reactions (excitement, panic), especially if the animal is already agitated or in a state of stress. There is also a risk of sudden weakness with loss of consciousness. Finally, sedatives are among the substances prohibited in equestrian sports and racing because they influence performance.

In conclusion, the administration of neuroleptics to horses prior to riding is a real danger as it can affect their health, welfare and performance, including their ability to move safely.

Ethically unacceptable justifications

To justify the use of a sedative, some argue that it is in the horse's best interest as it makes the equid less vulnerable to stress and avoids anxiety. This argument cannot be accepted. First of all, one strain (stress) may not be replaced with another (negative impacts of a sedative), especially where medication could be circumvented with proper selection and training. Furthermore, the explanation assumes a preference for tackling the effects of strain (anxiety, fear, panic, accidents) rather than the sources, which can be reduced to a minimum. Along these same lines, it could be considered ethically responsible by analogy, to use a unfit horse being treated (lameness, infection, other pathologies) in a parade without giving priority to the causes. Finally, the risk of negative effects of a sedative on the organism outweigh the disadvantages (resources, time) of prior selection, appropriate training and improvements to the route. There is no justification for foregoing these options.

Nor should discussions about the comparison of the quantitative and qualitative aspects of these types of strains be encouraged. The measures that can be taken along the route and the selection and preparation of suitable equids for a parade are very credible and proportionate alternatives. They significantly reduce the number of animals subjected to stress factors. Finally, a participant could argue that their own interest outweighs that of the horse, as they need the horse to take part in the event due to their own political function for example. However, in moral terms, the weight of the mundane requirement of appearance on horseback is inferior and unworthy of protection. If the importance of an individual's obligations and social status is such that this person cannot be reasonably expected to walk the route on foot, the alternative is obviously to choose a horse that is well prepared and with which this person has taken the time to train adequately.

In conclusion, the emphasis on the health and welfare of horses outweighs other interests, particularly as solutions are available to minimise the risk of strain. Furthermore, there are several issues that are not only unethical (McGreevy et al., 2018), but also legally unjustifiable (Art 16 Para. 2 Let. e and g AniWO).

5.10.6.4 Equids in shows

The justification for the use of equids in entertainment (film, television, theatre, other art forms) is the first point to be considered. In essence, their involvement is not fundamentally different from that in equestrian sports. All these uses represent a potential source of strain (Magalhães-Sant'Ana, 2020). The film industry probably has a high responsibility due to its large and numerous audiences. In this respect, depicting violence and cruelty to animals is abhorrent. These scenes have a detrimental effect on children and adolescents, even if they remain virtual or simulated and do not cause direct harm to animals.

An educational role

The ethical use of animals in films can play a useful role in educating the public about animal welfare and the benefits of harmonious relationships between animals and humans. The *Horse Whisperer* (1998) has had a very positive influence on contemporary human-equine relationships in this regard. One example is the amount of time it takes Tom Booker, the central character, to revive the soul of a damaged horse and to wait for it to come to him by favouring communication through body language and eye contact.

Respecting the needs of horses before, during and after their engagement

The use of equids is only justified if all sequences respect their dignity and ensure their welfare. In particular, strain should be kept to a strict minimum before, during and after their engagement and stabling at the filming location. Applying the measures set out in the codes of conduct (RSPCA, 2020; SPCA, 2020) is generally sufficient to meet these conditions.

In short, these codes advocate the use of domestic animals in entertainment (cinema, television, theatre) only if their needs are guaranteed before, during and after the performance. Their involvement can only be justified if their activity is adapted to ensure their welfare and that it does not cause undue hardship (pain, aches, harm, anxiety, physical or psychological distress).

Consequently, the animal's needs will be placed before those of the production and the public. This will be achieved by handling and training them without force using methods that cause little strain (SPCA, 2020; ISES, 2018). In addition, they will not be given any medication (anaesthetics, sedatives, analgesics). However, a global assessment of the circumstances and the horses is not enough. Each case and horse must be studied individually and discussed with the producers. All alternatives need to be examined that could achieve the same objectives and at the same time guarantee that each individual animal has the necessary capacity to succeed in the exercises required.

Finally, veterinarians should not administer sedation or induce short general anaesthesia for the sole purpose of performing a scene. These procedures can cause harm without providing any benefit to the animal (Magalhães-Sant'Ana, 2020).

5.10.6.5 Live pony carousels

Carousels of mounted and tethered ponies that run all day in the same direction cannot continue this mode of operating[288]. They are a source of unjustified strain, as they hinder the equid's range of movement for a long time. In addition, ponies are permanently, or for a large part of the time, deprived of the opportunity to satisfy their natural needs such as rest, free movement, social contact and feeding behaviour specific to their species. The balance of interests is clearly in favour of the animals. Several alternatives exist[289], including much less restrictive ways of introducing children to horse riding and fostering relationships with equids, as well as keeping them in respectful conditions. These possibilities also provide good opportunities to properly inform the public about the nature of animals.

5.10.6.6 Shows and breeding competitions

Shows bring together equids from different locations. Their meeting on arrival at the show site entails certain strains. As outlined in a previous section[290], organisers and participants have legal obligations to ensure that the animals are not exposed to more risks than are inherent to the event. It is therefore accepted that they may be subjected to temporary restrictions. However, these restrictions should be limited to protect their dignity and welfare. In particular, they should be spared pain, suffering, harm and overexertion. An honest weighing of interests is essential.

The difficulties of identifying unjustified strains upon arrival of the horses

The mere observation of aberrant behaviour is not sufficient to infer the presence of a major strain. Striking behaviours may be linked to exaggerated public intervention. However, they may also result from the motivation to satisfy natural needs. In particular, equids instinctively seek out social contact with new horses and display an expectation of food and increased musculoskeletal activity in an unfamiliar environment. For each situation, a detailed, objective and, above all, long-term analysis should be carried out. This avoids, for example, confusing the normal phase of relationship forming between young horses with strain caused by aggression. Nor should the calm that follows be confused with resignation which, in behavioural terms, reveals a situation of learned helplessness.

The risk of jumping to conclusions

Unwise people use their own criteria to assess a situation. Goodwill guides their approach to sometimes very relevant points (PSA, 2020b). However, an expedient observation of social, natural and transient behaviours does not lead to a real and detailed weighing of the interests of the parties involved[291].

This type of approach does not lead to the conclusion that there are lasting strains. In other words, it does not convincingly demonstrate that equids are exposed to more risks than are inherent at an event. Nor does it allow the argument that the agitation of the animals on arrival are indicative of pain, suffering, harm or overexertion, all of which would constitute strains to be avoided. It also does not explain why it would be difficult for young horses to express natural behaviour when they meet unfamiliar horses. It is important to recognise that this is the only way that horses cope with a new environment, for example by establishing a hierarchy with their neighbours. On this basis, it is wrong to conclude that they are overwhelmed by the situation and that they should be stabled and cared for in some other way.

Social interactions between equids and the presence of the public do not cause undue strain

The adaptability of the horse is very high and is expressed in some typical attitudes, notably that of meeting social challenges by interacting with conspecifics. They are thus able to satisfy natural needs even in a domestic environment. Affiliative relationships that develop through play and mutual grooming enrich their environment and represent a part of their dignity. This is very important because confinement degrades their welfare and, in the long run, encourages stereotypies, particularly in young horses.

Numerous scientific studies (cited in Hartmann et al., 2012) demonstrate that the risk of trauma during social interactions between mares and geldings is not a major problem. The purpose of these interactions is not to attack physical integrity. Even stallions usually display only the minimum amount of aggression required by the situation and encounters rarely turn into serious fights that result in injury (Briefer Freymond et al., 2013; HNS, 2018). Ordinarily, injuries observed, if any, are only superficial and

[288] 5.10.2.3 Live pony carousels, p. 194
[289] 5.10.5 Alternatives that allow the same results with less strain, p. 202
[290] 5.10.3.1 Swiss legislation on events, p. 199
[291] 2.7 Weighing the interests, p. 31

cosmetic in nature. However, if perpetual or extremely stressful stimuli are identified, their intensity and frequency should be reduced so as not to overwhelm the horse's adaptive capacity. In this regard, an individual should be repurposed or relocated if its ability to adapt is exceeded and the equid is visibly unable to adapt to the situation despite interventions to calm it down.

In conclusion, the COFICHEV considers that the usual presence of spectators at a show does not place excessive demands on the horses' ability to adapt and does not constitute a source of undue hardship. However, it is necessary to inform the public about appropriate behaviour.

5.10.7 Recommendations for implementation

- Event organisers are encouraged to consider carefully, with the help of equine ethologists if necessary, the circumstances in which they engage equids. They shall provide opportunities for each animal to meet its basic needs[292], respect its dignity and ensure its welfare. This is a legal obligation
- In order to improve the living and working conditions of the animals, organisers will take into account the particularities of their event. They will establish guidelines to prevent unjustified strains. If necessary, they will draw on the various codes of conduct and other relevant publications
- Organisers will also place great emphasis on communication with the media and providing information for participants and spectators. This communication will highlight several points:
    a. The need to improve the living conditions and use of animals (dignity, welfare, social concerns, reassuring visitors, informing participants)
    b. The natural behaviours of equids that can be observed during an event constitute their own value to be respected (animal dignity). They respond to their fundamental needs (interactions between conspecifics, activity, differences between the sexes, rest, exploration)
    c. Confusions to avoid: seeking social interaction *vs.* aggression, alertness *vs.* anxiety, calm and obedient *vs.* learned helplessness
    d. The intensity and duration of the strains caused by the very nature of an event: unexpected gestures from spectators, applause, loud music, a mixture of horses from different origins, fireworks, unfamiliar surroundings, specific stabling conditions
    e. The time required for a horse to become accustomed to a new environment (individual adaptive capacities, persistence and strength of stimuli)
    f. Prohibited practices and situations (sedatives, social isolation, neck hyperflexion, insufficient or inappropriate bedding)
    g. The measures taken to prevent, reduce or eliminate strains: carefully select, prepare and monitor the equids according to the requirements of the event
    h. Desirable conduct of spectators and other participants
- The COFICHEV recommends the creation of a fact sheet devoted to the various conditions of stabling and use of equids (parades, exhibitions, breeding competitions, equestrian sport). It should specify the concrete application of Articles 30a and 30b of the AniWO
- The cantonal authorities are encouraged to increase the number and scope of checks at public events. If necessary, they should carry out tests to detect the use of substances or practices intended to modify behaviour or performance (Art. 16 Para. 3 AniWO). If necessary, legislation or directives will specify how and what.

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[292] 5.10.3 Policy and regulatory context, p. 199

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5.11 The end of life of horses: euthanasia or retirement?

5.11.1 Description of the current situation, trends, strains and risks

The analysis and the way in which the parties involved in equine end of life decisions perceive the conflicts of interest (those of the owner, the veterinarian and the animal itself) and their resolution play a key role in the ethical reflection process. The legislative and regulatory context, as well as the importance that the practitioner attributes to these respective interests, are major points. It should also be noted that a consensus between the specialist (veterinarian) and the owner is not on its own sufficient to legitimise all actions that result in strain. Dignity is affected if these actions are not justified.

The death of an animal is the most relevant harm it can suffer

The AniWA (Art. 4, Para. 2) requires that no one cause unjustified pain, suffering or harm to animals. A person shall not put them into a state of anxiety or otherwise violate their dignity. Yet, in this respect, death is clearly the most significant harm imaginable. Yet the AniWA does not contain any regulations that protect animal life. More to the point, it considers that the dignity and welfare of animals does not include the right to life. Thus, Swiss legislation has not sought to encourage their preservation at all costs but has limited the regulations to repressing cruel or malicious killing. This is why the law regulates this process using slaughterhouses. The interest that justifies it is the eating habits of a majority of the population that consumes meat products (Figure 72). The AniWA implicitly considers the interest of human meat consumption to be overriding. On the other hand, enough vegetarian alternatives take into account the individual values of people who refuse to eat meat products.

Figure 72 Sign for a horsemeat butcher shop (Photo: personal collection)

The strains at the end of life and the justification of euthanasia

The issue of equine sacrifice is complex. While meat production legitimises the killing of livestock, the situation of companion animals is more difficult[293]. Indeed, the analysis of the situation is based on respect of their dignity. An ethical principle stipulates that the person caring for an equine animal assumes a responsibility for their stabling and use. This also extends to deciding, for example, if an animal with an incurable disease should be put down. The care of old or injured horses in order to prolong their lives is an ethical concern. However, this issue goes beyond the legislative framework of animal protection and remains a matter of individual commitment. This responsibility commences in the period before the horse is euthanised, from the onset of the first signs of injury or disease. Consequently, the end of life of an equine begins as soon as it can no longer provide any lasting service and can no longer benefit from acceptable living conditions. For example, if it can no longer be stabled, cared for and treated in a manner appropriate to its condition (Art. 5, Para. 2 AniWO) or be turned out for at least two hours a day (Art. 61 Para. 4 AniWO).

Issues of concern to veterinarians and owners

End of life issues of animals and respect for their dignity have been of concern to veterinarians for many years (ASPM, 2018; Dürr et al., 2011; Fahrion et al., 2011). When making decisions, veterinarians are not only confronted with medical issues, but also with legal, social, ethical, emotional and economic aspects. The challenges they face (Kleinpeter, 2020; Kunzmann, 2020; McGowan, 2012; Smith et al., 2021, Springer, 2019) touch on a few major issues:

- The impact of ageing and permanent medical treatment on the welfare of an animal
- Therapeutic relentlessness, which in some cases constitutes a reprehensible act of cruelty
- The requirements for euthanasia of convenience
- Financial contingencies.

The debate on equine end of life was rekindled by the 2012 scandal where horsemeat was fraudulently introduced into lasagne. Two unexpected statements illustrate this. HRH Princess Anne, president of *World Horse Welfare*, broke an Anglo-Saxon taboo in 2013 by praising the merits of horsemeat (Duffin, 2013; World Horse Welfare, 2013). Her reasoning was based on the frequent abandonment of equids in the UK due to the high cost of both euthanasia and correct disposal of the remains. She argued that the value of horsemeat would reduce abuse. The president of the French Equine Veterinary Association (Avef) pleaded in 2014 to open up the meat industry to all horses. Horses should be able to eat only grass for six or eight months to make them fit for consumption after eliminating drug residues (Neveux, 2014). These proposals have remained without major follow-up.

Veterinarians need to be prepared to support clients who are dealing with the complexity of caring for older horses. They do not have a specific tool to assess their quality of life, however, they can use the AWIN protocols to help them[294]. Their advice is a very important factor in owner decision-making. To this end, stakeholders should always consider the natural needs of the animal. Feeding behaviour (chewing), resting behaviour (lying down, standing up), free movement and health. In addition to age, the presence of a chronic disease should also be taken into account. A recent study (Ballou et al., 2020) found that only approximately one-third of horses over 20 years of age had been free of chronic disease for more than three months. These obligations represent a significant emotional burden, which should be added to the time required for care. Several institutions (AAEP, 2016; BEVA, 2009, 2021; EU, 2017; FEEVA, 2018) have developed guidelines to assist veterinarians and owners in the management of chronic conditions that have a lasting negative impact on quality of life. BEVA released a list in 2009 of cases that require either emergency euthanasia, a period of reflection or the opinion of a second veterinarian.

[293] 4.2 Equids: livestock or companion animals?, p. 42

[294] 2.4.1.2.4 The AWIN protocol, p. 28

5.11.1.1 Longevity and the end of life

Concepts that need to be clarified

The maximum lifespan of equids is estimated to be 30-40 years. A few publications report a genetic component of longevity in horses (Braam et al., 2011; Ricard & Blouin, 2011). However, it remains difficult to specify due to the lack of accurate demographic data in most western countries. In Sweden, the median age of ridden horses is about 15 years for males (geldings and stallions) and 22 years for mares (Wallin L et al., 2000). In Switzerland, the percentage of horses retired from active competition, no longer used or retired, seems to have increased over the last decade. However, there are no figures on the number and age of horses retired, nor the reasons behind the decision. Nevertheless, there is a clear ageing of the equine population in Switzerland. In 2021, the average age was 14.7 years, compared to 13.2 years in 2016 and 10.6 years in 2012 (Identitas, 2022; Schmidlin, 2013). The proportion of senior equids has also increased. While 10% of equids were at least 20 years old in 2012, this proportion increased to 20% in 2016 and to 25% at the end of 2021 (Identitas, 2022; Schmidlin, 2013). At the end of 2021, almost 47% of adult equids (48,416) were 15 years or older (Identitas, 2022). This gradual ageing has also been observed in France. In this country known for breeding, the average age has risen from 8.4 years in 2008 to 9.9 years in 2016. In 2020, 52% of all equids were 20 years or older, a sharp increase from 8.4% in 2008 (IFCE, 2019; 2021).

End of life considerations for equids

Advances in animal husbandry and veterinary medicine in geriatrics (Doligez, 2018; Raemy, 2017) are improving the life expectancy of equids. On the other hand, their high status in the hierarchy of domestic animals and the emergence of retirement centres and rescues are postponing the time of euthanasia. The criteria that contribute to the end-of-life decision process remain individual, personal and subjective. They depend both on the relationship between the individual and the equid, the type of use (for income, companionship, sport, breeding, hobby, racing), its physical and psychological health and the financial or emotional benefit that it generates. However, ambition, economic interests or an excess of sentiment can lead to neglecting the welfare and dignity of an equine that no longer possesses the capacities essential for its use. One thinks in particular of the infertility of a mare or stallion, the deterioration of competitive abilities or an incurable disorder (when its health is impaired by stereotypy, lameness, blindness, senescence).

The desire to keep a horse alive as long as possible is understandable. Nevertheless, the question arises as to how much more justification can be given for the strain of an impoverished existence versus death, and vice versa. The fact is that the risk of not parting with a horse also involves the risk of suffering and stress. Considering an equid as a companion necessarily makes the questioning of its future when it is no longer useful singular in nature. It becomes all the more acute as the conditions of stabling remain demanding. In addition, the possibilities of medication use for companion animals is more extensive than for livestock[295] and can influence the quality of life of senior horses.

The question then arises as to what extent and under what circumstances the retirement of a horse is more respectful of its dignity than putting it down. It is therefore essential to evaluate the quality of life of older horses.

5.11.1.2 The strains of euthanasia: chemical euthanasia or slaughter

Putting down a horse generates strain, which the owner/responsible person must keep to a minimum.

Euthanasia, a potential source of strain

The etymology (Ancient Greek ευθανασία = euthanasia) means good (ευ = eu) death (θάνατος = thanatos). It is most meaningful when an animal is put down without pain or stress. In Anglo-Saxon countries, the term euthanasia applies to all procedures: the administration of a lethal substance and killing with a piercing bolt or bullet (AEEP, 2016; BEVA, 2009).

Figure 73 An aged and ill horse. In the absence of a diagnosis, Equine Cushing's disease is suspected (Photo: Anne Ceppi)

Chemical euthanasia is difficult to perform in equids. A large volume of medication must be injected to cause the equid to lie down. With small animals (dogs, cats) the veterinarian or technician can hold the animal still during the procedure. Specialist equine veterinarians are familiar with a number of substances and methods; the preferred method should be chosen according to the health of the animal and should not cause pain or stress. In other words, unconsciousness is quickly achieved, followed by the cessation of vital functions. Chemical euthanasia also allows the animal to be put down at its home. This avoids the distressing situations associated with transport and the slaughterhouse. In all situations, patience is required from the owner because the procedure takes several minutes from premedication and narcosis to clinical death. The pain during the insertion of the catheter and the moment when the horse lets itself fall are the main strains. Equids react to these situations in individual and sometimes unexpected ways. These responses depend on the veterinarian's mastery of the technique and knowledge of the animal. Once the animal is lying down and unconscious, the injection of the lethal substance does not cause any strain.

[295] 4.2 Equids: livestock or companion animals?, p. 42

Conventional slaughter involving stunning the animal with a bolt, followed by exsanguination, also provides what can be called a good death if all the conditions are met[296].

Finally, euthanasia has a negative impact on the environment as it requires incineration of the remains or the production of animal meal (used as fuel). Specialised crematoria are available for various species, including equids, at a cost of up to CHF 2,700.00 depending on the weight of the animal (http://www.pferdekrematorium.ch/).

Slaughter

In recent years, the proportion of equids put down in a slaughterhouse has decreased dramatically. At the same time, there has been an increase in the number of Swiss horses registered in the ATD[297]. In the period 2016-2018, 36.7% to 40.0% of equine deaths were recorded as being by euthanasia or horses that perished on their own (HNS, 2020). These trends should be further analysed. In France, a recent study shows that it is up to 71%. This proportion rises to 80% for the 20+ age group (Merlin A et al., 2020). The subject of putting horses down in slaughterhouses and on the farm will be revisited in the next section[298].

Equids declared as companion animals (Art. 15, Para. 2, OVMP) may be admitted to low-capacity slaughterhouses. Their bodies are then removed in accordance with the legislation on the disposal of by-products (CF, 2022b). This offers a less burdensome alternative (CF, 2022a).

5.11.1.3 Retirement

The strain of retirement

Keeping an older horse in poor condition (Figure 73) is detrimental to its dignity and welfare. This situation can generate anxiety and stress depending on the severity of the pathologies and pain. This strain is relevant if it has to follow its fellow animals in a herd, defend itself to reach a food source or if its dentition prevents it from ingesting food properly. It should also be noted that an equid not in training must be turned out for at least two hours each day. It should also be remembered that, in the wild, an equid in poor condition either does not survive in the presence of predators or agonises for varying lengths of time.

Careful consideration should be given to the risks associated with environmental change. Depending on the stabling conditions, the welfare of an equid can deteriorate, especially if it is not familiar with group boarding. These problems are particularly noticeable in very old horses. In particular, the Horse Foundation does not accept horses over 23 years of age, as they have adaptive difficulties (https://www.philippos.ch/fr/nous-rejoindre/votre-cheval-age-chez-nous). In addition, a change in the rhythm of activities as well as the decrease in human contact and intensity of care are sources of physical and emotional stress, injury and boredom, especially for an animal that was in work its entire life. As a result, the lack of understanding of the physical and mental capacity of an older horse and the fear of permanent separation can lead to a relentless pursuit against its welfare. However, it should be emphasised that typical equine behaviour is to live in herds. Those that cannot be socialised remain rare. Finally, offering boarding for senior/retired horses is becoming a profitable niche for farms. There is an increasing risk that insufficiently skilled people will offer this service.

One point remains to be debated. Can the horse feel a sense of abandonment as a dog or cat would after having enjoyed a privileged relationship with a human? Is an equid's attachment to humans comparable to that of dogs and cats? To the Author's knowledge, the question of the existence of affect (Fraser, 2009) in animal psychology has not yet been addressed in horses.

5.11.2 Policy and regulatory context

The stabling conditions of older horses must comply with several requirements (CF, 2020):

- The physical and physiological functions of the equid are not impaired and their capacity to adapt is not excessively strained (Art. 3a AniWA)
- Equids must be able to get enough movement every day. Exercise or turnout are considered movement (Art. 61, Para. 1 AniWO)
- They must be turned out for at least two hours every day if they are not in work or at least two days a week if they are (Art. 61, Para. 4 AniWO)
- Turnout means: the ability of an equid to move freely outside, deciding on its own pace, direction and speed of movement without being constrained by halters, bridles, leads, harnesses, ropes, chains or other similar articles (Art. 2, Para. 3 Letter c AniWO)
- The AniWA does not prohibit putting animals down. However (Art. 26 Para. 1 Let. b), it prohibits, under penalty of imprisonment or fine, the cruel or malicious killing of animals
- The AniWO (Art. 5, Para. 2) stipulates that the owner of injured or sick animals must stable, care for and treat them in a manner appropriate to their condition. Failing this, the owner must have them put down

[296] 5.12.1 Description of the current situation, trends, strains and risks, p. 218
[297] 5.4.1.1 The Swiss Animal Tracing Database (ATD), p. 111
[298] 5.12.2 Policy and regulatory context, p. 220

- Animal welfare legislation does not describe under what conditions euthanasia should be carried out. However, no one may unjustifiably cause pain, suffering or harm to animals, put them in a state of anxiety or otherwise violate their dignity (Art. 4, Para. 2 AniWA)
- The AniWO contains several regulations for the slaughter of animals. In particular, Art. 181 Para. 8 stipulates that horses must be slaughtered immediately after arrival if the establishment does not have the infrastructure to house them in a humane manner
- The AniWO sets out the requirements for stable owners. It requires specific training depending on the number of horses held (Art. 31 AniWO)
- If an animal suffers an atrocious death as a result of negligence, it is assumed that this is a serious infringement of the animal protection regulations. Incapacity exists when a person is unable to follow the basic rules and prohibitions of the AniWA, for example due to mental illness, intellectual disability, alcoholism, or other reasons (Schnarwiler K, 2019).

By default, equids are classified as slaughter animals (Art. 3 OAbCV). This issue is discussed below[299].

5.11.3 Stakeholder interests and areas of conflict

Respect for the dignity of equids

The interest of a retired equid lies above all in the guarantee of its dignity and welfare. Without being strained, it should be able to express its natural behaviour and satisfy its basic needs, including optimal social contact and to move freely during turnout.

During the process of euthanasia, stress (transport, noise, waiting) and pain should be avoided. For example, a horse with a visibly irreparable fracture should not be transferred to a clinic, as it will suffer during the journey. This strain would constitute an attack on its dignity that cannot be justified by any overriding interest. If such an accident occurs during a sporting event, the first responders and attending veterinarian should take all measures to keep the injured animal completely out of sight of the public. This measure is important in order to avoid evacuating the horse alive at all costs or making a spectacle of its death.

Finally, delaying the time of death of an animal whose condition is impossible to treat or cure imposes unjustifiable strain. In this case, delayed euthanasia is a serious breach of ethical principles and the obligation to provide appropriate care (Art. 5 Para. 2 AniWO).

The strong emotional interest of the owner

As far as the owner is concerned, his or her interest in retiring a horse is primarily emotional. The owner therefore often postpones the moment of definitive separation. In this way, the owner accepts to prolong the equid's existence, even in the absence of use. This decision allows the owner to defend or promote his or her values, for example, to prevent the horse being used for meat consumption. Others gain satisfaction from providing their animal a quality end of life period. However, the owner incurs regular costs financing the retirement. There are also additional costs should the owner consider buying a younger horse. This is a challenge, especially for those who intend to continue their equestrian activities. Some people, however, are very attached to their senior horse and want to choose the time of its death. They want to spare the equid the risks and stress caused by a slowly deteriorating condition and a change of environment. Above all, they decide not to keep the equid alive in order to satisfy their own sense of compassion.

Economic interests

Boarding retired equids is becoming a lucrative niche for farmers. Suppliers of medication and feed supplements for older horses, as well as veterinarians, are also interested parties. Extending the life of a horse means that there is more care to provide.

Sending an equid for slaughter is also financially worthwhile for the owner of a livestock animal. Euthanasia is relatively expensive (at least 500.00 CHF for an adult horse). On the other hand, slaughter allows for the value-added processing of the meat and a small profit. The socio-economic difficulties surrounding this subject accentuate this phenomenon.

In summary, the values defended in favour of equids require that their welfare not be hindered and that they are able to grow old in good health even if they can no longer be used. Therefore, putting down incurable animals whose natural needs can no longer be met will not be questioned.

5.11.4 Alternatives that give the same results with less strain

There are no alternatives to putting down sick and incurable horses. The choice to let them die violates their dignity, as the agony causes them pain, suffering or harm and puts them in a state of anxiety. The only thing left to do is to develop techniques that are the least restrictive for the animal and the most respectful of its dignity.

Chemical euthanasia at the equid's own stable and according to good veterinary practice can replace slaughter. To avoid the stressful handling of intravenous catheterisation and inducing anaesthesia, the use of a bolt gun at the stable can also be consid- ered. Some veterinarians and butchers are willing to do this. If the procedure is well executed, e.g. with prior sedation, it is carried out without agitating the animal and results in immediate unconsciousness. However, the animal must be exsanguinated, otherwise,

[299] 5.12 Meat production and hippophagy, p. 218

there is a risk of a prolonged period of cardiac and respiratory activity. This procedure is not self-evident and is shocking because of its violent aspect (Figure 74). The body should then be disposed as after chemical euthanasia.

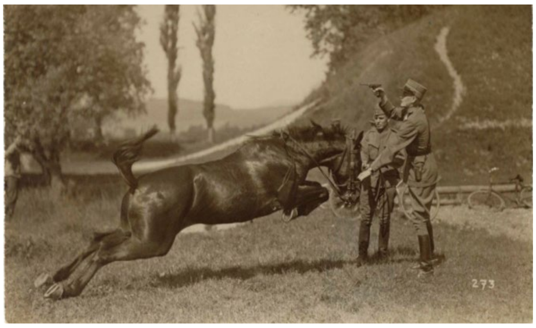

Figure 74 Field slaughter, early 20th century (Source: postcard, A. Freudiger, Phot., Aarau, collection of Peter Gysi)

When an equid is no longer in work, the best alternative to slaughter is retirement. Retirement is justified as long as the equid's state of health and physical condition does not hinder its ability to satisfy its natural needs.

Banning horse meat does not facilitate end-of-life planning. Cultures that do not eat horse meat are still ultimately faced with this problem. Moreover, it remains impossible to ban other methods of euthanasia or export for slaughter, which results in the transport difficulties discussed below[300]. The abolitionist position of no longer using equids does not provide a real solution either[301]. If equids can survive in such conditions or if they are to become extinct, the end of their lives will have to be dealt with in one way or another in both cases. In this regard, the fate of wild populations of domesticated equids in North America and Australia shows that the means used to put down wild roaming equids (hunting, in particular by helicopter) do not at all correspond to the paradisiacal representations of life in total freedom. Moreover, the extinction of equids would raise ethical questions and responsibility in terms of biodiversity.

5.11.5 Results of the balancing of interests and justification of strain

Putting an equid down is a justified practice that does not disregard its dignity when a deteriorated and incurable state of health permanently hinders the satisfaction of its natural needs. Keeping an equid alive cannot be justified by other interests, in particular by therapeutic obstinacy or an emotional bond. Euthanasia must be carried out in an irreproachable way and according to a precise protocol (sedation, narcosis, euthanasia, in an adequate setting) intended to avoid stressful situations for the equid. Conventional home slaughter (stunning with a bolt gun and exsanguination) can achieve the same objectives.

When a companion equid must be retired from its intended use and the satisfaction of its natural needs is not impeded, putting it down is unjustified. A thorough screening of alternatives should be carried out. First, alternative boarding and care arrangements should be sought by sale, donation or retirement. The strain caused by a change of ownership and environment should be examined in an objective weighing of interests. Emotional or pecuniary interests will not outweigh those of the horse. The latter will include in particular the horse's ability to adapt to an unfamiliar environment and its physical and psychological ability to express its natural behaviour in this new situation.

If a horse's deteriorating health impedes the satisfaction of natural needs, the choice of how to have it put down is based on a weighing of interests. This will take into account the equine's welfare and dignity and, secondarily, economic factors.

5.11.6 Recommendations for implementation

- Individuals boarding retired equids should undergo specific training to provide adequate, well-defined and controlled care, if necessary by legal requirement. The course material needs to include a section on older or retired horses
- All parties involved in the boarding, care and veterinary care of an equid should be kept informed of the strains imposed by retirement and the available methods of putting it down
- Veterinary organisations, together with event organisers, are encouraged to consider the possibility of developing a list of cases and situations that require emergency euthanasia, the steps to be taken and the conditions that require a delay or a second opinion veterinarian (BEVA, 2009, 2021)
- When it comes to the end of life of equids, veterinarians are called upon to regularly check and update their knowledge of the strains, animal dignity and welfare and the process of weighing interests.

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[300] 5.12 Meat production and hippophagy, p. 218

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5.12 Meat production and hippophagy

5.12.1 Description of the current situation, trends, strains and risks

The keeping of horses for the supply of horsemeat remains of interest in Belgium, France and Italy. It has helped to safeguard endangered breeds of draught horses threatened with extinction (Masson, 2008). This sector, which is very marginal in Switzerland, mainly concerns the Franches-Montagnes. Breeders as a whole slaughter on average nearly 40% of foals (Tüscher, 2019) and argue that this contributes to biodiversity and employment in rural areas (FJEC, 2019).

The slaughter process involves potential strains and undue hardship (Grandin, 1999, 2008). Grandin lists the following strains: loading, transport, unloading, smells, noise, the presence of strange animals, possible waiting periods, a narrow corridor and a stun box that is sometimes unsuitable for equids, as well as the final fatal action. The probability of firing the bolt in the incorrect position or direction exists and presents a risk of harm for the animal and the butcher. If the meat is deemed to be fit for consumption, the owner only makes a modest profit (less than 1,000 CHF for an adult horse). In the past, several small local slaughterhouses provided a favourable context. Today, the tightening of health standards has concentrated equine slaughter into large facilities, an industrialisation of killing in a vacuum. They often do not offer optimal conditions (Gregory & Grandin, 2007; Rémy C, 2009). It remains to be verified that the training programme for slaughterhouse personnel takes into account the effects of this change (Art. 177 & 197 AniWO).

The number of slaughters and consumption of horsemeat has fallen in Switzerland

A number of horses have their lives come to an end in a slaughterhouse. In Switzerland, this number has decreased significantly. Based on the data of the ATD (Identitas, 2022) and publications, the drop is estimated to be 67% over the last 20 years (Poncet et al., 2011; Schmidlin et al., 2013). In 2019, the 2,005 equids slaughtered in Switzerland provided 270 tonnes of ready-to-sell meat. This corresponds to about 10% of the 2,661 tonnes sold in total in Switzerland (Proviande, 2020). Practically all slaughtered equids were previously kept in Switzerland. The number of equids imported live into Switzerland for slaughter remains zero or negligible. The consumption of horsemeat has also fallen. From 680g per capita in 2007 (Poncet, 2009), it dropped to 310g in 2019 (Proviande, 2020). Compared to other species (beef, pork, mutton, poultry), horsemeat consumption remains very low. Furthermore, it is noted (OFAG, 2016) that French-speaking Swiss households buy more horsemeat - twice as much - than German-speaking ones. Consumers in rural areas also buy more horsemeat than those in towns and cities (+15.8%). In contrast, income or age of the individual does not provide any trend in preferences.

5.12.1.1 Questioning the conditions of production and distribution

Several scandals have marked the European food industry in recent years. In addition to bovine spongiform encephalopathy (BSE, spread by feeding animal meal to cattle), fraud and contamination have affected milk, eggs and poultry (Le Monde, 2017) and the horsemeat industry has been hit by cheating.

Defects in traceability

Investigations have highlighted the opacity and deficiencies of this sector in terms of traceability. The situation follows a pattern: a product ends up on the plates of consumers that has no business being there. In 2013, horses from the pharmaceutical industry entered the food chain after their identities were falsified. Health authorities discovered that lasagne and Salisbury steaks (chopped sirloin) certified as pure beef actually contained huge quantities of horsemeat. At least 28 companies in 13 countries, including various large retailers, were affected. These incidents show the complexity of meat trade channels and increase consumer mistrust (Agrobiosciences, 2013; Le Monde, 2017).

Swiss standards are stricter than in the countries of origin

In Switzerland, half (53%) of the horsemeat is imported from the European Union and 41% from the Americas. A study (Boessinger & Hoffet, 2019) compared Swiss welfare standards with those of the European Union (EU), Argentina and Canada. Next to Switzerland, Canada was the only country with specific criteria. The conditions under which horses are kept for meat production in exporting countries have also been criticised, in particular because of the strains caused by high density and unbalanced feeding associated with intensive management (Raspa F et al., 2020). Equine activists regularly draw attention to the poor conditions of transport, management and slaughter on the American continents. They call for a ban on the international or intercontinental transport of live animals for slaughter (TIR, 2018). According to the Canadian Horse Defence Coalition (NANOS, 2019 cited in Business Insider 2019), "nearly half of all horses are imported from the US where horse slaughter is illegal. Neither US nor Canadian horses can be traced effectively. Canada's Equine Information Document system is highly flawed and does not guarantee truth or accuracy. There are instances in Europe where banned substances, such as a commonly used pain killer for horses called phenylbutazone, have been found in horsemeat exported by Canada, as recently as June 2019."

In all the supplier countries studied, horses can be transported for much longer than in Switzerland. In the EU, the maximum transport time can be up to 24 hours, provided that they are given water every eight hours. In Argentina and Canada, horses can travel up to 36 hours without water or a break. It should be remembered that animals intended for slaughter are not allowed to travel through Switzerland. Despite the measures taken by Swiss companies to better control imports (Arcinfo, 2013) and to renounce certain origins of meat (Brazil, Mexico), production and transport methods are not improving and remain insufficient, particularly in Canada and South America (Animal Welfare Foundation, 2019; Finger, 2019; Talos, 2018). Food fraud and the repeated publication of images and videos of the disgusting conditions in which horses are kept, transported and slaughtered explain the disaffection of European consumers for horsemeat. Parliamentarians are taking these issues to the National Council of Switzerland, as some countries (Argentina, Australia, Canada and Uruguay) cannot guarantee compliance with current customer and EU welfare requirements. They call for a reliable tracing system (Schneider, 2021).

5.12.1.2 Socio-cultural factors

The aim of this report is not to enter into a broad debate on hippophagy, a practice encouraged by animal protection societies in the early 19th century (Bouchet, 1993; Mayor, 1838). Rather, the purpose is to highlight the realities of the situation. Horsemeat remains a very widespread product in the Latin regions of the world, Scandinavia and Asia (China, Japan, Mongolia). Moral and socio-cultural factors play an essential role. These barriers to the consumption of horsemeat remain almost impassable for the majority of German speakers. This is also the case for Anglo-Saxons, for whom this shocking practice is a food taboo. These barriers, based primarily on the ethics of belief, also seem to be more prevalent among women and young people in all countries. Purchases of horsemeat are falling in traditional regions. Consumers are getting older, while young people are turning away from the product. Market research shows that the development potential of this sector remains very low or non-existent. The socio-cultural relationship to horses (ethical reasons) and dietary lifestyles (reluctance to eat red meat) are parameters that are difficult to act on (Lamy et al., 2020a, 2020b).

In general, those who are shocked by the conditions under which horses bred or bought for slaughter are managed, transported and slaughtered, particularly abroad, should immediately refrain from eating horsemeat regardless of the fact that it could be produced in Switzerland under proper conditions. Curiously, a completely different attitude can be observed towards the consumption of lamb, which is just as symbolically charged.

5.12.2 Policy and regulatory context

The AniWO (CF, 2020a) devotes a section to slaughter (Art. 177 to 188). It lays down conditions for those who slaughter animals (training, compulsory stunning, instantaneous death), specifies responsibilities and how to treat animals with respect at the slaughterhouse (arrival, accommodation, relocation) and sets out the procedure for defining the tasks and responsibilities of official veterinarians. The Ordinance on slaughter and meat inspection (OAbCV) regulates the requirements applicable to slaughterhouses (operation, hygiene, controls, fees) under the overall supervision of the cantons (CF, 2020b).

5.12.2.1 On-farm slaughter now permitted

Home slaughter for butchery remained prohibited until recently. The updated version of the OAbCV provides for the possibility of on-farm slaughter from since July 1st 2020 (Art. 3, Letter q, Art. 9a and 14 OAbCV). However, it requires authorisation from the competent cantonal authority. It is intended to ensure compliance with animal protection legislation and hygiene rules. This provision offers optimal conditions that reduce the strains, in particular transport and killing procedures. The Ordinance on Veterinary Medicinal Products (OVMP) also addresses these issues for equids either designated as production or companion animals[302].

5.12.3 Stakeholder interests and areas of conflict

As noted above, some owners remain committed to the economic dimension of meat[303]. Breeders of draft horses send foals to slaughter that they either do not find buyers for or that have morphological or behavioural defects that they consider incompatible with future success. The producers in Jura (canton in Switzerland) remain interested, for reasons of profitability, in promoting these seasonal products. They praise the label of Swiss quality, environmental preservation through local production, the maintenance of traditional rural expertise and the characteristics of a type of meat that supports good health and a balanced diet (FJEC, 2019).

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[302] 4.2 Equids: livestock or companion animals?, p. 42

[303] 5.11 The end of life of horses: euthanasia or retirement?, p. 212

The sector remains primarily interested in a favourable selling price

The advantage for the sector (buyers, slaughterhouses, butchers) is to market healthy meat sourced locally. However, its interest lies above all in the favourable price of imported goods, in spite of the highly criticised management and slaughtering conditions in the country of origin and the environmental damage caused by transport. The veterinary authorities and food services ensure that the hygiene quality is controlled. Animal protection groups do not question the principle of humane killing, but above all, animal welfare before and during transport, as well as at the slaughterhouse.

The primary interest of consumers is to be able to buy quality meat at a favourable price. However, consumers are mostly reliant on the giant chain supermarkets, which almost exclusively sell products imported by air transport. Local Swiss horsemeat is only available in a few local butcher shops (FJEC, 2019). Customers are therefore never given the opportunity to express their preference for a local product sourced from an optimal situation of management, transport and slaughter. To the Authors' knowledge, consumer associations are silent on these issues.

5.12.4 Alternatives that achieve the same results with less strain

Many of the alternatives have already been discussed[304]. The renunciation, by personal choice, of the slaughter of horses and the consumption of horsemeat eliminates the strain directly linked to these practices. This position defends personal values but does not abolish other unavoidable techniques used to put down horses. However, public denunciations of mistreatment are effective in changing the behaviour of distributors and customers. Therefore, if an individual decides to eat horsemeat, he or she can refuse to buy imported products and support local or domestic production. This attitude minimises the strain inflicted on equids during stabling and management, long transport to the slaughterhouse and the negative impact on the environment.

5.12.5 Results of the balancing of interests and justification of strain

The principle of killing animals by slaughter is legitimised by the need to produce meat for human consumption. Moreover, both this method and chemical euthanasia cause, until proven otherwise, similar (total and irreparable) harm, provided, however, that both procedures are carried out in an optimal manner. This includes minimising the impact to the dignity and welfare of the animal in the context of breeding, stabling, transport and death, as well as negative environmental factors. The dignity of a livestock equid should not be affected more than that of any other animal whose meat is used for human consumption. One can also legitimise the valorisation of horsemeat through the necessity to not waste precious protein resources. Evidence shows that the majority of grasslands used for grazing livestock cannot be repurposed to grow crops for human consumption. However, negative environmental impacts or sub-optimal husbandry conditions should not ruin gains achieved by efficient use of marginal land.

From an ethical point of view, there is no argument for importing horsemeat that is produced under dubious circumstances (in particular on the American continents), especially not to the detriment of domestic production. The economic interest of the free movement of goods and low prices dictated by the laws of the market cannot be overriding either. All these points reveal a disregard for the creature, characterised by abhorrent conditions of breeding, stabling, transport and killing.

5.12.6 Recommendations for implementation

- Examine all possibilities to verify on-site whether welfare regulations for the slaughter of equids are being respected and improve the transparency of the traceability of imported equine meat origins
- Regulate, optimise and control the transport of equids for slaughter and slaughter conditions. It is likely necessary to intensify the monitoring of the treatment of equids, for example by appointing a welfare officer or offering further training to current staff
- Strengthen surveillance and publish health statistics of equids on arrival at the slaughterhouse and their treatment in these establishments
- Improve awareness of ethical issues of those affected by the conditions of transport and slaughter. The challenge is to be able to discuss and communicate on the topics of hippophagy and the negative aspects affecting horses for slaughter as two separate issues
- Recommend on-farm options for putting down horses, as well as small local slaughterhouses
- Raise consumer awareness of the various problems caused by imported horsemeat
- Increase the frequency of controls (fraud detection, declaration of ingredients, medication).

5.12.7 Thematic bibliography

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6 The use of equids in breeding

6.1 Introduction

The AniWA (Art. 10) and the AniWO (Art. 25 to 29) regulate the basic principles of animal husbandry. The FSVO Ordinance on Animal Welfare in Breeding (OSAV, 2015) gives concrete form to these principles. Its aim is to help breeders to apply these principles and to help enforcement agencies to monitor compliance with them. Furthermore, it aims to reduce the number of animals that are genetically burdened. In summary, this section addresses the strains and side effects caused by various breeding practices (extreme hereditary traits, assisted reproduction, juvenile diseases, training of young horses, use of broodmares and weaning of foals).

These topics are occasionally presented at conventions dedicated to current knowledge but are not discussed much within the equine industry. In turn, the scientific literature does not often deal with them in any particular way (Campbell & Sandøe, 2018).

6.1.1 The concept of breeding

Swiss legislation (CF, 2020) specifies what is meant by breeding (Art. 2, Para. 3, Letter a AniWO). It defines professional breeding as an activity carried out for profit for oneself, third parties or to cover one's own costs or those of a third party. The compensation does not necessarily have to be financial. In zootechnical terms, breeding is defined as the mating of animals selected to achieve a breeding goal, breeding without a breeding purpose or the production of animals using artificial reproduction methods (Art. 2, Para. 3, Letter i AniWO).

As for a breeding goal, it is understood to be the expression of the physiological or aesthetic characteristics sought in an ideal animal (Art. 2, Para. 3, Letter j AniWO). However, the selection of particular characteristics regularly leads to an increase in the frequency of spontaneous gene mutations, some of which deviate from the normal. A mutation that results in a debilitating phenotype (Art. 2, Para. 3, Letter k AniWO) produces an animal that, as a result of a genetic modification, is subject to strain. This takes the form of pain, discomfort or harm. The animal then lives in a state of anxiety or suffers a profound impairment of its physical appearance or abilities. There are several examples of extreme phenotypes in morphology, coat or abilities. The disabling mutation can occur spontaneously, induced by a physical or chemical factor or as a consequence of genetic engineering.

6.1.2 Ethical concerns over assisted reproduction technology

The various assisted reproduction technologies (artificial insemination, in vitro fertilisation (ICSI), embryo transfer[305], cloning[306]) affect legislation, ethics and morality and are addressed in this document in dedicated sections. They involve biotechnology in the sense that they use a range of recent (now traditional) technologies such as microbiology, biochemistry, biophysics, genetics, molecular biology or computer science. The question of the effects on the dignity and welfare of living beings and their offspring applies in a similar way to human and veterinary medicine. However, the analysis of whether or not the benefits outweigh the disadvantages is hampered by the lack of scientific studies. For example, there is little to no literature on whether embryos affected by these technologies suffer undue hardship (Campbell & McNamee, 2020). In this regard, the RMA, the Federal Reproductive Medicine Act (FA, 2017), only protects human dignity. Animal embryos are therefore excluded from these legal provisions. However, animal reproductive cloning falls under the heading of experimentation subject to authorisation under the AniWO.

The Ethics Committee for Animal Experimentation addressed the issue of interspecific hybrids and gene transfer (ASSM/SCNAT, 2009). It showed the state of the highly complex discussions on the current perspectives of scientific research, in particular the use of stem cells and molecular genetics to produce hybrids. These are regulated by the AniWA. This report will not elaborate on this very particular aspect.

6.1.3 Topics that are not covered

This report will not go into detail about animal welfare and health issues on stud farms, particularly infectious diseases, although they can cause equids pain, suffering and harm. Nor will a number of aspects that affect the dignity and welfare of equids be addressed on topics that remain absent or marginal in western countries. For example, breeding programmes to produce *ejiao*[307]. Growing demand has led to a rapid increase in the price of these animals over the past several years, putting dramatic pressure on their populations around the world, particularly in Africa, and leading to their theft and illegal trade. The livelihoods of those who depend on donkeys have been disproportionately affected (Bennet & Pfuderer, 2020; Davis, 2019; Lesté-Lasserre, 2019).

6.1.4 Breeding practices are now part of the animal welfare debate

Breeding requires the engagement of healthy breeding stock, consistent with their species in terms of behaviour and phenotype, and where appropriate, capable of sustained performance (in the broad sense). These concerns should be essential elements in the definition of zootechnical objectives, the preservation of genetic resources and the protection of equine dignity and welfare.

[305] 6.5 Embryo transfer, p. 245

[306] 6.6 Reproductive cloning, p. 250

[307] *Ejiao* is a gelatine produced from the collagen in donkey skin. It is used in traditional Chinese medicine which is said to have anti-aging and rejuvenating properties

However, ethical considerations often do not appear to be a priority, as breeding focuses on maximum performance and utilitarian aspects, rather than health and welfare. This is why breeding practices are part of the current debate (Farstad, 2018).

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6.2 Selection and occurrence of hereditary diseases

6.2.1 Description of the current situation, trends, strains and risks

The health consequences of certain inherited characteristics

In living beings, every characteristic that is not solely the result of environmental influence has a genetic component. Selection makes it possible to change the frequency of certain genes in a population. Some characteristics, such as hereditary diseases, are deleterious to health. They are often expressed through pain, suffering or harm (Figure 75). Some are lethal. As they are transmitted to offspring, they cause economic losses. Zootechnical breeding programmes include measures to isolate and control these genes (Lauper et al., 2015). These measures are not sufficient on their own. As a whole, the entire breeding programme must be designed to sustainably produce long-lived, healthy, high-performance horses that meet the intended purpose.

Figure 75 A horse with hyperkalemic periodic paralysis (HYPP), whose conformation is characterised by hypertrophy of the musculature and unpredictable episodes of weakness and muscle contractions that require strict rest (Source: murphy2136, screen capture https://www.youtube.com/watch?v=4ZGYxiNOynM)

More than 250 hereditary defects in horses

Various publications provide an overview of hereditary defects (Bettley et al., 2012; Brosnahan et al., 2010; Mele et al., 2007, 2008a, 2008b; Studer et al., 2007). The COFICHEV website also describes a large number of hereditary diseases (COFICHEV, 2020). The most recent review (Finno et al., 2020) provides a summary of the latest advances since the sequencing and functional annotation of the equine genome. These advances have allowed the integration of genetics into veterinary medicine and a deeper understanding of the mechanisms of many of these diseases. The *online Mendelian Inheritance in Animals* (OMIA) database currently contains 254 inherited defects, 61 of which are Mendelian[308] (OMIA, 2022). The gene variant responsible for 48 of these is known. These discoveries open the door to tests to diagnose them and take mandatory preventive measures[309, 310], including the identification of carrier animals and the practice of responsible breeding.

[308] The Czech monk Gregor Johann Mendel (1822-1884) is considered the pioneer of genetics. He was the first to show that parents pass on particular hereditary units that remain distinct in the offspring (like mixing two bags of marbles).

[309] 6.2.2 Policy and regulatory context, p. 231

[310] 6.2.2.2 The Ordinance of the FSVO on Animal Welfare in Breeding, p. 231

These diseases affect the dignity and welfare of horses by causing at times severe strain. They can restrict organic functionality or sensory capabilities to an extent that clearly deviates from the characteristics of a species. In summary, they affect all vital systems:

- Musculoskeletal system (skeleton, tendons, ligaments, joints)
- Respiratory system
- Behaviour
- Hemostasis
- Metabolism
- Musculature
- Skin and connective tissue
- Reproduction
- Cardiovascular system
- Digestive system
- Immune system
- Nervous and sensory system

This report cannot provide an exhaustive list. Some examples of hereditary single-gene (Table 8) and polygenic (Table 9) diseases serve to illustrate the strains they cause.

6.2.1.1 Monogenic hereditary diseases linked to particular coat colours

Figure 76 Skin depigmentation affects the eyes and a large part of the head. It is linked to a more or less pronounced deafness (Photo: Swiss National Stud)

Each basic coat colour (chestnut, bay, black) and hereditary diseases in the strict sense depend on a single gene, or very few genes. Adequate and effective investigations are increasingly identifying mutations in genes responsible for these characteristics. These results allow for the development of screening tests applied in practical breeding (Rieder, 2009). In this way, it is possible to exclude carrier animals and avoid risky matings.

Many breeders appreciate horses with unusual coats and sell them quite easily. The colour of the coat follows often simple rules of transmission which have favoured their selection for centuries. Thus, some breeds are distinguished by their specific coat colours or patterns. Unfortunately, they sometimes suffer from disabilities of the senses (Figure 76). The mutations responsible have a pleiotropic effect, i.e. they cause a special coat colouration and a disease at the same time (Bellone, 2010; Sponenberg & Bellone, 2017). Their list includes, among others, genes that add depigmented hairs such as piebald overo, white markings on the limbs and body or the leopard coat (Appaloosa).

6.2.1.1.1 The leopard coat and congenital non-progressive night blindness

The leopard coat (Appaloosa) in the homozygous state (Figure 4; Sponenberg & Bellone, 2017) is associated with night blindness (congenital stationary night blindness CSNB). Heterozygous carriers are not affected by CSNB. This inherited vision disorder occurs in low light and is considered to be a decrease in the normal sensory abilities of horses. This damage causes a loss of functionality that limits the animal's responsiveness. However, most affected horses can acclimatise to this sensory deficit and compensate for it to some extent. Their vision remains normal under good lighting conditions. Breeds with leopard patterned coats (Appaloosa, Knabstrupper, Noriker) are particularly affected. In addition, these horses often suffer from severe equine recurrent uveitis (ERU).

6.2.1.1.2 The overo coat and lethal white syndrome

The piebald overo coat colour (Figure 77) refers to a phenotype of depigmented spots (head, neck, flanks) located horizontally and not crossing over the back (Sponenberg & Bellone, 2017). The overo coat is dominant over the normal solid colour. An adult overo horse is always heterozygous. It carries only one overo allele received from its sire or dam. It is not possible to identify the overo gene with certainty on the basis of the phenotype. The white areas may turn out to be very small. Several other genes can also express a white or piebald coat, e.g. sabino, splashed white (Figure 78) or tobiano. A DNA test can be used to avoid breeding two individuals where both carry the allele. Paint Horse breeds, Miniature Horses, Pintos, Quarter Horses and their crossbreeds are particularly affected.

Figure 77 Piebald chestnut overo (Source: Malcolm Morley, www.horsevet.co.uk, https://en.wikipedia.org/wiki/File:Overo2.jpg, Creative Commons Attribution-Share Alike 3.0 Unported license)

The mutation responsible leads to the homozygous overo lethal white (foal) syndrome (OLWS or LWS). The foal is born completely white (depigmented mane, coat and irises) and has pink skin. In addition, the mutation suppresses the normal development of the colon, which causes incurable colic in the first 12 hours of life, resulting in death or euthanasia. Both breeding parents carrying the overo allele result in an average of 25% homozygotes with lethal white syndrome, 50% healthy overo heterozygotes and 25% with a normal coat (will not pass on the overo gene).

6.2.1.1.3 The splashed white coat and congenital deafness

The splashed white coat is characterised by well-defined depigmented areas extended over the legs and variably on the belly and white on the head that reaches the brow ridge. Depigmented irises are a hallmark of the colour pattern and explain the blue eyes. To date, six mutations have been identified (SW1 to SW6) in two genes (MITF and PAX3) that cause this phenotype (Haase et al, 2013; Hauswirth et al, 2012; Henkel et al, 2019; Maciel et al, 2020; Magdesian et al, 2020). A laboratory in the USA offers a DNA test (https://vgl.ucdavis.edu/test/splashed-white) with explanations to help breeders. Homozygosity for allelic mutations lead to embryonic lethality or very pronounced phenotypes. Depigmentation affecting the eyes and a large part of the face is often shown to be related to a more or less severe loss of hearing. The splashed white coat (Figure 76, Figure 78) appears in almost all breeds (Appaloosa, Icelandic, Miniature Horse, Morgan, Paint Horse, Franches-Montagnes, Quarter Horse, ponies, Thoroughbred, Trakehner).

Figure 78 Mutations of the MITF and PAX3 gene cause the splashed white phenotype and white markings of varying dimensions in horses. (Source: Hauswirth R et al, 2012, https://doi.org/10.1371/journal.pgen.1002653.g001, Creative Commons Attribution License 2.0)

As this coat pattern and deafness seem to be inherited in a dominant fashion, these horses should not be used for breeding, as sensory losses in their offspring cannot be excluded[311] (OSAV, 2015). Furthermore, skin depigmentation has been shown to be associated with an increased frequency of dermatological problems (Federici et al., 2015).

Congenital deafness

The Paint Horse and its cross breeds appear to be predisposed to congenital deafness. This problem has been known for several years (Morrison, 2007). These horses are very successful in reining. Since they have little to no hearing, they are probably less responsive to environmental stimuli. In this way they have an advantage in competition. It is also possible that these horses develop a learned resignation as they find themselves stressed by the inability to react in a way that is unique to their species.

The genes involved in deafness are known (KIT, MC1R, MITF and PAX3), but not their exact causal mutations. Therefore, there is no specific DNA test for this disability. Genomic studies are still needed to clarify the variations in this incurable hearing impairment and its relationship to the extent of depigmentation on the head.

6.2.1.1.4 The silver dilution and multiple congenital ocular anomalies

The silver gene causes a lightening of the pigment eumelanin (dilution effect of bay and black) with many variants (Sponenberg & Bellone, 2017). The manes appear silvery grey, sometimes almost white. The effect on the black coat is a chocolate hue of varying intensity, while the bay coat becomes paler and chestnut-like, but with silver tones on the tips (Figure 79, Figure 80, Figure 81). The chestnut coat is not affected by the silver gene, as chestnuts do not synthesise eumelanin (black colour), but pheomelanin (red colour). The silver colouring is transmitted dominantly. In summary, a black or bay horse carrying a single allele (heterozygous) will have a lighter coat. This nuance is found in particular in the Miniature Horse, Rocky Mountain Horse, Morgan, Paint Horse, Icelandic Horse, Shetland Pony and Comtois (very high frequency of the mutation).

Multiple congenital ocular anomalies

The silver dilution has been found to be related to Multiple Congenital Ocular Anomalies (MCOA). A complete ophthalmological examination reveals two types of damage. Cysts are seen mainly on the ciliary body in heterozygotes. They do not appear to affect vision, but pose an interpretation problem during a pre-purchase exam, which may discourage a potential buyer. In homozygotes,

[311] 6.2.2.2 The Ordinance of the FSVO on Animal Welfare in Breeding, p. 231

the MCOA phenotype causes multiple abnormalities of the eye structures (cornea, iris, pupil, retina) in addition to the ciliary body cysts, that vary greatly between individuals (Andersson et al., 2013; Brunberg et al., 2013). Severe (incurable) defects can, however, cause vision disorders (Sponenberg & Bellone, 2017). These congenital defects show little or no progression with age.

Figure 79 Dilution effects of the silver gene on the bay coat. The coat approaches chestnut with slightly silver tips (Source: Brunberg E et al. (2006), https://commons.wikimedia.org/wiki/File:Silver-Morgan.jpg, CC BY 2.0 Generic)

Figure 80 Dilution effects of the silver gene on the dark bay (Source: Pitke https://commons.wikimedia.org/wiki/File:421-tv-Ahonkukka-03.jpg, CC-BY-SA 3.0)

Figure 81 Dilution effects of the silver gene on the black coat (Source: Kumana, https://commons.wikimedia.org/wiki/File:Black_Silver_Dapple.jpg, CC BY 2.0 Generic)

6.2.1.1.5 Lavender foal syndrome

Lavender foal syndrome (LFS) is a lethal dilution of the coat that affects newborn Arabian foals of Egyptian lineage (Brooks et al., 2010). These foals suffer from neurological impairment (convulsions, tetany) and have a pale lavender coat. This disease is transmitted recessively, is incurable and inevitably leads to death or euthanasia (Figure 82).

Figure 82 Lavender foal syndrome (Source: Brooks S et al (2010), https://journals.plos.org/plosgenetics/article/figure/image?size=large&id=10.1371/journal.pgen.1000909.g001, Creative Commons Attribution License).

6.2.1.1.6 The grey gene (grey coat) and melanomas

Grey horses are born with a normal basic coat (shades of chestnut, bay and black, as well as piebalds and various dilutions). They develop white hair all over their coat as they age (Figure 83). The skin remains pigmented. This process begins in foals as rings of white hair around the eyes. This coat is dominantly transmitted. This means that a grey horse must have at least one parent with a grey coat.

Figure 83 Different shades of a grey coat with advancing age (Source: Curik et al (2013), https://doi.org/10.1371/journal.pgen.1003248. g003, Creative Commons Attribution License)

The grey coat has been shown to be predisposed to melanoma and vitiligo (variable depigmentation of the skin). Although vitiligo has little impact on health, the development of melanomas, particularly in homozygotes, can cause severe problems in sensitive areas (eyelids, perineum, genitals and internal organs).

6.2.1.2 Hereditary and polygenic diseases

Examples of other monogenic hereditary diseases and the strain they cause

Disease	Phenotype/Strains	Breeds	OMIA
Cerebellar abiotrophy - CA	Degenerative disorder of the neurons of the cerebellum: balance and coordination disorders (ataxia), tremors, progression beginning at four months of age. Hereditary neurological degenerative disease, changes in abilities, significant restriction of sensory functions. Behavioural disorders, injuries, euthanasia.	Arabian horses and crosses with Arabian breeds (Curly Horse, Trakehner, ponies)	000175-9796
Hereditary equine regional dermal asthenia or Ehlers-Danlos syndrome - HERDA	Degenerative skin disease (collagen abnormalities). Severe hereditary restriction of an organic function (skin); hyperelasticity of the skin; increased risk of back and limb injuries, haematomas, poor healing. Pain and damage that causes loss of functionality and affects general condition.	Quarter horse (AQHA) especially cutting lines, Paint Horse (APHA), Appaloosa, related breeds	000327-9796
Skeletal Atavism - Dwarfism	Dachshund appearance with long back and short legs; persistence of ulna and fibula, valgus; short and small ears. Chondrodysplasia. Profound changes in phenotype of hereditary origin. Deviations from species conforming development that strongly change the physical appearance of the animal. Locomotion disorders, lameness. Risks of instrumentalisation.	Shetland Pony, Miniature Horse	001271-9796
Glycogen Branching Enzyme Deficiency (GBED)	Disorders of the metabolism (muscle, heart, brain). Severe hereditary restriction of organic function (glycogen metabolism); abortion, foal death or euthanasia.	Quarter horse (AQHA), Paint Horse (APHA), Appaloosa, crosses with these breeds	000420-9796
Junctional epidermolysis bullosa (JEB1, JEB2)	Ruptures in the junction between the dermis and the epidermis, especially in the distal part of the limbs, loss of one or more hooves. Lethal neonatal condition. Skin lesions (hairless areas and erosion on head, neck, chest, limbs); ulcers of the mucous membranes of the oral cavity. Generalised dermatitis with blisters and severe infections. Foals die within 14 days or must be euthanised.	Belgian line (mostly American), Breton draft, Comtois, related draught breeds (JEB1) American Saddlebred (JEB2)	001677-9796 001678-9796
Congenital liver fibrosis (CLF)	Congenital liver degeneration with fibrosis, hypertrophy and cysts of the bile ducts. Profound restriction of liver function of hereditary origin. Fever, apathy, neurological symptoms, diarrhoea. Death at 2-8 months of age due to liver failure.	Franches-Montagnes, Pura Raza Española (PRE)	001938-9796
Equine hyperkalemic periodic paralysis (HYPP)	Metabolic disorder of muscle potassium (hyperkalemia). Severe hereditary restriction of organic functions (musculature, metabolism). Loss of functionality that affects the general condition: generalized muscle weakness, lameness, paralysis of the upper respiratory tract (abnormal neighing, inspiratory stridor). The strains are related to the purpose of breeding (highly developed musculature is favoured).	Quarter horse (AQHA) especially halter lines, Paint Horse (APHA), Appaloosa, related breeds	000785-9796
Polysaccharide Storage Myopathy (PSSM)	Excessive accumulation of glycogen in the muscles. Myopathy similar to a hemorrhage after light work. Muscle stiffness, reluctance to move, inability to move forward, pain, lameness, increased laboratory values (muscle enzymes), myoglobinuria in severe cases. Hereditary restriction of an organic function (muscle metabolism). Locomotion disorders and damage that causes loss of functionality and affects the general condition.	European draft breeds, Quarter Horse (AQHA), Franches-Montagnes	001158-9796
Dwarfism in the Friesian Horse	Osteochondrodysplasia; extremities 25% shorter and weight 50% lower than normal, dysplasia of the distal metaphyses, long and low jointed pasterns, normal head size and body length, narrowing of rib cage, deformity of hooves. Weakness of the fetlock suspensory apparatus, progressive worsening of tendon and ligament damage, arthritis, abnormal locomotion, lameness, euthanasia. The damage is incurable. Profound changes in phenotype of hereditary origin. Deviation from species conforming development that significantly impairs bodily functions. Risks instrumentalisation.	Friesian	002068-9796
Warmblood Fragile Foal Syndrome (WFFS)	Degenerative skin disease (collagen abnormalities). Severe hereditary restriction of an organic function (skin); hyperelasticity of the skin; fragile skin with increased risk of injury, injuries, hyperlaxity of joints.	All Warmblood breeds	001982-9796

Table 8 Examples of hereditary single-gene disorders (Source: COFICHEV, Inherited Diseases, https://www.cofichev.ch/fr/Connaissances/Genetique-ge-nomique/Maladies-hereditaires.html; Finno et al., 2020)

The situation is different for hereditary diseases where the manifestation of disease is the result of the joint influence of several genes and certain environmental factors. In this case, it is better to speak of undesirable phenomena with a hereditary component. Mendel's laws do not apply, which suggests that several genetic and non-genetic factors are involved. These are therefore complex traits with a multifactorial cause.

Examples of polygenic hereditary diseases and the strain they cause

The genetic cause of such diseases can neither be easily identified nor can it be ruled out using a genetic test. In each individual, the undesirable condition manifests itself with a variable intensity depending on environmental factors and the individual interaction of genes. The frequency and intensity can be reduced by setting selection targets, for example by using breeding values for those traits (e.g. osteochondrosis, laryngeal hemiplegia, summer dermatitis, respiratory allergies, fertility, sarcoids, severe conformational defects), but they cannot be eradicated.

Disease	Phenotype/Strains	Breeds
Cryptorchidism	*Retentio testis*. Absence of one or both testicles in the scrotum. In the majority of cases, cryptorchidism is unilateral. Most testicles are found in the inguinal canal (palpation, ultrasound), otherwise it may be an intra-abdominal testicle. Restriction of an organic function (genitalia); quality of life may be affected; behavioural problems that may make it difficult to live with other equids; affected animals may not be kept according to their needs; risk of self-harm; risk of frustration and abuse if the horse is punished unfairly. Castration is made considerably more difficult and expensive.	All breeds
Degenerative Suspensory Ligament Desmitis (DSLD)	Degenerative suspensory ligament desmitis is an incurable, chronic, degenerative, uni- or bilateral condition of the suspensory ligament of the fore- and hindlimbs that worsens slowly and progressively. It is probably a systemic condition affecting the connective tissues of the cardiovascular system, flexor tendons and ligaments. Restrictions of an organic function (musculoskeletal system) that can severely affect the general condition and quality of life; lameness, pain, euthanasia.	Peruvian Paso and crosses, Arabian, American Saddlebred, Quarter Horse (AQHA), Thoroughbred, Standardbred, other Warmblood breeds
Recurrent laryngeal neuropathy (syn. Idiopathic hemiplegia laryngis) - RLN	Bilateral degenerative neuropathy of the recurrent laryngeal nerve causing progressive paralysis of the laryngeal muscles, the left side being more severely affected. Affects mainly large horses. The laryngeal muscles are unable to open the larynx completely, resulting in a narrowing of the upper airway; resistance to the passage of air being drawn in causes an inspiratory noise during exertion (whistling, squealing, stridor) of intensity proportional to the exercise; inspiratory dyspnoea. The paralysis also affects vocalisation (neighing). Restrictions in organic function (upper airway) and damage reducing the capacity for sports performance due to poor ventilation and continuous limitation of incoming air volume despite increased inspiratory efforts. Severe cases may cause exercise intolerance (respiratory distress, hypoxaemia, hypercapnia (CO_2) and metabolic acidosis). Overexertion reduces welfare significantly. Damage can lead to the necessity for surgery, sometimes invasive and relatively serious, causing perioperative pain and economic losses, the end of a sporting career or euthanasia.	All breeds
Osteochondrosis or Osteochondrosis dissecans (OCD)	Juvenile osteoarticular disease (can be seen as early as yearling age): disorder of the ossification of the growth zones of the bones and abnormalities of osteoarticular development (detachment of cartilage fragments in the joint or osseous cysts). Hocks, stifles and fetlocks are most commonly affected. Studies of several breeds have shown heritability. Predisposing factors: genetics (parental status, breeds), diet (poor management during gestation and growth after birth, excessive energy and protein intake), biomechanical stress and trauma. Variable clinical signs depending on 1) number of lesions and location, 2) type and extent of lesions, 3) activity of the young horse (nature of the stresses of a growing skeleton). Restriction of an organic function (musculoskeletal system): distention of the joint, lameness of variable degrees and pain during manipulation (flexion of the limbs), intolerance to work. Spontaneous healing before the age of 18 months is possible if the bone fragment is small and extra-articular, otherwise surgical intervention to remove the fragments or curettage the cysts is necessary.	Mostly Warmblood and Thoroughbred breeds (sport and racing)
Maxillary prognathism in *Equus caballus*	Congenital craniofacial anomalies: dental anomalies and maxillary malposition. The maxilla (upper jaw) of the horse is longer than the mandible (lower jaw). Abnormal wear, overbite, mastication problems (when premolars and molars are involved), painful mucosal injuries. Difficulty grazing. Restrictions of an organic function (mouth and teeth, eating behaviour) that affect the general condition and quality of life.	All breeds
Bone fracture risk in Thoroughbred racehorses	Fractures of the distal extremities of the front and hind legs are among the most frequent catastrophic injuries in racehorses. They are most often stress fractures preceded by microlesions due to repeated overloading (syn. fatigue fracture). Various risk factors have been identified or are assumed. Restrictions of an organic function (musculoskeletal system) that strongly affect the general condition and quality of life; lameness, pain, euthanasia.	Thoroughbred
Aortic rupture and aorto-pulmonary fistulation in the Friesian horse	Aorto-pulmonary fistula, aortic rupture at an early age (acute form and sudden death; subacute; chronic with aorto-pulmonary fistula) Restrictions of an organic function (cardiovascular system) that severely affect the general state and quality of life; recurrent colic, lethargy, peripheral oedema, tachycardia, cough, recurrent nosebleeds, reduced performance capacity, sudden death.	Friesian

Table 9 Examples of hereditary polygenic diseases (Source: COFICHEV, *Inherited Diseases*, https://www.cofichev.ch/fr/Connaissances/Genetique-genomique/Maladies-hereditaires.html; Finno et al., 2020)

Today, genomic selection is opening up new ways of avoiding the occurrence of undesirable traits. The hereditary component has been demonstrated by scientific studies, but the genetic basis at the molecular level remains largely unexplained. Some studies have sought to identify regions of the genome, or even specific genes, associated with these traits. The results are promising, but not yet convincing.

In the context of this report, it is not possible to offer an exhaustive list of all hereditary conditions. The following section deals with some examples of particular coat colours or patterns related to the occurrence of undesirable hereditary traits in horses. Some examples of hereditary monogenic (Table 9) and polygenic (Table 10) diseases serve to illustrate the strain caused by these conditions.

6.2.2 Policy and regulatory context

In the introduction to this chapter several terms used in the legislation were defined (breeding, breeding goal, mutation with an debilitating phenotype).

6.2.2.1 The AniWA and AniWO

Article 10 of the AniWA empowers the Federal Council of Switzerland to issue provisions on the breeding and production of animals and to specify criteria for assessing the acceptability of breeding purposes and methods. In doing so, it takes into account the dignity of the animal. It may prohibit the breeding, production, keeping, import, transit, export and marketing of animals that have special characteristics, including abnormalities in their anatomy or behaviour (FA, 2017).

On this basis, Article 25 of the AniWO (CF, 2020) specifies the basic principles that breeding must meet:

- Breeding must aim to obtain healthy animals that are free from phenotypes that undermine their dignity[312]
- Breeding goals that would result in a restriction of an organic or sensory function or a deviation from the natural behaviour of the species shall only be permitted if the restriction can be compensated for without the animal suffering any disadvantage in terms of care, keeping, feeding or physical integrity or having to receive regular medical care.

The third paragraph prohibits certain practices:

- The breeding of animals that may hereditarily be deprived of body parts or organs commonly used by the species or result in deformities that would cause them pain, suffering or injury
- The breeding of animals with atypical behaviour for the species, which would make it very difficult, if not impossible, to live with other conspecifics.

Finally, the breeder must take all measures that can reasonably be required to prevent excessive reproduction of the animals in his or her care.

6.2.2.2 The Ordinance of the FSVO on Animal Welfare in Breeding

The FSVO has issued an Ordinance on Animal Welfare in Breeding (OSAV, 2015). It aims to reduce the number of hereditary strains. It contains provisions of a technical nature and sets out the requirements for the keeping of healthy animals in its 1st article. Article 2 imposes obligations on breeders. Anyone who carries out breeding:

- must be aware of the strains imposed on animals by the extreme expression of certain characteristics and by the proven hereditary defects of the breed in question
- shall not pursue any breeding goal that causes pain, suffering or injury to the animals, or that results in a profound impairment of an animal's physical appearance or abilities.

This provision obliges breeders to be adequately informed about the strains generated by certain traits and their consequences. Furthermore, based on the definition of dignity[312], this Ordinance (Art. 3) classifies the strains related to the purpose of breeding (Categories 0 to 3).

6.2.2.2.1 Breeding permitted under certain conditions

The intensity of the genetic strain determines whether an animal can be bred or not. If no hereditary strains are identified (Severity grade 0), unrestricted breeding is permitted. It is subject to certain conditions (special care of the animal, Art. 25 Para. 2 AniWO) in the case of a light strain (Severity grade 1). In the case of medium intensity (Severity grade 2), the Ordinance requires monitoring (documentation of the strategy and the strains). In addition, the breeding goal must result in a lower strain for the offspring.

Pedigreed equids are often inbred. The total exclusion of breeding stock with defective genes would further reduce genetic variability, causing even further problems. However, strategic breeding programmes employing controlled breeding can reduce the pressure of negative effects after a few generations. Furthermore, Art. 7 Para. 4 of the Animal Husbandry Ordinance (CF, 2022) requires that animals with hereditary defects be marked as such in their stud book. For these reasons, the use of these animals remains possible under supervision.

6.2.2.2.2 Prohibited breeding practices

The Ordinance of the FSVO specifies the cases in which breeding is prohibited. Animals that are subject to severe strains (Severity grade 3) are excluded from breeding. Breeding is also prohibited if the purpose of breeding results in the offspring being subjected to such severe strains. In addition, breeding is excluded if the animals are unable, due to their morphology or aptitudes, do any of the following things:

- Be held in accordance with their needs,

[312] 2.2 Dignity, p. 20

- Adopt a physiological posture,
- Move in accordance with the needs of their species,
- Feed themselves or raise their offspring without the help of humans.

Finally, breeding is prohibited if, due to their targeted breeding, it cannot be ruled out that the offspring will suffer sensory losses, such as blindness or deafness, or difficult births due to the anatomical constitution.

6.2.2.2.3 Assessment criteria for medium to severe strain categories

Anyone wishing to breed an animal with a characteristic or clinical sign which, in relation to the purpose of breeding may result in a moderate to severe strain (Severity grade 2 or 3) must first have a hereditary strain assessment carried out (Art. 5). This assessment may only be carried out by persons holding a university diploma in veterinary medicine, ethology or genetics and having the necessary experience in one or more of these disciplines. The findings will be laid out in a signed document for the breeder and, on request, for the authorities.

	Nature of the strain	Severity grade 2	Severity grade 3
1	Pain	Sporadic moderate pain or chronic mild pain that affects the general state of health	Chronic or severe moderate pain that strongly affects the general state of health
2	Harm	Harm that causes loss of functionality or behavioural deviations affecting general state of health Deviations from species-specific development that impair bodily functions or limit the animal's responsiveness to external stimuli	Harm that results in total loss of functionality with a significant impact on the general state of health Deviations from species-specific development that significantly impair bodily functions or severely limit the animal's responsiveness to external stimuli
3	Suffering	Pain, harm, anxiety, itching or behavioural deviations that affect the quality of life of the animal concerned	Illnesses that severely affect the animal's quality of life due to severe pain, itching, excessive demands on the adaptive capacity of bodily functions or the prevention of normal behaviour
4	Profound damage to physical appearance	Chronic changes to the body that alter the physical appearance of the animal	Chronic changes to the body that greatly alter the physical appearance of the animal
5	Profound impairment of skills	Deviations from species-appropriate development that impair bodily functions or limit the animal's responsiveness to external stimuli	Deviations from species-appropriate development that significantly impair bodily functions or severely limit the animal's responsiveness to external stimuli

Table 10 Criteria for classifying an animal in a severity grade of strain (Source: Ordinance of the FSVO on Animal Welfare in Breeding; Appendix 1)

The criteria for placing an animal in a category of strain are listed in an annex (Table 10). The most severe strain or clinical sign determines the classification.

6.2.2.2.4 Characteristics or clinical signs arising from breeding goals that may lead to moderate or severe strains

Annex 2 specifies the characteristics or clinical signs that may arise from following certain breeding goals and lead to moderate or severe strains in domestic animals:

- Cranial deformities with disabling effects: effects on the position of the teeth (e.g. prognathism) and eyes, respiratory capacity or causing dystocia
- Impairments of the eyes, such as blindness, or the auditory system, such as deafness
- Deformities
- Cataracts
- Coordination and motor skill disorders
- Paralysis (e.g. recurrent laryngeal neuropathy)
- Eating or chewing difficulties
- Disturbed sexual behaviour

6.2.2.3 The health regulations of breeding federations

In general, breeding organisations have integrated health selection for many years. For example, the Swiss Federation of Sport Horse Breeders (FECH, 2020) has included health as a breeding goal: animals approved for breeding must be healthy and fertile. More specifically, it takes into account the general state of health, fertility and hereditary criteria, longevity and robustness. Breeding stallions must be free of genetically predisposed diseases and behavioural disorders including stereotypies (cribbing, weaving). These characteristics are examined during a thorough veterinary check (radiographs, clinical examination, DNA tests). The FECH (FECH, 2020, 2021, 2022) publishes information on two hereditary defects: FFS (Fragile Foal Syndrome Type 1, formerly Warmblood Fragile Foal Syndrome) and PSSM (polysaccharide storage myopathy). Since 2019, the most important preventative measure is the genetic testing of stallions before they are approved.

For FFS the FECH publishes the results and informs mare owners of all carriers. In this way it fulfils its legal obligations (Art. 7, Para. 4). Currently, all stallions approved for breeding have been tested. As PSSM can limit sporting performance, the FECH requires approved stallions to be PSSM free since 2019. Not all previously approved stallions have been tested. In all cases, the FECH publishes whether the stallion has been tested or not and the test result where applicable. Currently all tested approved stallions are negative. In this way, the FECH relies on the individual responsibility of the breeders and fully transparent information.

The breeding department of the FECH is currently analysing the PSSM situation, including the risk of propagation in the absence of testing and selection against this hereditary defect.

The Swiss Federation of the Franches-Montagnes also has a health-based breeding programme. (FSFM, 2020); the horses used for breeding must be healthy and fertile. To this end, the FSFM takes into account the general state of health, hereditary health, fertility, inbreeding, as well as longevity and robustness. Judges are required to report and record serious health problems (lameness, insect bite hypersensitivity, sarcoids). Stallion candidates must pass a full veterinary examination including radiographs of the forelimb navicular bones. The FSFM has also published guidelines on hereditary diseases for the stallion approval process (FSFM, 2019a, 2020). They concern two hereditary defects: congenital liver fibrosis (CLF) and polysaccharide storage myopathy (PSSM1). Since 2012, the FSFM has withdrawn all CLF carriers from the breeding program and only approves CLF negative stallions. Since 2020, the FSFM has added PSSM1 to the tests that stallion candidates must have done before the selection procedure begins. Stallions with a positive result in one of the two tests will not be admitted to the selection procedure. However, the FSFM does not communicate the results of the monitoring that it undertakes (FSFM, 2019b).

Finally, the FSFM has published a list of polygenic hereditary diseases considered undesirable in breeding and a reason for non-admission or exclusion depending on the degree of impairment. It is not exhaustive and may be adapted according to advances in research on genetic defects (Table 9). They are classified by anatomical area affected:

- Head (deafness, prognathism/brachygnathism, cleft palate, recurrent equine uveitis)
- Reproductive system (cryptorchidism, monorchidism)
- Musculoskeletal system (bone spavin, navicular disease, osteochondrosis, shivering, pacing, congenital tendon contracture)
- Skin (insect-bite hypersensitivity)
- Respiratory system (recurrent laryngeal neuropathy)
- Cardiovascular system (atrial fibrillation/atrial septal defect)
- Behaviour (cribbing, weaving).

6.2.3 Stakeholder interests and areas of conflict

6.2.3.1 Equine interests

From birth on, equids have an interest in ensuring that their organic functions, particularly sensory (blindness, deafness), and behaviour are not hindered by the expression of hereditary diseases that could put excessive demands on their adaptive faculties. In particular, they should be able to adopt a physiological posture and move in accordance with their needs without enduring medical treatment and care conditions that are contrary to their natural needs. Finally, they also have an interest in ensuring that their offspring do not suffer from these strains. In short, these interests are affected when breeding goals result in genetic strains that affect their health, dignity and welfare (Table 10). If they have mild hereditary strains, it is in their interest to have appropriate management, feeding and care. Care should be taken not to undermine their dignity and welfare by subjecting them to frequent medical procedures.

The interactions of humans with deaf horses, for example, are profoundly affected. This disability prevents many auditory distractions, but also forces people around them to communicate differently than with healthy animals and to pay particular attention to them. Specifically, people have to use more tactile and visual signals. Scientific advances on the phenotypic and genotypic characterisation and effects of deafness in splashed white coat patterns could therefore be in the interest of these equids. They would benefit from better knowledge of horse trainers and professionals in the equine industry (Rattehalli & Jain, 2020).

6.2.3.2 Human interests

For their part, the owners and enthusiasts of certain breeds have an interest in breeding healthy equids, particularly because of the economic losses caused by hereditary defects, whether mono- or polygenic. Furthermore, genetic defects can damage the image of breeders' associations that are not sufficiently proactive in identifying the occurrence of genetic disorders. It is therefore in their interest to carry out screenings that are representative of their own animal population, monitor breeding stock (mares and stallions) during their selection and communicate the results of their monitoring. Animal welfare organisations, authorities and the public all have an interest in these issues.

A particular coat colour or pattern can increase a horse's value

The variation in specific coat colours is the result of domestication and breeding processes. It contributes to the genetic diversity of breeds (chestnut Haflinger, grey Camargue horse, black Friesian, piebald) and gives them an economic and symbolic value. This is particularly the case for customers of horses with particular markings or rare characteristics.

The value of breeding animals with hereditary diseases

Normally, breeders and their organisations are particularly interested in putting healthy animals on the market. However, this interest can sometimes place them in a field of conflict. They face difficulties when they have to forfeit using a promising sire that is heterozygous for a genetic defect and at the same time consider the genetic diversity of the selection programme of their breed. Stakeholders must therefore consider the most appropriate way to treat carriers of recessive inherited diseases and how to involve them in breeding, especially when breeding for lineage (EFFAB, 2020; Flint & Woolliams, 2008; Herzog, 2001; Luy, 2006; Mepham, 2005).

Reining horses with partial or total deafness

Where a loss of sensory ability may provide an advantage, the question arises as to whether these animals have an advantage in competitions. For example, several paint horses with very large white markings on their heads and potentially limited hearing are successful in the Western discipline of reining (Magdesian, 2010). Several are descendants of the stallion Colonels Smoking Gun, also known as Gunner, who was known to be congenitally deaf. Notably, his son Gunners Special Nite, presumably deaf, won the World Games in 2010 in reining. In terms of sporting ethics, then, it is arguable that Gunners Special Nite had an illegitimate advantage.

From a strictly scientific point of view, other questions arise: where should the reference value be located? How much can be attributed to natural variation? What are the conditions that exceed a horse's adaptive capacities? What are limitations that still allow the horse to adapt? What should be considered as a species or breed specific trait?

Some breeds have high rates of hereditary diseases

One example is the Quarter Horse in which sub-populations have certain hereditary diseases with an allelic frequency of up to 30%. This means, in short, that a high rate of disease is accepted if screening tests are not applied before breeding (Tryon et al., 2009). To date, the studbook authorities of this breed only require DNA testing for a few defects. Several other breed associations approach the issue of hereditary disease control in an opaque manner. The economic benefits and owner influence seem to outweigh transparency when known carrier sires are successful. Breeders would benefit from knowing about them in order to weigh the consequences of their choice.

6.2.4 Alternatives that achieve the same results with less strain

An alternative is to forego the selection of coats related to disabling traits (Table 8, Table 9). To this end, the consistent use of screening tests to avoid risky pairings is recommended (Mele et al., 2008a & 2008b). In general, scientific studies will specifically test for a direct causal link between a functional restriction and a coat feature (overo, silver, leopard). In the case where the colour attached to the adverse effects is not the distinguishing feature of a breed, breeders take appropriate measures to progressively reduce the frequency of a defect (strategic breeding, exclusion, monitoring). On the other hand, if the defect is directly linked to the coat colour or pattern distinguishing a specific breed, the situation is more complicated. Deciding, for example, to eradicate congenital stationary night blindness in the Appaloosa breed[313] would probably lead to the extinction of the breed altogether. However, only leopard homozygotes suffer from non-progressive congenital stationary night blindness (CSNB). These individuals could be identified with DNA testing and not be used for breeding. Keeping only heterozygous parent horses decreases the frequency of horses with CSNB in the population but increases the frequency of foals without the leopard pattern.

6.2.5 Results of the balancing of interests and justification of strain

Hereditary diseases ruin the reputation of a breed and the commercial value of the breeding stock. Therefore, for the health of their own population, breeding federations should examine in detail the frequency of animals carrying responsible alleles. Depending on their severity, they need to select against coat colours and patterns associated with pathologies. However, in order to make a definitive judgement on the matter, there is a need for more scientific data on the genetic mechanisms, the phenotypes involved and the degree of severity of the phenomena described. This is already the case with the overo lethal white syndrome, which has been widely described[314].

The ethical and legal need to protect the dignity and welfare of equids supports the use of DNA testing to complement selection measures. The strain on the animals when hair or blood is collected for DNA testing analysis is negligible and justified by the valuable information it provides (Campbell & McNamee, 2020). In the case of a recessive defect, the results then allow a carrier sire to be withheld from breeding or mated only with non-carriers. This method of selecting parents avoids the birth of homozygous individuals. If an entire breed were to undergo such a selection procedure, the deleterious gene would be eliminated in one or two generations.

6.2.6 Recommendations for implementation

Breeding federations and their members are encouraged to take action:

- The use of disease markers or available DNA tests appears imperative. The screening of carrier individuals is also part of a code of good practice (EFFAB, 2020), as well as legally required in Switzerland.
- Organise an analysis of the extent of hereditary diseases present in the population of a particular breed. Use DNA analysis to identify mares and stallions that are carriers. Strengthen stud book requirements. Where necessary, fund research programmes.
- Define breeding and communication strategies. Exclude or strategically plan breeding to carriers of genetic defects to reduce their frequency.

[313] 6.2.1.1.1 The leopard coat and congenital non-progressive night blindness, p. 226

[314] 6.2.1.1.2 The overo coat and lethal white syndrome, p. 226

- Use selection for phenotype importance when DNA diagnosis is not possible. Estimate breeding values for health traits.
- Amend the competition rules to ban horses from competition that have a performance advantage due to a hereditary disease that restricts their welfare or causes a change in sensory capacity that deviates from a species-specific benchmark. Consider whether they meet the definition of genetic doping.

6.2.7 Thematic bibliography

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6.3 Live cover

6.3.1 Description of the current situation, trends, strains and risks

6.3.1.1 Live cover in hand

Live cover in hand is understood as a mating method in which the person in charge guides and holds the stallion during mating. Until the introduction of artificial insemination[315], this was the traditional method of horse breeding. Around 65% of broodmares give birth to a foal. Unlike in the wild, partners do not freely associate with each other. Some describe this as a potential form of rape. Their examination is therefore essential (Campbell, 2018).

Once the mare has been found to be in heat by the teaser stallion, she is taken to a dedicated area. Her tail is wrapped in a bandage and her genitals and anus are cleaned. Often, a special harness is attached to the pasterns or hocks (Figure 84). The stallion is then led behind the mare and given time to prepare for mounting. During mating, the person in charge assists the stallion in introducing his penis into the vagina, if necessary, and confirms ejaculation. He must remain in a good position behind and on the mare until mating is complete. In some cases, the application of a twitch or sedative replaces or complements the effect of the restraints to avoid agitation and defensive reactions.

A method still frequently used in Switzerland

Figure 84 Breedings hobbles and tail bandage for live cover in hand (Photo: Swiss National Stud)

In-hand live cover remains the most frequently used method in Switzerland, especially in the Franches-Montagnes and Haflinger breeds (98% of breeding). On the other hand, it is hardly used any more in sport horse breeding. One of the reasons for this is that most of the breeding stallions have a career in competition, making them unavailable during the breeding season. The Jockey Club (IFHA, 2021) prohibits artificial insemination[315], embryo transfers[316] and cloning[317] in horses registered as Thoroughbreds. Some breeders of recreational breeds are showing an increasing interest in closer-to-nature alternatives[318]. In general, breeders tend not have a great deal of knowledge about natural sexual behaviour in a harem, which leaves them at a loss when the horses do not express the expected behaviour during live cover in hand. However, it can be argued that there is potential frustration among both stallions and mares due to unsatisfied behavioural needs. These practices will be examined from the perspective of animal dignity.

The restriction of sexual behaviour in stallions may be the reason for lower fertility in live cover in hand breeding

To the Authors' knowledge, there is no evidence that restriction of sexual behaviour leads to frustration in horses[319]. However, this limitation likely explains why the fertility rates of live cover in hand breeding is much lower than in a harem (Ginther, 1983; Van Buiten, 1998) and in donkeys. Recent studies show that mares choose their partners and take the initiative in mating in a harem. In contrast, stallions do not select their partners but rather mate with mares that are receptive without much distinction. This research shows the advantage of the direct relationship between the stallion and mares. It can accelerate the start of the cycle of mares not yet in heat (Aepli et al., 2011; Burger et al., 2010; Sinclair et al., 2020; Wespi et al., 2014). Further research is needed to investigate the duration and frequency of contact and the nature of the strains encountered[320].

6.3.1.1.1 Donkeys

The sexual behaviour of donkeys is different. The satisfaction of their needs does not depend on a harem but is linked to a territory. Most often, the male donkey (jack) mounts the jinny (female donkey) as soon as he is erect. For this to happen, the female in heat must attract him from a distance. As with cows, they sniff each other and then the jack mounts the jinny. Breeders often ignore this requirement when breeding in hand. As a result, the male's sexual behavioural needs remain unsatisfied.

6.3.1.1.2 The strains of mares and stallions when breeding in hand

Live cover in hand imposes behavioural strains on the stallion, teaser stallion and mare because they cannot behave as they would in the wild i.e. in a herd (McDonnell, 2000).

[315] 6.4 Artificial insemination, p. 242
[316] 6.5 Embryo transfer, p. 246
[317] 6.6 Reproductive cloning, p. 251
[318] 6.3.4 Alternatives that achieve the same results with less strain, p. 240
[319] 5.1.1.1 The strains and risks, p. 92
[320] 6.3.1.1.2 The strains of mares and stallions when breeding in hand, p. 238

The risk of strain to the mare

Major hazards include injury and defensive reactions of mares. In addition, breeding hobbles attached to the pasterns or hocks (Figure 84) can cause severe injuries with long-lasting consequences.

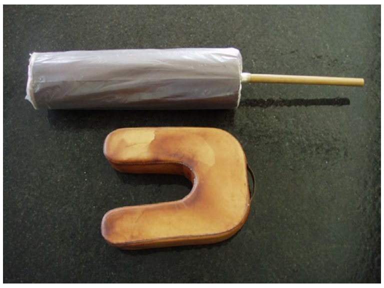

Figure 85 Protective equipment against vaginal injuries during breeding (Photo: Swiss National Stud)

The second risk is the transmission of venereal or contagious diseases. In the majority of cases, the stallion is wrongly accused of responsibility for sexually transmitted diseases observed in mares. In reality, mares are susceptible to bacterial colonisation of the genital tract if they have a weakened immune system. Among the sexually transmitted diseases include coital exanthema, contagious equine metritis (CEM), which is usually asymptomatic in stallions, and equine viral arteritis.

Superficial tears of the vagina without involvement of the abdominal cavity have a favourable prognosis but are generally fatal in the event of perforation and peritoneal contamination. These injuries occur mainly in young mares that are nervous and tense during breeding as well as mares that are anxious, in a state of panic or insufficiently receptive and forcefully bred. Some stallions cause vaginal wall perforation more often than others. Various causes can be identified: the size of the penis, the size of the stallion or his behaviour during mating. To prevent these injuries, the stallion holder can place a cushion between the penis and the vulva when the stallion enters the mare (Figure 85).

Rectal injuries occur when the holder fails to ensure that the penis enters into the vagina correctly or is unable to control a violent stallion. Less than a third of mares survive rectal injuries caused by breeding, as the tear usually results in a fatal, untreatable, fulminant peritonitis.

The question of responsibility

The problems noted above are considered to be inherent to horse breeding. Thus, the owner of the mare assumes the entire risk when he or she brings a mare to be serviced. The stallion handler can only be held responsible if he or she is at fault or has not followed appropriate safety precautions. In particular, the stallion handler must use a cushion if necessary, monitor the penile penetration, not allow a mare to be covered that is not in heat and receptive and have the health status of the stallions and mares checked (CEM in particular).

The risks of live cover breeding in hand for stallions

The risks to the stallion include falling during and after breeding well as injuries caused by the mare kicking (risk of injury to the forehand and penis of the stallion). In addition to these risks, there is the risk of infectious disease transmission mentioned above.

Potential strains for the teaser and breeding stallions

Most often, a teaser stallion teases the mare beforehand to give her the opportunity to show her heat and receptivity. Separated by a wall (teasing chute), their contact is limited to a few auditive, olfactory and corporal communications. At stud farms, this stallion does not cover the mares. For breeding in hand, the holder usually leads the stallion to the rear of the broodmare without letting him interact with her head. At best, this quick contact allows for a short exchange of vocalisations and very brief sensory exploration. To be motivated to breed, even a well-conditioned stallion must respond to weak stimuli. A restricted precopulatory phase does not always give him the opportunity to express his libido, which can result in a certain slowness. In controlled breeding, humans emphasise restraint of the stallion and mare. Breeders justify this restraint by the need to protect against injury.

These preliminary actions and the act of breeding itself are different from what is observed in the wild. In a harem, the stallion and the mares interact continuously (alertness, regrouping). For breeding, the stallion never initiates contact from directly behind the mare. He always approaches from the side near the head. He then begins a process of licking, vocalising and (sometimes) trial mounting before penetration (McDonnell, 2000; 2011b). This precopulatory phase allows the mare to show her preferences, and on the other hand to give the stallion the opportunity to satisfy his need to smell the female, her urovaginal secretions and her faeces. Before actual penetration, the stallion makes several attempts without an erection. As a rule, stallion holders do not tolerate this behaviour, which is considered a vice. The correction can be a strain. In addition, after natural mating in a herd, the stallion stays on the mare for several seconds after ejaculating in order to recover. The duration of mating is shorter during live cover breeding in hand than in a natural setting. The stallion is expected to immediately dismount after ejaculation, which causes him discomfort.

Care should be taken not to idealise natural breeding. In wild herds, stallions have also been observed that harass and assault mares, especially unfaithful mares in the harem and while competing with other stallions to assume the position of harem stallion (Linklater, 1999).

The strains of intercontinental transport and a high number of covers

Busy breeding schedules have been shown to cause loss of libido (McDonnell, 2011a). They also compromise the welfare of the stallions (Allen, 2015; Campbell & Sandøe, 2018). Several high-quality Thoroughbred studs complete a spring breeding season in the northern hemisphere and then another in the southern. The search for maximum profitability and the ban on artificial insemination in this breed explains this procedure. However, it imposes strains (stress, air travel, over utilisation). In addition, a very popular stallion can find himself obliged to cover three or four mares per day, i.e. nearly 300 per season.

6.3.1.2 Natural cover

Natural cover or pasture breeding is the practice of allowing a stallion and mare to breed of their own accord in an outdoor area, under supervision but without direct human intervention. It is usually practiced out to pasture (Figure 86) or in a spacious turnout area. The management of natural cover requires skills in behavioural observation, group boarding, and providing adequate surfaces (ground conditions, hygiene, safety).

This method of breeding, which is not very widespread in Switzerland, is very common in France for breeding draft or leisure horses (Margat et al., 2020). The pregnancy rate at the end of the season is higher than for live cover breeding in hand. It can even reach 90% depending on the circumstances. Success depends mainly on the constitution, balance, organisation and supervision of the herd, the choice of stallion and economic imperatives. A stallion with an irreproachable character and gentle attitude towards mares and foals should be chosen. The herd can take several forms depending on the infrastructure and the climate. There are very stable harems as in the wild or more variable group structures that vary according to the breeding season, the clientele and the available space.

Opportunities for equids to express their natural behaviour and to satisfy their needs are the main interests of this method of reproduction. It also has economic advantages because the stallion detects the heat and the number of foals is generally higher. Additionally, labour costs are saved (breeding, transport, gynaecological examinations), although the monitoring of the animals and the stallion's activity can be slightly more cumbersome. This process restricts the possibility of choosing a different stallion for each mare. Careful selection of the stallion is therefore required to maintain prospects for progress and genetic diversity. It is therefore not very suitable for breeders specialising in horses with a high potential for competition and racing.


Figure 86 Natural cover (Photo: Sarah Krieg, Swiss National Stud)

Contrary to popular belief, the risk of accidents is low, because only mares in heat allow themselves to be mounted and the stallions learn to approach from the fore side. However, this practice can occasionally favour the rapid spread of venereal diseases (contagious equine metritis, coital exanthema), even if testing is done before the breeding season. The difficulties increase if the breeder does not have the necessary knowledge (herd management, zootechnical and sanitary requirements, behaviour - especially sexual behaviour - of mares and stallions, pasture management).

6.3.2 Policy and regulatory context

Animal welfare legislation does not prohibit live cover in hand so long as it is practised in accordance with the regulations. The general provisions of the AniWO (Chapter 2) outline expectations of the health and welfare of the animals used, but without setting specific requirements for natural cover (CF, 2020b).

Prevention of contagious diseases is still necessary

The Epizootic Diseases Ordinance (CF 2020c) determines which transmissible diseases need to be controlled. Section 9 (Art. 240 to 244 EzDO) regulates the control of contagious equine metritis (CEM). Horse owners and breeders must take measures to prevent the spread of the disease by persons, fomites and carriers. They should observe mares in the days following breeding. It is strongly recommended to test imported breeding stock for CEM before breeding them in Switzerland. In addition, stallions are subjected to an yearly bacteriological swab (CEM) before the start of the season. The Animal Husbandry Ordinance (CF, 2020a), as well as the regulations of the individual breeding organisations, are not applicable to live cover breeding methods (in hand and pasture).

6.3.3 Stakeholder interests and areas of conflict

Discussions about breeding methods touch the emotional sphere of society. Individuals often make references to anthropomorphic concepts (freedom, rape, harassment, coercion, fidelity, modesty, sexually transmitted diseases).

The importance of typical equine sexual behaviour

Animal protection, the executive branches of the legislation and insurance companies advocate a breeding method that imposes a minimum of strains (stress, injuries, infections) on breeding stock. They particularly recommend conditions that allow stallions and mares to express typical equine sexual behaviour without compromising their dignity. These interests often conflict with the traditional values of breeders.

The search for the highest fertility and profitability

With live cover breeding, breeders hope for better fertility in optimal conditions of profitability (cost, time, organisation, infrastructure, availability of genetic resources). They also take into account the risk of injury. The owner of the mare also wants to choose the most favourable stallion for breeding progress. For these economic and zootechnical reasons, live cover breeding in hand is still the most common method for certain breeds, despite the availability of alternatives that offer advantages over this method.

6.3.4 Alternatives that achieve the same results with less strain

Training young breeding stallions

In the case of live cover in hand, the main focus is on improving the training of novice stallions. In particular, the maximum amount of olfactory and tactile interaction should be encouraged during the preliminary phase with the mare in heat. A respectful and firm training of the young stallion requires theoretical and practical knowledge to recognise the behaviours to be encouraged or corrected (aggressiveness, excessive libido). In particular, the stallion handler needs to understand that he or she is rewarding (positive reinforcement) undesirable behaviour if the stallion is allowed to forcibly cover a mare. To prevent this dangerous behaviour, the handler needs to teach the stallion to respond appropriately to simple commands such as to walk towards the mare, wait or back up. To restore calm (should the stallion become overexcited), the handler should take the stallion out of the breeding shed and then start the procedure again including preliminary contact and approaching the mare. It is important to reward the stallion by allowing him to breed if he behaves well during all the previous phases (McDonnell, 1986, 1999).

Natural pasture breeding reduces the risk of strain

Breeding a mare to a stallion in a pen or pasture reduces strain because the typical equine sexual behaviour is manifested to a very large extent (Figure 86). However, stallions should be given time to become accustomed to this method, at least a few days or weeks. Stallions that are frenetic or aggressive are not suitable for this method (McDonnell, 2011a).

Artificial insemination (AI)

AI[321] completely removes the risks of live cover breeding. However, this method excludes specific sexual interactions. The reproductive needs of a stallion are only partially satisfied during semen collection and the mare's needs are only partially met if she is teased beforehand. This method of breeding is more expensive than live cover breeding. For Thoroughbred stallions that travel between the two hemispheres, artificial insemination would avoid the strains of travel and over utilisation.

6.3.5 Results of the balancing of interests and justification of strains

Live cover breeding in hand is justified provided that optimal measures are taken for the stallion, the teaser stallion and the mare. They should all be allowed to express typical equine sexual behaviour, especially during foreplay and breeding. The breeding stallion should be given time to recover, without being punished, when he remains on the mare after ejaculation. As for the mare, she should only be covered if she is clearly in heat and receptive to the stallion without displaying defensive or anxious reactions. The handler will only use breeding hobbles on the mare if it is necessary for safety reasons. Failure to follow these guidelines will cause unjustifiable stress to the stallion and mare. Pasture live cover[322] is preferred or artificial insemination[321] under the guidelines provided if the application of the provisions for live cover proves impossible. The use of a twitch or sedation during live cover in hand is abusive.

6.3.6 Recommendations for implementation

- Stallion handlers and other stakeholders must receive adequate training, in particular in breeding techniques and typical equine sexual behaviour
- The administrative or breeding authorities need to inspect the breeding station including infrastructure (stabling, teasing chute, equipment, hygiene practicies) and breeding methods (precopulatory phase, the act of breeding, handling of stallions and mares, safety, disease prevention)
- Further studies on the interactions between mares and stallions need to be done.

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6.4 Artificial insemination

6.4.1 Description of the current situation, trends, strains and risks

Artificial insemination (AI) has clearly gained importance in horse breeding. The procedures include the collection and preservation of semen (Davies Morel, 2020), as well as the deposition of semen into the uterus of the mare.

A brief history and current situation

Figure 87 Semen collection on a dummy (Photo: Swiss National Stud)

AI started in Eastern Europe, especially in Russia, at the end of the 19th and the beginning of the 20th centuries. In Switzerland, the National Stud in Avenches implemented AI for the first time in 1966. Since 1990, AI has become increasingly important in the global production of sport horses, Trotters and Quarter Horses, including in Switzerland. There is an increasing international demand for genetic resources in the form of cryopreserved semen. Many mares begin their breeding career after being successful competitively. Their fertility is often reduced. In Switzerland, Warmblood breeders inseminate about half of their mares using AI. This rate reaches 80% in Germany. AI is still forbidden for Registered Thoroughbreds intended for racing. Other circles question the justification of AI (Campbell & Sandøe, 2018). In addition, there are reports of negligence or deception on the identity or quality of marketed semen.

Various techniques used in AI

Semen is collected from a stallion using an artificial vagina (AV) where the outer wall is filled with very warm water, which helps to trigger the chain of sexual reflexes in the stallion. In many cases the stallion is stimulated by the presence of a mare in heat. An ovariectomised mare who is given oestrogen to induce heat behaviour can also be used.

The AI technician collects the semen from the stallion using the artificial vagina. Its outer wall is filled with very warm water to trigger the chain of sexual reflexes. The presence of a mare in heat stimulates the stallion. The mare in heat can be replaced by an ovariectomised female under the influence of oestrogens which makes her receptive. The collection procedure is carried out when the stallion mounts either the mare or a dummy (Figure 87). Stallions accept the use of the dummy well after a period of habituation. Collection can also be done with the stallion standing on the ground, however, this posture does not reduce strain on the hind-quarters as one might expect. Sperm production is also reduced by 25% and copulatory behavioural problems appeared during the first tests (Meroni et al., 2011). The experience, know-how and skill of the AI technician determines the success or failure of collection. After collection, the semen is filtered to remove impurities and the gel fraction of the ejaculate, the sperm concentration and vitality are examined, doses are prepared with a suitable extender for the type of preservation (fresh, chilled, frozen), and the semen is stored in a safe place. Each technique has its own extender, packaging, cooling speed and storage temperature (Margat & Doligez, 2017).

Semen is deposited in the mare's uterus at a time close to ovulation. This usually involves several gynaecological examinations by a veterinarian. It is also recommended to check that the mare is in heat using a teaser, but breeders do not usually do this. The mare's perineum is cleaned and washed before manually inserting a sterile insemination catheter through the open cervix into the uterus and inseminating the mare. These precautions reduce complications such as inflammation of the uterus. Several inseminations per cycle improve fertility rates.

Potential strains on the stallion

The AI procedure, including the preparation of frozen doses for export, imposes sanitary standards that may isolate the stallion and deprive it of social contact. Additionally, the manipulations during collection to accustom it to the dummy and the artificial vagina can cause mild physical and psychological stress of varying intensity depending on the individual and the circumstances. Finally, by analogy, the strains of live cover in hand[323] on sexual behaviour are also relevant here.

Potential strains on the mare

Like stallions, broodmares endure a lack of contact that limits their sexual behaviour, especially if a teaser stallion is not used to check for signs of heat. Dangers include incorrect interventions during semen collection and insemination (insemination in the absence of oestrus), injuries to the rectum during gynaecological examinations and contamination by semen from a donor with a venereal disease. Examination of the reproductive system and insemination may also cause mild to moderate strain depending on individual sensitivity. In particular, the passage through the closed cervix may inflame or infect the uterus without, however, disturbing the general state of health.

Regular administration of oestrogen to mares is a strain

Regular injection of oestrogen for the purpose of using ovariectomised mares for various breeding techniques causes strain. First, oestrogen administration has side effects that can affect their health and reactions; they no longer express natural sexual behaviour. The lasting effects of such treatments are unknown (McKinnon, 2011), but obesity, especially fat deposits in the crest of the neck, is commonly observed. In addition to these effects, there are the risks inherent in any injection, such as anaphylactic shock. Finally, the need for an ovariectomy without any medical indication constitutes an additional strain. This use can even be described as unjustified instrumentalisation.

6.4.2 Policy and regulatory context

Currently, all European countries have competent professionals and reproductive centres authorised by the authorities to collect, process and store semen and perform AI.

6.4.2.1 Swiss legislation

6.4.2.1.1 Trained veterinarians and technicians are authorised to inseminate mares

Animal welfare legislation allows the manipulations necessary for AI as long as they comply with the regulations. Veterinarians do not have exclusive rights to carry out AI. Artificial insemination technicians - trained in anatomy, physiology, nutrition, zootechnics, given practical training, and granted certification after passing an examination - can perform AI on mares, as can owners on their own farm or an employee on a stud farm. The FSVO, formerly the FVO Federal Veterinary Office, sets the conditions (OSAV, 2007). The FSVO has also issued guidelines on insemination centres for horses (OSAV, 2022). Passing the certification exam entitles the owner or manager to carry out all semen collection, as well as preparation and insemination of semen. However, it does not entitle them to perform rectal or gynaecological examinations or to carry out therapeutic interventions.

6.4.2.1.2 Controlling the health status of horses and semen

The regulatory provisions concern the protection of animal health and of semen. The Epizootic Diseases Ordinance (EzDO) sets out the regulations to be observed (Articles 50 to 58 EzDO). In particular, it prohibits the use of semen carrying transmissible diseases (CF, 2020b). If semen is suspected of being contaminated, this material may not be used for AI until the FSVO has set health requirements (Art. 50, Para. 2 and 3, EzDO).

[323] 6.3.1.1 Live cover in hand, p. 237

The import and export of semen must comply with EU regulations in accordance with bilateral agreements, meaning that only EU-approved centres can package semen doses for export. In Switzerland, the cantonal veterinarians are responsible for the supervision of these centres.

6.4.2.1.3 Authorisation to use AI remains the responsibility of the breeding organisations

The Animal Husbandry Ordinance (Section 7 OE) of November 14, 2007 (CF, 2020a) regulates semen handling and pedigree certificates of breeding animals placed on the market. Breeding organisations are free to lay down specific provisions, for example to allow or refuse the use of frozen semen after the death of the stallion.

As mentioned above, the Jockey Club prohibits AI in Registered Thoroughbreds worldwide. Recently, however, some parts of the United States have been practising semen infusion into the uterus under the guise of Reinforcement Breeding. This is de facto insemination of residual semen (the dismount semen sample) collected immediately after live cover in hand of the same mare (Blanchard et al., 2006, Varner et al., 2010). Furthermore, in 2014, the Federal Court of Australia unanimously rejected a challenge to the AI ban in Thoroughbreds. A former bookmaker and president of the Sydney Turf Club had initiated the litigation. He alleged that the clause constituted an impairment of trade and competition in the bloodstock market (The Blood-Horse Staff, 2012, 2014).

6.4.3 Stakeholder interests and areas of conflict

In short, AI is proving to be a source of tension between the safety and health of the equids concerned and traditional economic and emotional values.

6.4.3.1 The interests of mares and stallions

As discussed in the section on natural cover or pasture breeding, the reciprocal interactions between the mare and stallion during foreplay is their primary interest.

In practice, mares are inseminated without any contact to a stallion

Those involved in AI strongly recommend that equids should be allowed to express normal sexual behaviour during foreplay. In competent AI centres, a mare stimulates the stallion that will be collected. At the same time, the mare to be inseminated is able to show signs of heat in the presence of a stallion. In most cases, these two activities do not take place simultaneously or in the same place. In practice, for reasons of efficiency and profitability, many AIs are performed in the stable without a teaser stallion for the broodmares. This is why, traditionally some breeders prefer natural cover to AI, which to them seems to be more artificial (as the name suggests). In addition, they do not use semen extenders - dreaded substances. Scientists consider this fear to be unjustified.

The AI debate in Thoroughbreds

Discussions about AI in Thoroughbreds have been going on for a long time. The authorities and breeders point out several disadvantages. They mention the high costs, the spread of diseases and hereditary disorders and the risk of loss of genetic diversity. With AI, a small number of popular stallions could dominate the breeding market (Hunter, 2013). They also argue that the natural mating dynamics are missing and that AI artificially selects the semen and as a result they expect lower quality offspring. In his reference book for Registered Thoroughbred breeders, Federico Tesio (Tesio, 1965) puts forward several hypotheses that have no real scientific basis (copying of plant fertilisation, setback in biological evolution, unnatural manipulation, lower stress resilience of offspring).

6.4.3.2 The interests of the breeder

The handlers, technicians and veterinarians working at the stud, researchers, animal welfare and law enforcement authorities all have an interest in AI. This method continues to provide valuable knowledge in equine reproduction.

Fertility and efficiency are superior to those of natural cover

Stakeholders point to several benefits of AI. In particular, they note the improved safety for staff and animals, as well as higher fertility rates than with natural cover. The procedure allows the semen to be evaluated at each collection and to check semen quality and changes. Stallion owners appreciate the reduction in physical and mental stress to the stallion, the possibility of using the stallion in breeding and sport at the same time, as well as the efficiency of collection in comparison to live cover. One single ejaculate can be used to produce 20 chilled or frozen doses. This allows more mares to be impregnated regardless of location and time of year. In addition, deep uterine insemination allows the use of only 50 million sperm per insemination instead of 250 - 500 million. Finally, AI improves the management of older stallions. Mare owners also expect faster genetic progress through the wider range of excellent genetic resources. This high heritage value supports programmes for the preservation of endangered breeds. Breeders can also hope to obtain a foal from broodmares whose fertility is reduced by old injuries caused by breeding or foaling. In addition, the shipping of the doses saves the breeders and horses long journeys and stress during transport.

AI enables effective control of contagious diseases

When hygiene measures are applied according to regulation, AI is effective in controlling venereal and contagious diseases[324].

[324] 6.3.1.1.2 The strains of mares and stallions when breeding in hand, p. 238

Ancillary costs

The breeder not only pays for the genetic value of the stallion but also the work of collecting and preparing the semen, the gynaecological examinations and performing the AI.

6.4.4 Alternatives that achieve the same results with less strain

The only alternative is to use natural cover under ideal conditions[325]. It avoids the risks of gynaecological checks and the stress related to insemination. By allowing normal sexual behaviour between the mare and stallion, it fulfils their basic needs. In this way, it also prevents the potential danger of stallion frustration when using a dummy. This method does not restrict the ability of the animals to reproduce autonomously. It respects their dignity and spares them the risk of excessive instrumentalisation. Moreover, this alternative is less costly. However, the health risks are higher, it requires the observance of regulations and limits the choice of available genetics, which may reduce breeding progress. Finally, it requires the transportation of broodmares.

For stallions, practices should be adopted prior to collection that allow the stallion to meet its sexual stimulation needs by making olfactory, visual and tactile contact with a mare in heat. Even if the stallion is well conditioned, a dummy or mare will only partially fulfil these needs in the absence of full foreplay. The use of ovariectomised mares that are regularly given oestrogen is not an adequate alternative.

6.4.5 Results of the balancing of interests and justification of strain

The need for social interaction and safety measures are the relevant selection criteria

AI is justified today provided that both parties (mare and stallion) can adopt sexual behaviours specific to their species to a large extent. At a minimum, foreplay should include vocal, olfactory and tactile contact. In addition, a mare should be present to stimulate the libido of the stallion during semen collection and the broodmare to be impregnated should have the opportunity to show signs of heat to a teaser stallion. The practice of inseminating a mare is abused if she is deprived of the possibility to show her heat and receptivity to a stallion. In addition, trained personnel are needed to carry out veterinary examinations and procedures according to regulations. Both live cover in hand[326] and AI limit the ability of animals to fully express normal reproductive behaviour and the ability to reproduce autonomously.

In conclusion, what proves to be overriding and decisive in ethical terms is not primarily in the choice of method. The decision must be made primarily on the basis of the nature and intensity of the social interactions that the mare and stallion can develop. This should be coupled with the measures taken to minimise the risk of stress, disease, injuries and accidents.

6.4.6 Recommendations for implementation

- The organisations concerned are encouraged to disseminate codes of good practice on the key issues of AI:
  a. The essential expression of species specific sexual behaviour in stallions and mares
  b. A minimum required level of training for the use of artificial reproductive methods
  c. Basic measures for the control of communicable and hereditary diseases
  d. Appropriate facilities in place
  e. A good working relationship needs to be developed between veterinarians and broodmare owners
- Raise awareness of these aspects during advanced training courses of veterinarians, technicians and breeders
- Periodic monitoring of AI on breeding farms and centres.

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[325] 6.3.5 Results of the balancing of interests and justification of strains, p. 241

[326] 6.3 Live cover, p. 237

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6.5 Embryo transfer

6.5.1 Description of the current situation, trends, strains and risks

Brief history and current situation

The development of equine embryo transfer (ET) began in England and Japan in the 1970s (Allen & Wilsher, 2020). This method has now become established, after some initial technical difficulties, high expectations from breeders, and biological and zootechnical obstacles. The pregnancy rate can reach 75% to 90%.

Today, several laboratories offer ET as a commercial service, particularly in South America (IETS, 2015, 2020). In 2019, the IETS performed 27,110 ETs worldwide, of which 20,702 were in South America (Brazil). North America (4,664) and Europe (1,744) comprise the rest of the market. For the time being, the flushing of fertilised mares provides the majority (78%) of embryos (IVD[327]). In Switzerland, the number of ETs is about 20 per year. However, there has been an increase (+1126.2% between 2017 and 2019) of in vitro production (IVP[328]) by sperm injection (ICSI[329]) in oocytes obtained by ovarian puncture (OPU[330]). The results are promising (Galli et al., 2015; Morris, 2018; Morris et al., 2019; Squires, 2020). These technologies are interesting for stallions with very low numbers of sperm or poor sperm quality. As it only uses a single sperm cell per oocyte, ICSI requires a very small amount of fresh or frozen semen. Infertile or older mares also benefit from these advances (Dascanio & McCue, 2014).

The laboratories store some of the embryos created using these technologies by freezing (cryonics) and transfer them later. However, the success rate after thawing remains much lower (20-30% pregnancy rate) than those obtained with fresh or refrigerated embryos (Guignot, 2015; Guignot et al., 2017). Embryo sexing (determining the sex of the embryo) and splitting (an embryo is split during early replication stages, allowing two ETs from one original embryo) have also been recently developed. However, a few factors limit the use of ET in equids. Techniques to induce hyperovulation do not produce the satisfactory results seen in cattle where up to 35 embryos can be harvested per flush. In recent years, breeders and animal scientists have questioned these techniques and doubted their ethical justification (Campbell, 2018).

[327] IVD: in vivo derived

[328] IVP: in vitro production

[329] ICSI intracytoplasmic sperm injection

[330] OPU ovum pick-up

6.5.1.1 The techniques of embryo harvesting and transfer

Technical description of an ET

Scientific literature describes ET techniques very well (Allen, 1982; Brinsko et al., 2011; Caillaud & Doligez, 2019; Davies Morel, 2008, 2020; McCue & Squires, 2015; McCue, 2017; McKinnon et al., 2011). To obtain an embryo, the operator flushes the donor mare's uterus seven to eight (nine) days after ovulation and insemination. The recovered embryo is then deposited into the uterus of the recipient (carrier) mare as for AI. The embryo can also be chilled (5°C) or frozen. Currently, it usually requires two to four cycles to achieve the birth of a live foal from ET. It is also possible to proceed surgically (laparotomy, transvaginal puncture or laparoscopy). The results of this alternative technique are only slightly better.

In order for the embryo to develop, the ovarian cycles of the donor and the carrier mares must be at the same stage. The method of choice is to select a suitable recipient from a herd of mares but this is expensive. The other solution is to synchronise the mares by injecting the recipient with hormones beforehand.

The recipient mare influences the phenotype of the foal

The influence of the recipient mare on the ET product remains a poorly studied factor. Researchers (Tischner & Klimczak, 1989) have found that large broodmares give birth to larger and heavier foals than could be genetically predicted. They also have a faster growth curve while nursing. Other studies (Lagneaux & Palmer, 1989) showed that pony-type mares were not suitable for ET. The latest studies (Allen et al, 2002a, 2002b, 2004; Chavatte-Palmer, 2017; Peugnet et al, 2014, 2017) confirm that the stature of the recipient mare influences the postnatal growth of the foal. Therefore, carriers should be chosen that are of similar size to the donor. Furthermore, genetic factors have a greater influence on the behaviour and temperament of a ET foal than the traits of the recipient mare (Allen, 1993, personal communication; Burger et al., 2008). Breeders and riders involved in embryo transfer projects seem to confirm this hypothesis.

6.5.1.2 Strains and risks to mares

6.5.1.2.1 The strains of the embryo transfer

Gynaecological examinations and manipulations of the donor mares (insemination and uterine flushing) and recipients (embryo deposition) cause strain of low to medium intensity, but not higher than in AI. However, it should be noted that embryo flushing and transfer take place seven to 10 days after ovulation at a period of the cycle called dioestrus. At this time, the cervix is closed. As a rule, mares tolerate this manipulation without any problems, just as they do when they are in heat. Furthermore, all stages of the ET have the same restrictions in social contact and equine sexual behaviour that are relevant in AI. In contrast, surgical transfer, ovariectomy and hormone injections cause stress and moderate to severe pain.

6.5.1.2.2 Oocyte harvesting for IVP

Oocyte harvesting by follicle aspiration and puncture (OPU) requires a transvaginal approach, sedation and epidural anaesthesia. The latter carries the risk of adverse effects such as infection, ataxia and falling (Nemoz, 2007). The mare then remains under veterinary supervision for three days and receives anti-inflammatories and antibiotics. These techniques cause significant strain.

6.5.1.2.3 The strain of medication administration

ET requires the injection of hormones (prostaglandins): to synchronise the mare's cycle when no suitable herd is available, to initiate a new cycle of the donor mare after flushing and of the recipient in the absence of pregnancy. An ovariectomised (spayed) mare can also be used as a carrier, but the technique requires a daily administration of hormones to ensure pregnancy to term. During ET, a non-steroidal anti-inflammatory drug and a mild sedative may be used to reduce stress in the mare and relax the cervix. After the transfer, some still consider supplementing with progesterone to compensate for a perceived low level. However, this treatment is unnecessary for most recipient mares. The use of these medications imposes strains that need to be considered (McCue, 2017).

6.5.1.3 Do embryos suffer?

One study has suggested that animal foetuses may suffer earlier than thought and experience negative effects through subcortical awareness (Campbell et al., 2014). For this to happen, they would need to have a sophisticated nervous system capable of receiving sensory information and transforming it into cues harmful or aversive enough to cause suffering. However, it is believed that the neural system of mammalian foetuses is insufficiently sensitive during at least the first half of gestation. These prerequisites (necessary structures and processes) only develop shortly before birth. Therefore, the embryo and the foetus seem never to be conscious after fertilisation and during the first part of gestation (Campbell et al., 2014; Campbell, 2018; Mellor & Diesch, 2006).

However, human responsibility for living beings is not only based on their capacity to suffer. Should there be a concern as to the fate of embryos during the ET procedure? Do embryos deserve respectful treatment as potential future horses, especially should they not develop into a foetus or foal?

The ethical answer is difficult to provide. First, the moral status of an embryo cannot be higher than that of the adult it could become. An animal does not have an absolute right to life[331]. Second, a detailed weighing of interests must be carried out. In this

[331] 5.11.1 Description of the current situation, trends, strains and risks, p. 212

way, the weight of the damage inflicted on the embryos is weighed against the benefits that can be expected from the various procedural steps and their outcome. As can be seen, this is the subject of much debate.

6.5.1.4 Other risks

Some breeders use ET to obtain offspring from infertile mares. This practice carries the risk that the offspring inherit genes that promote these health problems.

6.5.2 Policy and regulatory context

6.5.2.1 The legislation does not protect the animal embryo

The legislation does not prohibit non-surgical ET according to the regulations and it does not protect the embryo[332]. Section 7 of the Animal Husbandry Ordinance (CF, 2020a) only deals with the issues of pedigree certificates for the marketing of breeding stock, semen, ova and embryos.

6.5.2.2 The health aspects of ET are at the forefront of the legal provisions

As in the case of AI[333], the Epizootic Diseases Ordinance (CF, 2020b) regulates ET. Only veterinarians authorised to practise the profession may collect ova and embryos and entrust qualified personnel with the preparation, storage and transfer of such (Art. 57 EzDO). They shall inform the appropriate cantonal administration where the animals are kept. They shall also take measures to prevent the spread of pathogens during the various stages of the procedure. The donor and recipient mares must be examined beforehand. In addition, the veterinarians are required to keep a register of stored ova and embryos for three years (Art. 58 EzDO). The technical guidelines (Art. 56 EzDO) remain the responsibility of the FSVO (OSAV, 2008). Surgical ET may only be carried out with the aim of establishing and maintaining a healthy herd. This provision theoretically applies to equids but, in the Authors' opinion, is not imperative. Where appropriate, the ET will respect the principles of animal welfare legislation. Furthermore, the technical operations will be carried out according to international standards, in particular those of the IETS (https://www.iets.org/, International Embryo Transfer Society). Some stud books require permission for ET, which places additional requirements on the recipient mare and limits the annual number of embryos per donor (Reis, 2015). Finally, it should be noted that ET, like AI, is still prohibited in the Thoroughbred breeding. For Trotters, the authorities limit ET to one foal per year per donor and require approval of the biological dam.

6.5.3 Stakeholder interests and areas of conflict

6.5.3.1 The interests of mares

As with other reproductive methods the animal welfare community and authorities are calling for procedures that avoid as much strain as possible and protect the dignity of the animals. In the case of ET, they are concerned about the risk of excessive instrumentalisation of mares[334]. This occurs when biological dams are used as embryo donors or when carriers are seen as mere receptacles for the embryos. The danger is particularly high if, in addition, the recipient mares receive hormonal treatments to synchronise their cycles or if they are rendered infertile by ovariectomy for the sole purpose of being an ET mare. They also argue that mares should be given the opportunity to express typical equine behaviour. For them, the technical manipulation of a living embryo for eugenic purposes constitutes an insurmountable moral barrier.

6.5.3.2 Breeders' interests

For breeders attached to the value of tradition and economic profitability, ET is too expensive. However, in a survey (Aurich et al., 2007) conducted in Germany, Austria and Switzerland, only 14% of respondents mentioned ethical concerns.

Some expressed an interest in obtaining more foals earlier and more often

The possibility offered by ET to multiply the progeny of a high-quality mare appeals to many owners. Depending on the investments made and the fertility rate of the broodmare, the owner can expect two to five foals per year. The owner thus contributes to the genetic diversity (endangered bloodlines or breeds). ET also allows owners to prepare mares for a competition career without running the risks of breeding. If the mare is successful in sport, this adds value to her ET progeny.

Zootechnical interests

From a zootechnical point of view, ET shortens the interval between generations, accelerates selection progress and thus gives more weight to maternal lines. The additional offspring increase the accuracy of the breeding values of the dam. ET also has the advantage of making it possible to obtain foals from a mare whose reproductive organs (vagina, cervix, uterus, ovaries) are either not functioning properly, reduce her fertility or threaten her health at the time of breeding or foaling - provided that the conditions are not hereditary.

Finally, in the very near future, ET will make it possible to analyse the genotype of an embryo at the blastocyst stage (seventh or eighth day). Initial results indicate that this preimplantation diagnosis remains without adverse effect on the chances of subsequent

[332] 6.1 Introduction, p. 224

[333] 6.4.2 Policy and regulatory context, p. 243

[334] 2.3.6 Excessive instrumentalisation, p. 25

gestation (Choi et al., 2015; Herrera et al., 2015). In this way, carriers of a deleterious allele of an inherited disease[335], sex or other attractive characteristics such as coat colour can be identified. However, these points will require a detailed weighing of interests.

6.5.3.3 Preservation of the genetic heritage of endangered species and breeds

ET is one of the tools for the conservation of threatened equine species. Methods of preservation of their genetic heritage includes freezing (cryonics) of semen, ova and embryos. For example, the donkey population in industrialised countries has suffered a dramatic decline over the last century that is endangering almost all European donkey breeds. Despite the fact that the first ET in donkeys dates back 50 years, few studies have been conducted on this species. Knowledge on several biological aspects of their reproduction remains limited. The cryopreservation of semen, embryos, oocytes and in vitro fertilisation (ICSI) still need to be intensified, particularly for threatened or endangered breeds of donkeys and horses (FAO, 2021; OFAG, 2020; Panzani et al., 2020).

6.5.3.4 The interests of scientific research

ET and related technologies allow biologists and veterinarians to gain valuable knowledge in reproductive sciences (fertilisation, implantation, development, early embryo death).

6.5.4 Alternatives that achieve the same results with less strain

To minimise the strain (excessive instrumentalisation, suppression of typical equine behaviour, technical manipulation of living organisms), other breeding methods (live cover, AI) represent solutions. They do not compromise the success of selection, even if breeding progress is theoretically less rapid. Breeders interested above all in the economic, zootechnical, early and intensive use of the genetic heritage of their mares have no alternative.

6.5.5 Results of the balancing of interests and justification of strain

The weighing of interests aims to assess whether the benefit obtained by ET justifies the strain on the donor and recipient mares. The weight of the benefits must be greater than the harm to the dignity of the animals. Ethical values often conflict with economic, zootechnical, scientific and safety benefits. In some circles, ET remains unjustified, as the interests put forward in its favour are not overriding or worthy of protection. For the COFICHEV, ET can only be justified if it meets all of the following conditions:

- The biological dam and the stallion both have a very high objective merit (breeding value estimated according to a recognised method) that has the potential for decisive breeding progress without loss of genetic diversity. Or these animals are of significant value for the preservation of an endangered breed or species
- The donors, recipients and stallions are healthy in all respects, including freedom from hereditary defects. In addition, the conditions under which they are kept are optimal for their legitimate desire for interaction with other equids
- A team with sufficient expertise performs the ET using a non-surgical, peer-reviewed technique. In addition, the procedure is state of the art and offers a maximum chance of success (probable pregnancy rate of at least 75%)
- The recipient mare is not instrumentalised (ovariectomy, hormones) and comes from a herd that meets the natural needs of the equine species
- Oocyte harvesting by puncture and transvaginal aspiration for ICSI or freezing (cryopreservation) is reserved for specific cases, in particular the safeguarding of animal genetic resources.

The strains caused by ET are unjustified if these requirements are not met, especially in one of the following situations:

- Recipient mares have undergone ovariectomy without medical indication and are given hormones, for example to induce heat signs
- The donor mare does not have a high genetic value
- The team uses unproven or surgical methods
- The recipient is instrumentalised
- The mares are used for unauthorised scientific research.

6.5.6 Recommendations for implementation

- Increased monitoring of centres that perform embryo harvesting and transfer or use assisted reproductive technologies is recommended
- Where breeding organisations deem that ET is justified, they set conditions for stallion and mare breeding stock based on the ethical requirements mentioned above.

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6.6 Reproductive cloning

6.6.1 Description of the current situation, trends, strains and risks

6.6.1.1 Introduction

After Dolly the sheep in 1996, scientists have cloned many other livestock and companion animals including horses and mules. Opinions on animal cloning are very divided. The health and welfare of the animals concerned, scepticism among consumers of milk and the effects on international trade remain the focus of concern (OSAV, 2010a; Menéndez González & Reist, 2011). The question of whether reproductive cloning of equids is ethically justified is rightly raised (Campbell, 2016; Campbell & McNamee, 2020).

In cloning an equid without genome manipulation, an offspring is obtained that has a nuclear genetic heritage identical to the original. To be more precise the nucleus of an ovum of any mare is combined with the nucleus of a somatic cell taken from a sire, usually a skin cell. When the conditions are favourable, this new cell develops as an embryo which is transferred to a recipient mare[336]. It develops as a normal foetus and is born through normal channels. This technique is called cloning by *somatic cell nuclear transfer (SCNT)*. Laboratories have been offering cloning services for several years for around 250,000€ per foal. Several hundred clones have been produced from Quarter Horses (*Smart Little Lena*), and clones have been successful in endurance (*Pieraz*) or show jumping (*ET FRH, Calvaro, Quidam de Revel, Gem Twist, Jazz*). The high quality of the semen of certain stallions

[336] 6.5 Embryo transfer, p. 246

allows them to have a breeding career and to have their first offspring. The exact number of clones remains unknown, as cloning companies do not publish statistics or activity reports (Campbell, 2016; Gambini & Maserati, 2018).

6.6.1.2 Cloning of sport horses in Europe

A mixed record

In Europe, the French company *Cryozootech* in collaboration with Texas A&M University and the Italian laboratory LTR-CIZ in Cremona (Italy) have dominated the cloning scene. Founded in 2001, *Cryozootech* ceased operations in 2016. Leon Melchior of Zangersheide Stud, the most enthusiastic supporter, used this method. Products include clones of the stallions *Air Jordan Z, Chellano Z, Cumano Z, Levisto Z and Zandor Z*, as well as three clones of the broodmare *Ratina Z* (Hector C, 2019). The production of clones of famous athletes using this technology seems to have stopped nowadays, especially due to its exorbitant cost.

After around 20 years, the behaviour of the European market shows that most sport horse breeders are still very reluctant to clone their horses. They expressed unfavourable opinions on the subject in 2007 (Aurich et al., 2007). Moreover, after the initial excitement, the resounding success of clones in international competitions is yet to come. In France - an important sector of equestrian sport - the IFCE has published the first breeding values (BLUP) calculated on the progeny of clones (IFCE, 2020) in show jumping. So far, the results are disappointing. The recommendations based on these indices vary from not recommended (*GEMINI CL* (USA), clone of *Gem Twist*, BLUP -11, 0.31), to acceptable (*E T CRYOZOOTECH Z CL* (BEL), clone of *E.T FRH*, BLUP +10, 0.63). Another example: *Quidam de Revel II Z CL* - a clone of *Quidam de Revel*, a breed leader - only scores a mediocre BLUP of +2 (0.53) in 2020, while the original *Quidam de Revel* has a BLUP of +14 (0.99). Obviously, this clone, born in 2005 (23 years after the original), is not of great interest to mare owners. Owners prefer more recent genetic resources to diversify lines and breeding progress. Some clones or their offspring are nevertheless performing very well (Fletcher, 2020), especially in show jumping. For the time being, those who achieve sporting and breeding performances on a par with their original model are still rare. It will take at least another ten years to evaluate whether these clones and their offspring are able to transmit the original qualities in a significant way, as promised by the proponents of the method.

6.6.1.3 Cloning has garnered more interest in America

There is a great interest in cloning Polo Ponies and Quarter Horses in the Americas, especially in the United States and Argentina (Figure 88). In the final of the Abierto de Palermo (a major championship), Adolfo Cambiaso, one of the world's top polo players (WorldPolo Tour, 2022) and businessman, fielded a team consisting of six clones of his mare *Dolfina Cuartetera*[337] (Cohen, 2016). One filly, a clone of the same mare, sold for $800,000 (The Economist, 2013). Such horses remain rare on the market, as breeders want to exploit them for breeding or competition (de Montaigu, 2018; Wiederkehr, 2019). In Argentina, the firm Crestview Genetics (Crestview Genetics Argentina, 2015) reportedly produces an average of about 50 clones per year with undeniable commercial success. According to this firm, some twenty polo players have paid $80,000 to obtain a clone, not counting the owners of endurance, show jumping and dressage horses. The situation of Crestview Genetics seems very unclear today. Its website (http://www.crestviewgenetics.com/) is no longer an active domain. Furthermore, Adolfo Cambiaso, who had entrusted Crestview with several clones, sued Crestview and accused them of illegally marketing clones for their own benefit (Casetext, 2021).

Economic success is not always achieved (Western Bloodstock, 2010). For example, out of five clones from the champion cutting Quarter Horse champion *Smart Little Lena*, one died of cancer and the others were sold at auction for a price of $28,000 and $27,000 for two fertile stallions and $2,300 and $3,000 for two others that were sterile. Each had cost $150,000 to produce. However, it was pointed out that although these clones can compete in Western disciplines in the USA, they are excluded from their breed's stud book.

6.6.1.4 The strains

The horse from which cells are taken is not subjected to any strains other than those imposed during a biopsy carried out according to the principles of veterinary medicine. As explained above[338], the gynaecological examinations and transvaginal embryonic clone deposition cause only low to medium strain to the recipient mare. In contrast, the stress and pain are significant in the case of surgical transfer, ovariectomy and hormone replacement injections.

Figure 88 Eight clones derived from the mesenchymal stem cell line of a polo mare and born in August, September and October 2016 (Source: Olivera et al., 2018, CC BY-NC 3.0)

A high failure rate with massive loss of oocytes, embryos and newborns

Many aspects of SCNT cloning are still unknown and further studies are needed. At present, the reasons for the low efficiency of cloning can be roughly classified into two groups:

[337] Crestview Genetics Argentina (2015)

[338] 6.5.1.2.1 The strains of the embryo transfer, p. 247

- Manipulation of oocytes and during embryo culture,
- Abnormal gene expression and epigenetic patterns[339] at the embryonic stage.

With somatic cell derived clones, massive losses are observed. Less than 1% of harvested oocytes result in a live foal. In the case of *Prometea*, 513 nucleus reinjections produced 328 embryos, but only four gestations and one live birth. A recent compilation of sources (Gambini & Maserati, 2018) shows that the pregnancy rate varies between 9% and 100%. On average, three to four foetuses are produced to get one live foal. Researchers consider aberrant placental development and pathologies affecting 50% of live clones on delivery to be among the causes of failure. One study (Johnson et al., 2010) shows only six (43%) normal subjects out of 14 clones. The others suffered from neonatal maladjustment syndrome, umbilical problems, malformations of muscles, tendons and bones or immune deficiency. The number of stillborn clones was high. Despite supportive therapy (oxygen supplementation, guaranteed colostrum supply, prophylactic administration of antibiotics), many die in the first few days. Difficult delivery may also require a caesarean section.

Finally, in several species, several anomalies and phenotypic variations are observed between clones of an individual, the origins of which are attributed to genetics or epigenetics (de Montera, 2009).

Improvements under development

Scientists (Damasceno Teixeira et al., 2019) are seeking to improve the efficiency of nuclear reprogramming, for example by using mesenchymal stem cell nuclei from bone marrow instead of skin. 90% of these clones appear completely healthy and normal at birth, whereas two-thirds of those derived from skin cells were not (Olivera et al., 2018).

Food safety issues

Food safety issues are being studied by all sectors (EFSA, 2009, 2010, 2012) although this is less relevant in the equine industry. Both the European Food Safety Agency and the Food and Drug Administration (FDA) in the USA have concluded that food obtained from clones is safe for consumption. However, it is still impossible to distinguish between milk and meat from clones and from normally bred animals. Customers are wary. In a survey conducted in the European Union in 2008, 58% of people do not want cloned products in foodstuffs. In the USA, the population reacts in the same way: 64% refuse to buy them (OSAV, 2010a).

6.6.2 Policy and regulatory context

6.6.2.1 Swiss legislation

In Switzerland, the legislation considers cloning in the same way as animal experimentation. Accordingly, it requires a weighing of interests between the expected benefits and the strains imposed before the administrative services will grant authorisation. However, the acquisition abroad of cloned semen and embryos is still allowed without any particular conditions. Only the import of goods treated as "new kinds of foodstuffs", i.e. derived from clones, is under discussion. In accordance with the bilateral agreements, Switzerland has adapted its ordinance (ODAIOUs) to European standards (CF, 2020; OSAV, 2017).

6.6.2.2 European and American legislation

At the beginning of the 21st century, the European Commission (EC) suggested a five-year moratorium on cloning. It would have excluded the cloning of animals for food production (EFSA, 2009, 2010, 2012; European Commission, 2010; OSAV, 2010b, 2010c). It justified this on the basis of welfare concerns related to cloning. In 2013, the EC drafted a directive (European Commission, 2013). In 2015, the Parliament proposed amendments, a definitive prohibition and the choice of regulation as a more appropriate legal instrument (compared to a directive). The legislative dossier was then blocked by the Council, as Member States could not agree on whether to ban semen and animal products derived from the offspring of clones. On the grounds that progress was unlikely, the EC withdrew all proposals in the Official Journal of September 29, 2020 (EPRS, 2022). A few sites have published a recent analysis of the situation in the EU (Brouwers, 2017; USDA, 2019). In short, there is no European legislation on equine cloning. The competence to regulate cloning remains with the Member States. It is unclear how long this situation will last, and whether the European Parliament's views will change over time. The Netherlands prohibits the cloning of all animals, including horses, except for sport or leisure purposes. It is still allowed in France and the UK for non-food purposes on a licensed basis. In Asian countries there is no ban to the Authors' knowledge.

Cloning regulation in the USA

The United States has a very liberal view of cloning. They do not believe that cloning poses any risk to animal health. For this reason, the federal government has seen no reason to impose legislation that prohibits it. As a result, horse cloning remains permitted in the United States (Brouwers, 2017).

[339] Epigenetic phenomena modify the expression of genes without affecting the DNA structure of the genes. They act, for example, by interfering with the effect of genes on the phenotype after they have provided information to the cell. Although these effects are reversible, they are retained during cell division and function as the cell's memory. These markers then remain capable of modifying its physiology long after the event (stress, toxins, etc.) that caused them has occurred. This is why the prenatal and postnatal periods are critical, as the developing organism is very sensitive to its environment. Sperm cells carry epigenetic information and may play a role after fertilisation in the development of the embryo and its adaptation to the environment (Jammes et al., 2011; Le Blévec et al., 2020).

6.6.2.3 Regulation of equestrian sports, racing and breeding

In 2007, the FEI opposed the use of clones and their offspring in international events. This technique contravened one of the FEI's fundamental principles: to allow the participation in competitions under fair and regular conditions. After the growing interest in cloning and the fact that most sport horse studbooks were allowing clones and their offspring into their stud books, the FEI quietly allowed it in 2012 (FEI, 2012a, 2012b). In contrast, Article 1004 of the Veterinary Regulations maintains the ban on any form of genetic modification (FEI, 2021).

Most sport horse registers allow clones into their stud books

- At times influenced by the FEI decision, most sport horse studbooks have adapted their views on cloning over the years. However, the problems of entering a clone into a studbook are still numerous and unregulated
- Can cloning be considered in the same way as a traditional breeding method?
- Who is the breeder of a cloned foal: the breeder of the original, its owner or the person who commissioned it?
- What is the role of the owner of the mare providing the oocyte?
- What reliable procedure can be used to identify the various clones of an equid and their progeny individually?[340]
- Should clones be selected?
- How can the health of clones be monitored (e.g., hereditary diseases)?

Breeding registers that allow the registration of clones include the KWPN (Dutch Warmblood), BWP (Belgian Warmblood), Zangersheide studbook, Holsteiner Verband, World Breeding Federation of Sports Horses (WBFSH) and Continental Studbook USA (Brouwers, 2017). The FECH (Swiss Federation of Sport Horse Breeders) does not allow clones to be entered into its stud book, but will issue them with covering certificates (FECH, 2020).

Some major genealogical books do not register clones

The American Quarter Horse Association (AQHA) and the Pure Bred Arab Register do not allow the registration of clones and their offspring. This refusal was challenged in the US Court of Appeals, which ultimately upheld the decision to reject them (Vaught, 2018). The ban does not, however, affect participation in polo or other disciplines open to Quarter Horses or Arabians. On the other hand, clones of Thoroughbreds and Trotters, as well as those that have been genetically manipulated, remain excluded from the stud books. Consequently, they cannot race, as racing authorities only allow horses that are registered in the stud book of their breed (IFHA, 2020; UET, 2020).

6.6.3 Stakeholder interests and areas of conflict

6.6.3.1 Animal interests

Several aspects of cloning do not respect the dignity of equids

Animal welfare and the supervisory authorities focus on the welfare and dignity of the clones, although production conditions are also of concern. They argue that every horse has its own value (animal dignity) and respect of animal dignity is incompatible with the creation of a copy by cloning. In particular, they consider that the serious health problems frequently observed in clones at the foetal and newborn stage and, in view of the considerable number of mares required, the potential instrumentalisation of the oocyte donors do not justify this method of breeding (Ammann et al., 2007). In other words, they believe that the use of every applicable technological innovation is not synonymous with useful progress (*Everything is allowed, but not everything is beneficial*[341]). In terms of freedom and individual responsibility, they answer negatively to the question *Is everything that is not prohibited legitimate?* As for the authorities responsible for monitoring the food chain, their main concern surrounds consumer safety.

A method of reproduction that excludes sexual behaviour

The opponents of cloning also repeat the arguments put forward during the weighing of interests and potential harm as regards other artificial reproductive technologies. They consider it unjustified to breed equids without allowing the parties (mare and stallion) to express species-specific sexual behaviour. Furthermore, an extreme and soulless practice replaces natural cycles.

6.6.3.2 Breeders' interests

Some breeders hope to gain a competitive advantage

Breeders and pro-cloning organisations seek to conserve and maximise the value of the genetic heritage of animals with high zootechnical and economic potential. Indeed, this technique makes it possible to produce a fertile duplicate of a gelding, a stallion or a mare of high genetic quality. In this way, proponents intend to gain a decisive competitive advantage in the market for sport horses and stallion semen. Sentimental reasons - a miraculous resurrection after death - also motivate some breeders.

For others, cloning is a negation of genetic progress

Opponents put forward numerous zootechnical, moral, traditional and economic arguments. Cloning of a few individuals of high genetic quality negates the progress achieved by an efficient breeding programme because cloning transfers an old genome into a young body. In other words, when the stallion clones are of breeding age, more successful and modern selected breeding stock

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[340] 6.6.3.4 A clone, a true copy of the original?, p. 256

[341] 1 Corinthians 10:23, Bible, Louis Segond Version 1910. *Ich habe es alles Macht; aber es bessert nicht alles*, Lutherbibel, 1912.

will prove to be better. In addition, breeders legitimately question the interest in going back in time and neglecting the causes of a colt's castration (inadequate conformation or behaviour, transmissible defects). Breeders do not find this to be a determining factor.

6.6.3.3 Benefits of transparency for society as a whole

Transparency is a factor that determines the trust of the people and communities involved. Failure to do so creates an asymmetric relationship and fuels mistrust between service providers and customers of cloned semen. The scientific community, breeders, their organisations and society therefore have a legitimate interest in knowing the principles and particularities of cloning processes.

The lack of traceability: several names, various stud books, a taste for secrecy

The main risk is the lack of traceability of the provenance and biological identity of each clone of a stallion. The problem becomes acute if more than one has been created or if one of them is used as a donor for further cloning. The multiplicity of players plays a major role. Several private entities deal with the cells of the original, the necessary oocytes, the nuclear replacement, reprogramming, obtaining an artificial embryo, placement into a mare, gestation, foaling and breeding of the clone. They do not communicate the measures taken to trace the biological material. Nor do they inform other stakeholders as to the agreements with a stud book on how to record these operations (breeder, owner, pedigree, registration, microchip). Moreover, several countries and organisations may give the horse a first identity, a new name in a sports federation and a third name when it is approved for breeding. For the practitioner at the end of the chain, the distinction between the different clones of the same horse and its successive copies is complex, if not impossible. In fact, the first clones of stallions are sometimes not recorded in a pedigree register until several years after their birth. It is only assumed that someone has checked the nuclear DNA compatibility of the original and the clones. However, to the Authors' knowledge, the laboratories, services and breeding authorities involved do not guarantee this traceability. So everything seems to be based on mutual trust and a given word.

Several factors limit access to this information and fuel mistrust. In addition to the commercial interest of the various owners, the secrecy surrounding the clones, the opacity of the laboratories' activities and the almost total absence of scientific publications all negatively impact transparency. The clones of the stallion *Quidam de Revel* and the vagueness that surrounds them provide a significant example.

6.6.3.3.1 The example of the Quidam de Revel clones

In 2005, the press announced the birth of *Paris Texas*, the first cloned foal in the United States (Hinrichs & Choi, 2005) and published some illustrations that made it possible to recognise him. It was later revealed that he was the Z (Zangersheide) studbook clone of *Quidam de Revel*. After that, no more information could be found: no photos, no performance records, no offspring. In 2011, some breeders raised a number of questions (Chronicle Forums, 2011): Is the clone dead? Was its semen sold under the name of *Quidam de Revel*? The exact date of *Quidam de Revel's* death remains unknown. In 2012, an online magazine (Stud for Life, 2012) published a photo of the clone *Quidam de Revel I Z* who was starting a breeding season at a Belgian stud. Severely injured at the age of three, the clone did not have the successful career of the original, but the AES (Anglo-European Studbook) had just admitted him, the only one who had agreed to approve him at that age. Surprise: *Quidam de Revel I Z* did not show the same white markings (head, leg markings) as *Paris Texas*! Error or trickery? The truth only comes out in 2017. The University of Agriculture in Krakow, Poland (Tischner & Tischner, 2017) explained that two clones of *Quidam de Revel* were sent to their owner at the age of one year. They also announced that *Quidam de Revel II Z CL*, also born in 2005, would be standing in Poland. This confirmed the information in the article from Stud for Life. However, the photo of the 2017 stallion is identical to the one of the alleged *Quidam de Revel I Z*, therefore confirming that it is the same stallion.

In summary, *Quidam de Revel II Z CL* remains the only active *Quidam de Revel* clone as a sire. As a result, the foals attributed to *Paris Texas* are most likely due to him. However, one may wonder about the sudden appearance of a second clone of *Quidam de Revel II Z CL*, 7 years after his birth, without any communication from the owner or the cloning company. A search revealed an unnoticed 2006 publication on another clone born in 2005 (Church, 2006). As for *Paris Texas Z*, he has certainly disappeared from the active stallion market without a trace according to investigations. That said, the confusion continues; fresh semen from *Paris Texas Z* (http://www.harasdelaliniere.fr/quidam_de_revel.html) and several horses (https://www.horsetelex.nl/horses/progeny/554550) attributed to *Paris Texas Z* could still be found on a private database in 2022. All were born in 2013 or later. In any case, through ignorance or by withholding relevant information, several actors in the cloning scene have maintained ambiguity about the careers of these two clones. They have thus undermined the confidence of serious breeders in the cloning process.

6.6.3.4 A clone, a true copy of the original?

For some, the relevance of the question of the identity of a clone is lacking, as it is a duplicate of the original. In reality, however, a clone is an imperfect phenotypic duplicate: dissimilar white marks, distinct environmental influences, diverse life experiences (diseases, accidents, training). Prosaically, one could say that if someone cloned his dog, it would not recognise his master! Breeders also observe that the performance of the originals and clones can vary, making some much more interesting than others obtained from the same donor. Therefore, in the ethical and scientific debate that is the subject of this section, it remains important to understand what a clone really means and whether it can be distinguished from the original.

Although the clone in principle has the entire nuclear DNA of the donor, it is an incomplete duplicate in terms of genome. The discrepancies arise from the procedure. The procedure does not transfer, or only partially transfers, the mitochondrial DNA (mtDNA) from the cell to be cloned into the enucleated oocyte that will produce the embryo. This oocyte retains its own mtDNA. The effects of the confrontation of the mtDNA of two individuals and the consequences of the interaction with the original nuclear DNA are unknown. Nor is the impact of these factors on the phenotype known. In view of the central role of mitochondria in cellular energy metabolism, there are questions about their influence on performance (Engel et al., 2022). International parentage and identity tests based on nuclear DNA markers only quantify the probability of distinguishing between two different individuals, or of affirming that they are the same subject, if they are descended from sexual reproduction (Dubois et al., 2018). However, this method is not suitable for discriminating between a horse and its clone, or two of its clones, on the basis of mtDNA. Analysis of the latter does not seem appropriate either (Costa et al., 2016).

A second phenomenon can cause variation between the clone and the original. The genes express their effects during the reprogramming that takes place after nuclear transfer. The regulation specific to each animal makes it impossible for the model and its clones to express themselves identically. This phenomenon also explains the discrepancies observed. Several studies postulate the role of epigenetic regulators that influence embryonic development and its adaptation to the environment. This would indicate that nuclear DNA would not be the only factor at the origin of heritable phenotypes (Jammes & Renard, 2010; Le Blévec et al., 2020). Finally, an original nuclear DNA gene can sometimes mutate spontaneously during the first cell division after transfer. In this case, the embryo will carry DNA that neither of its parents possessed.

Seamless identification is essential, but currently impossible

In conclusion, infallible identification is still essential for breeders to be able to follow the lines of descent, in particular to recognise the various clones of an original, as well as their respective descendants. However, no method currently allows this. Research is therefore needed to meet the demand (Costa et al., 2016).

6.6.3.5 Economic interests

Economic interests are at the heart of commercial cloning activities. On the one hand, laboratories spend huge sums of money to produce clones, and on the other hand, only very wealthy breeders can afford such genetic operations. These conditions distort the market and create a power imbalance, as almost all breeding organisations are unable to finance and develop cloning control techniques.

6.6.3.6 Scientific interests

Technological development in the testing of cloned or genetically modified animals will not progress without the use of new technologies. Accurate characterisation of strains is beneficial to protect the dignity and welfare of equids and to ensure fairness and sporting ethics. In addition, cloning research provides a wealth of knowledge on equine reproduction. In the interests of transparency, research should focus on the infallible identification of clones used for breeding. Finally, all of these procedures (cell cultures, in vivo and in vitro techniques) are necessarily part of the fundamental tools of biology, which are indispensable for understanding and defending the living world. In this context, full account will be taken of the dignity and welfare of the animals concerned.

6.6.3.7 Interest in extinct or endangered species

For the time being, a few hundred cloned individuals do not threaten sport or polo horse breeds. However, their use on a very large scale weakens small populations by reducing their genetic diversity. That said, breeders, blinded by dystopian prospects, will have sacrificed precious financial resources. One wonders why these resources should not be used to save endangered species of equids instead of passively watching them disappear.

As the sixth mass extinction accelerates, cloning is striking the imagination. The regular publication of so-called mammoth 2.0 advances (Yamagata et al., 2019) and *greenwashing* suggest that the cloning technique will provide the solution. But what are the next steps after the first animal is reborn, when at least a thousand oocytes have to be harvested to be successful and it is necessary to know the biology of the species intimately? Where will the other representatives of this revived genus be found? In the Authors' opinion, copying the DNA of a few individuals will not resurrect a species and its extinct DNA.

6.6.3.8 Conclusion

In summary, the ethical and moral values related to the welfare and dignity of horses are in fundamental conflict with the maximum economic value of the genetic heritage of a few individuals.

6.6.4 Alternatives that achieve the same results with less strain

Today, no alternative can be found that allows strictly identical results (cloning of an individual). If the potential justification for cloning lies in the genetic progress of a breed then traditional breeding and selection methods also achieve the same objective. The history of the various breeds of horses easily demonstrates this.

6.6.5 Results of the balancing of interests and justification of strain

The acceptability of genetic technologies in horses depends on one's view of their moral status and the justification for their use. In any case, equids will be given consideration due to their nature as sentient beings capable of emotion. Veterinarians, owners and breeders should therefore act in favour of equine athletes and their interests (dignity, welfare), which is not always the case. This is why these ethical points will be discussed and regulated now. The debate among scientists has begun without yet providing a satisfactory and definitive answer (Campbell & McNamee, 2020).

The objections to cloning are first related to the adverse effects on the dignity and health of equids caused by the manipulation of oocytes and embryos (reprogramming, genome editing, sexing, splitting). The irreparable consequences of this manipulations are yet undetermined. In addition, the risks of financial inequality and unfair competition in sport can be invoked. In the eyes of some scientists, however, technical developments offer hope for a solution (Campbell & McNamee, 2020). In the current state of knowledge, the cloning of horses remains ethically unacceptable. Arguments such as the breeding progress, economic interests of those involved, the cloning of geldings or the emotional attachment to an animal are never overriding. All these situations entail the risk of strains that disregard the dignity of the equid, hinder its welfare or instrumentalise it excessively. The very few circumstances that could justify this practice would be exclusively to develop reliable tests to monitor it.

In summary, the COFICHEV views cloning as an inefficient and very expensive mode of vegetative reproduction (asexual reproduction) that reduces the animal to the level of plant cuttings. It meets the criteria for excessive instrumentalisation.

6.6.6 Recommendations for implementation

- Legislation will be adapted to prohibit cloning, the use of cloned equine semen and oocytes as well as the import of foodstuffs derived from these animals
- In the meantime, sports and breeding federations are encouraged to adjust their regulations for reasons of image and sporting fairness, even if the means of control are still lacking. They should also work together to develop them at an international and multi-sport level
- The public should be transparently informed about the knowledge and regulations in place
- Interested parties (supervisory, breeding and sporting authorities) are called upon to support scientific research to develop reliable tests for biological identification of clones.

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6.7 Training and selection of young horses

6.7.1 Description of the current situation, trends, strains and risks

6.7.1.1 Introduction and premises

At what age a young horse first begins training and work depends on the breed and the socio-economic background of the owner. In the past, heavy draught horses for use in agriculture and transport were already pulling heavy loads at the age of two. Thoroughbreds and Trotters are sent up as yearlings to specialised establishments in the autumn to learn the basics for their future training. For almost four months, a stable lad accustoms them in stages to wearing a saddle, carrying a rider and galloping at various speeds on a track - usually a dirt track - the breaking-in period. The stable lad also takes care of the horses and the stables. At the age of two and a half, these future equine athletes compete in their first short distance races. At the age of three, they are ready to take part in more important races. Training[342] of competition horses (dressage, show jumping) and leisure horses begins

[342] 4.4.4.3 Training and dissemination of knowledge, p. 77

later, with the breaking-in period around the age of three to four. These methods are common practice in all regions of the world (König von Borstel, 2018; Velie et al., 2015; Wong et al., 2019).

The critics

The age at which horses are trained is a recurring topic of controversy. Opponents argue that the intensity and frequency of training damages the integrity of skeletally immature animals. Furthermore, the psychological strains are not sufficiently taken into account, as this initial training phase subjects them to very significant changes in their environment and behaviour. They believe that slow breaking-in would promote the healthy development of the horse and enable it to cope with these strains. In this way, they believe that early activities will ruin the health of the equid. As will be discussed below, there is a lot of scientific work addressing these issues. The most recent programme, funded by the German Ministry for Food and Agriculture (BMEL), is evaluating the influences of breed, training conditions, age and the type of boarding/stabling on the health, behaviour and welfare of horses started at an early age in equestrian sports and racing (ATB, 2022; BMEL, 2022).

Current breeding practices

Those who deal with these young horses approach the issue in a different way. Their core business is based on their training and experience of traditional practices. They know that inactivity and inadequate rearing conditions encourage problems such as behavioural disorders and obesity. Another observation is that the longer it takes to diagnose a disease, the more severe and complicated it can become. They also understand that mares and stallions can pass on hereditary defects to their offspring. They therefore make several efforts in favour of early detection, not only of sporting qualities but also of various problems that may affect an equid's health and that of its offspring. They consider that their objective is to ensure optimal selection and training for the intended use of the equids. This includes, in addition to the need for progressive training of the body, the acquisition of coordination skills specific to the intended discipline.

The evolution of the musculoskeletal system and the effect of domestication

Over the course of evolution, the musculoskeletal system of ancestors of the genus Equus developed and specialised. This resulted in a taller stature, an elongation of the limbs (cannons) and a reduction in the number of phalanges, which explains the current digitigrade position (one phalanx with a hoof). Thanks to its unique characteristics, this imposing mammal can travel long distances in search of food. With its long strides, it can reach high speeds (above 15 m/s) at an early age (Oikawa et al., 1991, cited in Firth, 2006). It is assumed that these evolutionary adaptations have favoured equids by allowing them to escape predators quickly. However, they may also have reduced the mechanical strength of musculoskeletal tissues. This would explain the current frequency of limb injuries.

An appropriate skeleton for efficient locomotion and adapted to running

After its domestication, selective and rational breeding has accentuated the size and strength or, in other cases, increased the velocity of certain breeds. The fastest horses, stemming mainly from Thoroughbreds and Arabian horses of Middle Eastern or Asian origin, are marked by their adaptation to racing. The horse's skeleton constitutes a robust framework suitable for movement thanks to a system of levers on which the muscular actions are applied. Its spine forms a very rigid thoracolumbar bridge which transmits the propulsive force of the hindlimbs to the forehand. The long digital tendons along the extremities store energy and make locomotion efficient, while the joints control the range of motion between the different bones. In addition, a powerful cardiovascular system provides the necessary energy substrates. However, these complex components are exposed to a changing environment and must adapt to it, especially in relation to the mechanical load and age of the animal (Degueurce, 2012; Smith & Goodship, 2008).

Are an equid's needs for movement met in boarding conditions?

It is noted that traditional horse boarding conditions in Switzerland and many neighbouring regions often limit the movement of foals and young horses (stabling in groups and then in stalls and small turnout areas). Moreover, the way in which they are trained for leisure (the most common use) and sport remains a private matter that is not regulated by competition and event organisers and federations. These institutions only regulate the minimum age for participation in breeding and sporting events.

A comparison of musculoskeletal activity between wild horses and their conventionally managed domestic counterparts shows significant differences. While the former travel up to almost 30 km/day (on average around 18 km), this distance is reduced to 1.1 km/day in a 6m x 6m turnout area for the latter (Hampson BA et al., 2010a, 2010b). Even when kept in a group in a stall with separate functional areas and a large amount of space, they move less than those living free range or on pasture year-round (Hoffmann, 2008). There is no evidence of reduced natural needs in domesticated equids. Therefore, it must be concluded that they remain unsatisfied in the various stabling systems if not offered incentives or additional opportunities for movement. This exercise not only maintains their musculoskeletal health and physical function, but also improves welfare and the harmony of their social life. However, it is difficult to define the optimal work intensity for each individual (Rogers et al., 2012a, 2012b).

Various breeds of horses

Each of the 500 horse breeds selected over the centuries is distinguished from the others by specific traits. These traits are homogeneous and can be passed on to their offspring. They affect health and physical functional capacity (strength, speed, biomechanics, endurance, agility) and psyche (learning, temperament, cooperation with humans). Historical (needs, preferences, competence), economic and geographical conditions have modulated these traits. These substantial differences (zoogenetic diversity) constitute a genetic heritage that contributes to the self-worth (animal dignity) of each representative of a specific breed.

Scientific advances clarify the genomic characteristics of breed groups (Ablondi et al., 2019; Andersson et al., 2012; Bailey & Brooks, 2020; Chowdhary, 2013; Dall Olio et al., 2020; Edwards et al., 2011; Engel et al., 2022; Frischknecht et al., 2015, 2016; Grilz-Seger et al., 2019; Han et al., 2020; Hill et al., 2010a, 2010b, 2012; Jäderkvist et al, 2014; Khan, 2019; Littiere et al, 2020; Myćka et al, 2020; Novoa-Bravo et al, 2021; Orlando, 2020; Petersen et al, 2013a, 2013b; Raudsepp et al, 2019; Ricard, 2015; Rooney et al, 2017, 2018; Sponenberg & Bellone, 2017; Tozaki et al, 2012; Vila, 2001; Wilkin et al, 2017; Wilson & Rambaut, 2008).

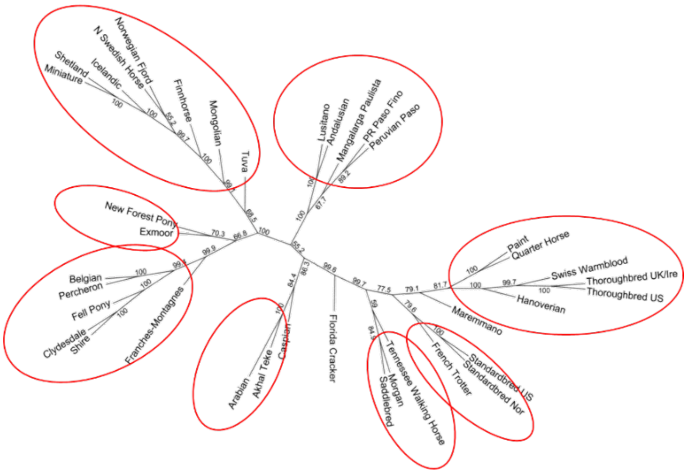

Figure 89 The phylogenetic tree (*neighbour joining tree*) shows the genetic distance (gap) between the main groups of modern horse and pony breeds. It uses the frequencies of SNP haplotypes in the genomic dataset (Based on Petersen et al, 2013a, https://doi.org/10.1371/journal.pone.0054997.g002, CC BY)

These molecular genetic techniques clearly distinguish between Nordic ponies and horses, draught breeds, Iberian and South American horses, Arabian and Turkmene horses, North American Saddlebreds, Trotters, Thoroughbreds and Warmbloods (Figure 89). They also explain why certain specific features of morphology and performance are found in one population and not in others. The results also highlight some functional genes involved in the various vital systems and their adaptation to environmental conditions. These include the cardiovascular system, the bones of the limbs and face (morphology, size), coat colour, behaviour, biomechanics (reaching high speeds at the trot and pace), physiology and muscle fibre types (speed), physical abilities, e.g. for dressage and show jumping, fertility and energy metabolism during races. These DNA sequences can be described as irreversible signatures of choices made by human societies (DMRT3, HMGA2, LCORL/NCAPG, MSTN, ZFAT). In other words, their presence demonstrates that selection has exerted pressure on the various phenotypes and genotypes. Significant differences are now found to constitute interesting, but sometimes deleterious and heritable, breed characteristics and abilities[343]. Furthermore, the summary of results indicates that breeders have made a differential selection of early performance (speed as a two-year-old) for athletes especially well adapted to racing and to certain geographical regions.

All of these breeds belong to the species Equus caballus whose dignity must be respected. Nevertheless, each breed has its own characteristics (speed, strength, endurance, behavioural profile) that contribute to the individual equid's dignity, in particular the needs to be taken into account to ensure its welfare. To hold a superficial discourse and to assimilate all ponies, draught horses, leisure and sport horses and racehorses without considering their nuances is not the right approach.

Musculoskeletal injuries result in a loss of value and income

Studies show that injuries affecting the musculoskeletal system (joints, bones, cartilage, tendons and ligaments) of sport horses and racehorses cause significant losses in value and income (Flash et al., 2020a, 2020b; Hinchcliff et al., 2014). These include interruption of training, premature termination of a horse's career and the cost of veterinary care or retraining. The strains of using adult horses in equestrian sports and racing as well as preventive measures are discussed in Chapters 4[344] and 5[345]. This section therefore focuses in detail on the growth, training and selection of juvenile horses and the various concomitant pathologies.

The analysis of these health problems is legitimate, especially as they generate negative reactions from the public. This is particularly true when horses are used for sport and recreation (Patterson-Kane & First, 2014). In particular, there is a pressing need to identify animals and circumstances that carry a risk of catastrophic injury. The solution that spontaneously comes to mind is to remove the root cause of injury – in other words, to ban racing altogether (Rogers et al., 2012b; Wulf et al., 2011). The welfare of young horses remains an ongoing concern in discussions prior to the establishment of guidelines for their education and training. Caution should be exercised and the right questions asked about the justification for certain practices.

6.7.1.2 Answers can be found in scientific knowledge

The level of maturity and age are determining factors for questioning:

- Can the level of maturity be a relevant criterion to help define a minimum age for young equine athletes to start basic training with respect to their physical and psychological needs?
- When and to what extent does early exercise cause health problems and undue stress?

[343] 6.2 Selection and occurrence of hereditary diseases, p. 225

[344] 4.4 The use of equids in sport, p. 56

[345] 5.9.2.3.1 General and ethical considerations, p. 169

To answer these questions, the following paragraphs present the results of studies on the most important issues. They will be used to formulate a synthesis and answers to the questions[346]:

- The processes of growth and maturity of young horses and functional life span
- The adaptation of young horses to early exercise (early training[347], training, selection tests for equestrian sports, racing, leisure activities)
- The significant features of the musculoskeletal system of various breeds (one of the most vulnerable bodily systems), including juvenile diseases (clinical signs, etiology, pathogenesis, causes, prevention)
- How breeding organisations deal with these issues.

6.7.1.3 When does a horse reach an appropriate maturity?

In the lay literature, and social media in particular, a lack of maturity remains the most common argument used to question the training and preparation of young equids. It is based on a spurious comparison with human growth (Figure 90). Ideally, according to this comparison, breaking-in and use should be delayed until a more mature age. These ideas are in contradiction with the scientific literature. In the German debate on this subject, a meta-analysis of studies on the subject (König von Borstel, 2018) came to the objective conclusion that an *"early start to training with an age adjustment for intensity and frequency is an advantage if the framework conditions are met, such as sufficient additional free movement."*

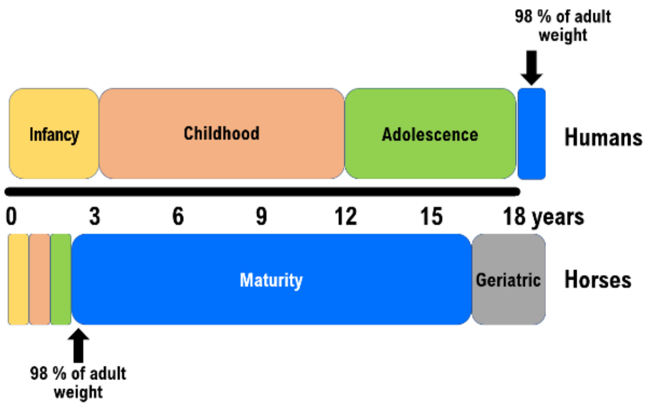

Figure 90 Schematic representation of the three growth periods of human and equine development and the relative age of attainment of skeletal maturity (Based on Rogers et al., 2021, https://www.mdpi.com/2076-2615/11/12/3402/htm, CC-BY)

In short, the issue is complex. For this reason, the following sections detail the available knowledge on several developmental processes: the growth of the musculoskeletal system, development of orthopaedic diseases and adaptation to physical exercise before maturity.

6.7.1.3.1 The asynchronous and asymptotic growth of the various tissues

Growth is one of the fundamental characteristics of animals. The term describes a subtle process of significant development in size and weight accompanied by a progressive and complex differentiation that affects the composition, structure, proportions and functionality of the various organs.

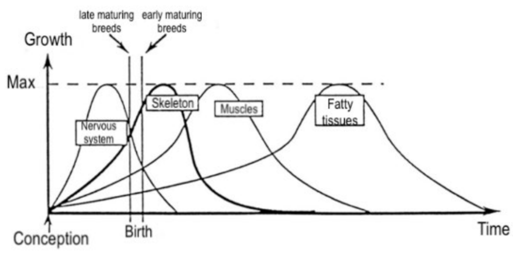

Figure 91 Schematic growth curve of the main tissues as a function of time (Based on Hammond and Blanchard cited by Devillard, 2003)

The nervous system develops first, then the skeleton, muscles and finally fatty tissue (Figure 91). It can be seen that their respective growth rates increase gradually, before reaching an inflection point (maximum growth rate) followed by a gradual slowing down. Their asymptotic curve makes it impossible to determine the exact moment when the process ends. Therefore, maturity is defined as its completion. However, this morphological criterion alone is insufficient to characterise it.

Compared to other species, the foal has the basic ability to stand upright, follow its dam over long distances at a walk, trot and gallop and sometimes even to overcome small obstacles only a few hours after being born. Over the following months, its central nervous, hormonal and musculoskeletal systems mature (Juliand & Martin-Rosset, 2005; Walker, 2007). It then takes up the adaptive challenge of synergistically regulating its organic functions to meet the demands, particularly mechanical ones, linked to the increase in size, weight, strength and speed[348]. These processes determine its future performance and sustainability and deserve great attention. Indeed, the environment of young equids very often deviates from the original conditions they were accustomed to, for example when they are moved to individual box stalls, as is common during early training.

The innate development of certain behaviours and individual adaptation to the environment

From birth, foals show innate behaviours, often without much prior experience. Examples include suckling, gaits (walk, trot, canter) and play. Development to maturity (ontogeny) is a gradual process of adaptation to a particular and changing environment. This adjustment only takes place within the limits of the hereditary framework transmitted by the parents. The traits that result from the permanent interaction between genetic inheritance and environment (experience) constitute the phenotype of an animal, which is

[346] 6.7.1.7 Synthesis of knowledge and answers to questions, p. 280
[347] 4.4.4.3 Training and dissemination of knowledge, p. 77
[348] 6.7.1.5 The adaptation processes of young horses to exercise269

distinct from that of its conspecifics. In this way, the individuality of each equid is forged. Finally, after optimal growth, nutrition, bone development and strength, the body weight and skeletal forces of the equid are orchestrated in a subtle balance (KER, 2018).

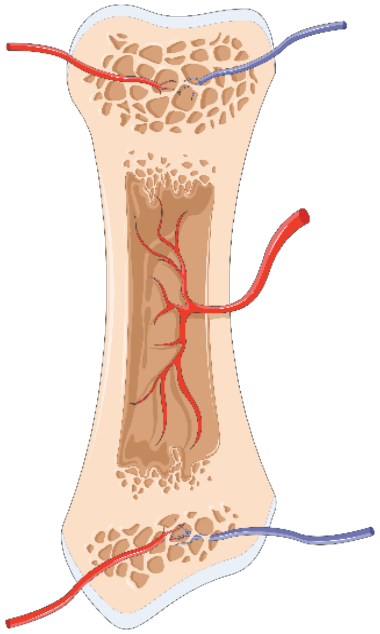

Figure 92 Diagram of the development of the epiphyseal growth centres of a long bone; mammalian foetus. (Source: Servier Laboratories, https://commons.wikimedia.org/wiki/File:Bone_growth_4_--_Smart-Servier.png, CC BY 3.0)

Limb and spinal bones	Age at which ossification is complete
3rd phalanx (pedal bone)	At birth
2nd phalanx (short pastern bone)	8 - 12 months
1st phalanx (long pastern bone)	12 - 15 months
3rd Metacarpal bone (forelimb cannon bone)	6 - 18 months
3rd Metatarsal bone (hindlimb cannon bone)	6 - 20 months
Scapula (shoulder blade)	24 months - 3 years
Calcaneus (point of the hock)	3 years
Humerus	24 months - 3.5 years
Radius/Ulna	24 months - 3 years
Tibia	24 months - 3.5 years
Femur	24 months - 4 years
Pelvis	10 months - 5 years and older
Dorsal vertebrae	5 years and older
Occipital and first cervical bones	5 years to 8 years (large breeds)

Table 11 Age of complete fusion of major equine bones (Compiled from sources: Bennett, 2008, and his bibliography; Butler et al, 2017; Myers, 1963)

6.7.1.3.2 An increase in weight and skeletal growth

Rapid and similar morphological growth over all breeds

The foal grows rapidly during the first few months. At one year of age, it reaches about 65% of its adult weight and 90% of its final height at the withers. At 24 months, the foal has reached 98% of its adult height (variation between 93 and 100%). Thereafter, the average monthly growth does not exceed 1 millimetre. The shape of the growth curve does not show any significant difference between horse breeds (Devillard, 2003; HNS, 2018; Hois, 2014; Hois et al., 2015; Lawrence, 2004a, 2004b; Walker, 2007).

The radiographic appearance of the growth plates is an insufficient criterion for assessing the state of maturity of the musculoskeletal system because the functional closure of the ossification centres[349] precedes radiological signs. On the other hand, the radiographic determination of growth plate closure is a subjective assessment of a process that takes several months from the time the growth plate is still fully open to the time it is fully closed. This may lead to an overestimation of the remaining growth potential. In addition, some authors report early dates of fusion observed by radiology (Butler et al., 2017). The ossification centres fuse completely at a specific age for each part of the skeleton. (Figure 92; Table 11). Finally, some do not participate in the functionality of a joint complex.

To put it simply, osseous growth plate fusion advances gradually from the phalanges upwards in the animal. In other words, it begins at the level of the hoof at birth. The further away from the distal extremities, the later in life growth plates fuse. Furthermore, the intensity of husbandry (feeding) influences the closure of the epiphyseal plates. It is shown to be earlier in foals with a high growth rate (Münch et al., 2011).

Bones reach their final length at three years and their maximum size at five to six years

Most growth plates are completely closed and bones have completed their longitudinal growth by around the age of three. On average, horses reach adult size at this age. The size of the large bones of the skeleton (length, width and thickness) does not reach its maximum until about five to six years of age or even later for larger horses. The last growth plates to fuse are in the spine (32 growth plates), notably the apophyses of the first thoracic vertebrae (withers), the occipital bone (skull), and the first two cervical vertebrae (neck).

6.7.1.3.3 The development of muscle mass until reaching adult weight at five or six years of age

Growth also involves a process of muscular development which takes place later than that of the skeleton. Depending on the intensity and nature of locomotion, it starts with the neck, continues with the limbs (shoulder, hindquarters) and ends with the back (Trillaud-Geyl & Doligez, 2017). The intensity and nature of exertion also modifies the metabolic and contractile properties,

[349] A cartilaginous area at the ends (metaphyses) of long bones where active longitudinal new bone growth takes place. Synonyms: growth plate, growth cartilage, epiphyseal plate, epiphyseal growth centre.

as well as the proportion of muscle fibre types (Valberg, 2014). This will be further elaborated on in a later section[350]. A body condition scoring scale and weighing of foals allows for monitoring.

The increase in muscle mass results from muscle fibre hypertrophy, rather than from an increase in the number of cells (hyperplasia) present at birth. An equid reaches 80% of its final weight after the first 18 months. Warmblood and draught males sometimes reach a higher adult weight than females (sexual dimorphism), but the difference remains small and rarely significant. More surprisingly, the weight growth curve is identical for all horses. They do not reach their final weight before the age of five to six years of age. Shetland ponies reach their maximum weight at seven or eight years of age (Hois, 2014; Hois et al., 2015).

6.7.1.4 Developmental Orthopedic Diseases (DOD)

6.7.1.4.1 Introduction

As discussed above[351] the risks of strains affecting the health and welfare of adult equids in sport, including mortality, increase with the age of racehorses. For this reason, this section examines only juvenile osteoarticular disorders.

The first musculoskeletal health problems appear very early in a foal's life

Contrary to widespread opinion, diseases of the musculoskeletal system appear very early in foals, long before breeders subject them to any exercise. They cause significant musculoskeletal dysfunction and substantial losses to the equine industry (racing and equestrian sports). Since around 1990, the term DOD has been used to describe a variety of problems in the growth plates that develop into bone and cartilage tissue in young mammals. The term JOCC (Juvenile osteochondral conditions) also characterises these developmental problems:

- Epiphyseal plate and joint pathologies: inflammation of growth plates (epiphysitis), incomplete ossification, osteochondrosis, osteochondritis dissecans (OCD) and subchondral cysts
- Consecutive or concomitant clinical signs: ataxia (*wobbler*, cervical vertebral instability) caused by a vertebral anomaly, osteochondral fragments and fetlock degeneration (arthritis/juvenile arthrosis)
- Congenital limb deformities (conformation): angular deformities (valgus), tendon laxity or flexural limb deformity

Scientists admit that the aetiopathogenesis of these developmental problems is very complex, multifactorial and variable depending on the anatomical sites involved (growth plate, parts of the various joints). This will be discussed in detail below[352]. To better understand its clinical importance, the following paragraphs categorise these lesions more precisely.

6.7.1.4.2 Prevalence, clinical signs and diagnosis

Several studies have described the characteristics of DOD and its prevalence, but each study is usually limited to a single breed. Research conducted simultaneously on several populations in similar breeding systems and based on accurate radiographic diagnoses of a large number of joints and views is largely lacking (Baxter, 2011, 2020; Betsch & Michel, 2011; Bourebaba et al, 2019; Bramlage, 1998; Carlsten et al, 1993; Dik et al, 1999; Douglas, 2011; Denoix et al, 2013; Firth, 2004b; Grøndahl & Dolvik, 1993; Hinchcliff et al, 2008, 2014; KER, 2018; Lepeule, 2007; Lepeule et al, 2008, 2009, 2011, 2013; Lesté-Lasserre, 2020; Lykkjen et al, 2010, 2012; McCoy et al, 2016, 2018; McIlwraith, 2004a, 2004b, 2008; McIlwraith & Wade, 2005; McIlwraith et al, 2016; Neundorf et al, 2010; O'Donohue et al, 1992; Pagan, 1998, 2004a; Richardson, 2011; Ross & Dyson, 2011; Skarbek et al, 2020; Stock, 2010; Teyssèdre et al, 2012; van Grevenhof et al, 2009a, 2009b; Walker, 2007; Wittwer et al, 2006, 2007a, 2007b).

DODs predominantly affect Thoroughbred and sport horse breeds

First, it should be noted that DODs, including osteochondrosis remain rare (around 6%) in populations never subjected to specific selection for sporting use and racing. This is particularly true of hardy breeds of ponies, Franches-Montagnes or horses that live in the wild (Hendrickson et al., 2015; Valentino et al., 1999).

OCD is a polygenic hereditary disease that belongs to the DOD group. It manifests as juvenile osteochondrosis, characterised by disturbances in endochrondral ossification and abnormalities in osteoarticular development, including cartilage lesions, subchondral fissures and fractures, synovitis and detachment of bone and cartilage fragments into the joint, sometimes accompanied by subchondral bone cysts. The fetlocks, hocks and stifles are the most commonly affected joints.

The literature (Lepeule et al., 2008; O'Donohue et al., 1992) explains that at some point in time, DOD[353] affects - in ascending order - 60-80% of Warmblood, Trotter and Thoroughbred foals followed up to the age of 18 months before placement with a trainer. Only about one third never show signs of DOD. The peak occurrence of all problems is shortly after weaning. The joints affected vary between breeds: the dorsal region of the hind fetlock, fore fetlock, stifle and carpus in Warmbloods and Thoroughbreds; carpus, plantar region of the hind fetlock and proximal region of the hock in Trotters.

The significant differences ($P < 0.05$) between anatomical locations, breeds and breeding farms are a strong indication of the role that heredity may play, for example, in ossification processes (growth rate). They also suggest that selection for certain traits may

[350] 6.7.1.5.5 Muscular adaptation, p. 272
[351] 4.4 The use of equids in sport, p. 56
[352] 6.7.1.4.5 Treatment and prognosis, p. 266
[353] 6.7.1.4 Developmental Orthopedic Diseases (DOD), p. 264

have inadvertently introduced these diseases (Van Weeren, 2016, 2018). Genetics would also explain the significant occurrence of lesions in the offspring of certain stallions or mares[354] or individuals that remain healthy throughout their career (Neundorf et al., 2010).

6.7.1.4.3 The early signs and evolution of DOD

The first clinical signs of DOD may emerge before birth or shortly after (Carlsten et al., 1993; Dik et al., 1999; Malone, 2022). The prevalence of osteochondrosis changes significantly during the growth of the animal and for each of its joints. The variable clinical signs depend on the number, type and extent of lesions and their location, as well as the intensity of the musculoskeletal activity of the foal. There may be no gait or limb conformation problems for several months, but clinical signs may appear suddenly in the pasture or after more strenuous exercise. Signs may also be very subtle and only identifiable by careful and knowledgeable observers. There is a restriction of the musculoskeletal system (reluctance to move), lameness of irregular degree and pain, particularly after flexion of distended joints (Figure 93). In severe cases, the strain may impair growth, damage the subchondral bone and cause avulsion of a defective portion. This has led to the hypothesis that clinical osteochondrosis may be just the tip of an iceberg of multiple disorders that affect cartilage ossification. These would only become significant if the horse's regenerative capacity failed before maturity (Barneveld & Van Weeren, 1999a, 1999b).

Figure 93 Swelling (distention) of the hock (tibiotarsal joint) is the most common sign of osteochondrosis (Source: Malone, 2022, https://open.lib.umn.edu/largeanimalsurgery/chapter/osteoarthritis/, CC BY-NC 4.0)

High regenerative capacity for the first year

During the first few months of life, the musculoskeletal system of foals is vulnerable to influences that can trigger DOD. However, its regenerative potential remains high, even for tissues known to lack repair capacity in the adult, such as articular cartilage and tendons. This period involves dynamic processes of modelling (adaptation) and remodelling (repair) of bone and cartilage tissue. At the same time, osseous tissue undergoes phases of development and resorption followed by metabolic processes (KER, 2018). The development of bone fragment lesions (OCD), followed by a return to a healthy state before the age of five to 12 months of age has been observed. Joint disease becomes permanent at about one year of age and is manifested in the progressive damage to the joints, including articular cartilage (hyaline and calcified cartilage), synovium and subchondral bone. For some tissue components, such as the collagen of articular cartilage, their constitution is thought to be final at the age of five months (Barneveld & Van Weeren, 1999a; Dik et al., 1999; van Grevenhof et al., 2017; van Weeren, 2006, 2018; Van Weeren & Barneveld, 1999).

Figure 94 The bony fragment attached to the distal tibia in the tibiotarsal joint is a typical radiological sign of OCD (Source: Malone, 2022, https://open.lib.umn.edu/app/uploads/sites/208/2019/03/DIRT-lesion-and-synovial-change.png, CC BY-NC 4.0)

6.7.1.4.4 Diagnosis

Clinical examinations (palpation, arthroscopy) and classical imaging techniques (radiography, scintigraphy, ultrasound) are used to confirm the suspicion or to specify the exact nature of the disease. Two methods are being developed to screen young horses with DOD or OCD (Figure 94). With computer tomographic (CT) and magnetic resonance imaging (MRI) of the extremities, small osseous lesions due to fatigue that often precede a fatal fracture can be diagnosed. However, their high cost tends to hinder their regular use as diagnostic tools. In view of the dynamic onset and healing processes in the first year, radiographic diagnosis becomes indicated from the age of one year onwards (Dik et al., 1999). This helps breeders to obtain very useful information for estimating the prevalence of DOD on their farms. Today, radiographs of the limbs are part of the inspection required for participation in yearling auctions (Scott et al., 2004).

Markers as a screening tool?

Several studies have shown that biomarkers (metabolic indicators) are found in synovial fluid, blood or urine and reveal osteoarticular alterations. Osteocalcin and alkaline phosphatases seem to be easy to measure in blood. When sensitive, early and specific, these indicators could contribute to the diagnosis and monitoring of certain bone diseases in horses (Berg-Johansson, 2009; Fradinho et al., 2019; Lepeule, 2007; McIlwraith & Wade, 2005; Mendoza et al., 2018). Page et al. (2021) also suggest that mRNA markers may be used as a pre-race screening tool in the future.

6.7.1.4.5 Treatment and prognosis

Generally, drugs are only effective in reducing the clinical signs of DOD. Veterinarians can administer hyaluronic acid, chondroitin sulphate, non-steroidal anti-inflammatory drugs (NSAIDs) and corticosteroids, for example. Currently, researchers are developing

[354] 6.7.1.4.6.2 Genetic factors, p. 267

stem cell therapies (autologous or allogeneic origin) and are relying on their potential to promote tissue regeneration. Stem cells appear to play a restorative role through their ability to stimulate the survival of equine chondrocytes (Kim et al., 2020).

After the phase of possible spontaneous healing has passed, surgery is required to remove any small, bone fragments or curettage cysts after 12 months of age. This is risky and causes strain. The veterinarian will decide if surgery is indicated after a thorough clinical and radiological diagnosis. The functional prognosis depends on the severity and the anatomical location of the lesions. For a sporting career, the prognosis is quite favourable for 60 to 75% of young horses affected by OCD of the fetlock and tibiotarsal joint (the most mobile joint of the hock). The prognosis is worse for an intra-articular chip and is guarded for around half of all cases involving lesions of the shoulder and stifle (femoropatellar joint), especially in the presence of a large fragment (>4cm). Damage to the condyles or trochlea of the femur or humerus makes the prognosis unfavourable. Prognosis is poor for OCD of the hip (coxofemoral joint).

6.7.1.4.6 Causes of DOD

6.7.1.4.6.1 Introduction

During early development, various decisive factors favour the development of musculoskeletal disorders. They affect growth and bone development of foals in the foetal stage and from birth on. As is often the case with other multifactorial diseases, the causes are sought in genetics and the environment. In short, the hope of finding a single aetiological factor is doomed to failure.

With regard to DOD, researchers have put forward numerous hypotheses on the aetiopathogenesis of these diseases of the joint-bone-epiphysis complex (Bourebaba et al, 2019; Collective, 1999; Laverty & Girard, 2013; Olstad et al, 2007; van Weeren, 2006, 2018; van Weeren & Olstad, 2016; Ytrehus et al, 2007). They now agree to refer to the vascular disruption of growth plates as the primary event (Figure 92 and Figure 95). This leads to subchondral ischaemic necrosis, delayed ossification, articular cartilage fissure formation and surface fragmentation (OCD).

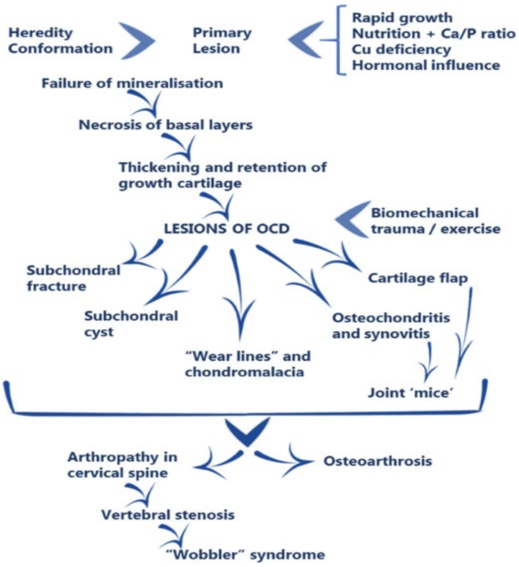

Figure 95 Schematic representation of the development of the osteochondrosis lesion complex in horses and the associated factors involved in their pathogenesis (Source: Bourebaba et al., 2019, https://link.springer.com/article/10.1007/s12015-019-09875-6/figures/3, CC BY 4.0)

6.7.1.4.6.2 Genetic factors

Heredity determines susceptibility to DOD and boarding conditions influence the manifestation of DOD

Genetic background is an essential parameter: heredity (parental status, breed) determines the predisposition to DOD. The conditions that subsequently influence the development of lesions (Figure 95) are of a nutritional[355] and biomechanical nature[356].

As discussed above, hereditary predispositions[357] are particularly conducive to osteochondrosis and OCD. An online website from the University of Sydney in Australia (OMIA, 2022) lists hereditary disorders and single-gene traits in equids. It cites major scientific publications on diseases of the musculoskeletal system (joints, cartilage, tendons) that can develop during growth (DOD) and are found to be linked to genetic factors (Table 12). The hypothesis of their existence was raised as early as 1974 (Haakenstad and Birkeland, 1974, cited by Grøndahl, 1990). Several studies have demonstrated the heritability (h2) of osteoarticular and tendon injuries. Their values vary considerably (0.00 - 0.87) depending on the anatomical sites affected, the methods of analysis and calculation, and breed (reviewed in Distl, 2013 and van Weeren & Olstad, 2016; Grøndahl, 1990; Grøndahl & Dolvik,1993; Hilla & Distl, 2014 a, 2014b; Lewczuk, 2012, 2018; Naccache et al, 2018; Oki et al, 2008; Philipsson et al, 1993; Pieramati et al, 2003; Ricard et al, 2001, 2002, 2013; Russell et al, 2017; Stock et al, 2005; Teyssèdre et al, 2012; van Grevenhof et al, 2009b; Wittwer et al, 2007a).

The heritability of OCD is sufficient to take effective selection measures

Pieramati (2003) showed by simulation that a selection of Maremmano horses (Italy) based on a heritability of 0.09 to 0.14 applied for five successive generations could reduce the prevalence of osteochondrosis dissecans from 16% to 2%. In Germany, the rigorous selection of stallions (dressage, show jumping) over the last 20 years has considerably reduced OCD of fetlocks and hocks. The impact on performance and inbreeding is minor (Büttgen et al., 2020a, 2020b).

The analyses highlight the DNA sequences involved

Several groups of researchers have demonstrated hereditary influences using genome-wide association studies (GWAS). They have demonstrated the relationship between lesions and genes or QTLs (quantitative trait loci) on chromosomes. These results vary between breeds (Thoroughbred, Norwegian Standardbred Trotter, Hanoverian Trotter) and joints affected by OCD. The locus

[355] 6.7.1.4.6.3 Errors in nutritional management, p. 268

[356] 6.7.1.4.6.4 Biomechanical factors, p. 268

[357] 6.2 Selection and occurrence of hereditary diseases, p. 225

of some genes or QTLs is rarely identical (Bailey E et al., 2013; Chowdhary, 2013; Corbin et al., 2012; Dierks et al., 2007, 2010; Distl, 2013; Hilla & Distl, 2014a, 2014b; Lampe et al, 2009a, 2009b, 2009c; Lykkjen et al, 2010; McCoy et al, 2016, 2018; Sevane et al, 2016; Teyssèdre et al, 2012; Wittwer et al, 2007a, 2007b, 2008, 2009). This polymorphism makes comparative genomics between populations and their various uses difficult (Wypchło et al., 2018). Studies are ongoing to improve this. The expected advances will particularly concern the genome sequences that control gene expression at the post-transcriptional level. This requires the accurate characterisation of the lesions (phenotypes) of each joint, standardisation of international criteria for interpreting and scoring medical images, and a better understanding of the influence of environment and breed. It is hoped that these results will improve selection processes with breed-specific genomic breeding values, help to improve prevention and predict the evolution of DOD and possibly discover new treatments.

Disease	Description	OMIA
Arthritis	Degenerative joint disease; term interchangeable with osteoarthritis	OMIA 000064-9796 : Arthritis in Equus caballus, https://www.omia.org/OMIA000064/9796/
Bone spavin	Osteoarthritis or osteitis of the distal intertarsal and tarsometatarsal joints	OMIA 001232-9796 : Bone spavin in Equus caballus, https://www.omia.org/OMIA001232/9796/
Fracture	Elevated risk in Thoroughbred racehorses	OMIA 001858-9796 : Bone fracture in Equus caballus, https://www.omia.org/OMIA001858/9796/
Osteochondral fragments	Palmar or plantar location in the metacarpal- and metatarsophalangeal joints. Standardbred and Hanoverian Trotters	OMIA 001307-9796: Palmar/plantar osteochondral fragments in Equus caballus, https://www.omia.org/OMIA001307/9796/
Compressive myelopathy	Cervical vertebrae: malformation and malarticulation; stenosis; wobbler syndrome	OMIA 001894-9796 : Cervical vertebral compressive myelopathy in Equus caballus, https://www.omia.org/OMIA001894/9796/
OCD	Osteochondritis dissecans	OMIA 000748-9796 : Osteochondritis dissecans in Equus caballus, https://www.omia.org/OMIA000748/9796/
Osteochondrosis	Abnormal differentiation of growth plate	OMIA 000750-9796 : Osteochondrosis in Equus caballus, https://www.omia.org/OMIA000750/9796/
Flexural limb deformities (contracted tendons)	Congenital malformation, contracture of the deep digital flexor tendon, hyperflexion of the phalanges, club foot	OMIA 000990-9796 : Tendons, contracted, congenital in Equus caballus, https://www.omia.org/OMIA000990/9796/
Navicular syndrome	Navicular disease, podotrochlosis	OMIA 000704-9796: Navicular disease in Equus caballus, https://www.omia.org/OMIA000704/9796/
Tendonitis	Injuries to the superficial digital flexor tendon	OMIA 001816-9796 : Superficial digital flexor tendon injury in Equus caballus, SDFT injury, https://www.omia.org/OMIA001816/9796/

Table 12 List of polygenic diseases that are part of the DOD complex of juvenile orthopaedic diseases (Source: OMIA, https://www.omia.org)

6.7.1.4.6.3 Errors in nutritional management

Maternal nutrition already influences the joint health of foals

The concept of foetal programming explains the long-term effects of maternal malnutrition. It can affect the health of the foal, including testicular and bone development, glucose metabolism of foals and their response to overfeeding. In late gestation, the foetal cartilage metabolism is destabilised by maternal obesity. A high insulin level modifies glucose intake and the production of a growth factor (*IGF-1, Insulin-like growth factor 1*) that is essential at this prenatal stage (Torres et al., 2020). Poor nutritional practices thus threaten the athletic potential of the offspring (Robles et al. 2017). Therefore, it is considered that all environmental elements can interact with the intrauterine environment of broodmares. Therefore, the management and feeding of broodmares is of paramount importance (Peugnet et al., 2014, 2015).

Lack of movement combined with an overly rich diet accelerates growth and the onset of orthopaedic pathologies

Feeding mistakes in mares and foals are mainly related to feed intake (hay and grain) that does not adequately cover their nutritional requirements. Examples of note: rations rich in energy (easily digestible carbohydrates: grain, sugars) and protein, mineral imbalances - copper deficiency, excess zinc or excess phosphorus in the Ca:P ratio (standard 2:1).

Overfeeding foals combined with a lack of exercise causes a consequent acceleration of growth. Their large size and excessive weight favour the development of DOD. In general, the risk of OCD is higher in foals fed grain concentrates. Their glycaemic and insulin responses increase after ingesting a large amount of grain. Individuals that are heavier at weaning than their counterparts (a greater increase between three and eight months) are more likely to develop OCD. On the other hand, the lesions of those that are not fed grain heal better (Mendoza et al., 2016), especially in the femoropatellar joint (Van Weeren et al., 1999). Periods of slow development followed by a rapid growth phase are also particularly dangerous.

In summary, the feeding and management of foals is a delicate balancing act between achieving desirable growth levels and preventing DOD (literature review in Lepeule, 2007 and van Weeren & Olstad, 2016; Firth, 2004b; Pagan & Nash, 2008; Pagan, 1998, 2004b, 2004c; Ralston, 2001; Vervuert & Coenen, 2004; Waite et al., 2001)

6.7.1.4.6.4 Biomechanical factors

Movement is essential for continuous and normal bone growth

A well-developed and adequately shaped musculoskeletal system normally provides solid structural support for equids. In sport horses, the structural support is tested to its limits. They must adapt from birth to withstand the load, tension and forces imposed on tissues (bones, ligaments, tendons, muscles) and joint components (Kohnke, 2007; Lawrence, 2004a, 2004b).

Foals need time to allow their locomotion to mature due to their increasing weight, limb length, stride length and capacity for endurance and speed (Back et al., 1999; Cano et al., 2001; Weijers and Berghout 1997 cited in Barneveld & van Weeren, 1999a). From their very first days, they perform dozens of sprints daily in the wild. The equine musculoskeletal system undergoes a period of subtle transformation of cartilage into bone, but also alteration and regeneration of this tissue. A lack of vascularisation during the first months of life is a key factor in the pathogenesis of osteochondrosis (Carlson et al., 1995; van Grevenhof et al., 2009a; van Weeren & Barneveld, 1999). These lesions become permanent at about one year of age[358].

The tension and compression of the growth plates is an essential factor in ensuring their continued and correct development. Encouraging free sprinting in the first year improves mineral density and bone dimensions more than normal pasture exercise. In addition, the latter enriches the glycosaminoglycan content of cartilage and tendons. Increasing these forces accelerates growth, while decreasing them slows it down. This is why lack of exercise (stabling) in the first few months of life generally hinders the development of locomotion and tissues of the equine musculoskeletal system, including their chemical composition. In other words, the reduction in the physical activity of foals imposed by a higher intensity of confinement than found in an equid's natural environment prevents the adaptive modification of cartilage required later for normal or sporting use. This deprivation has a lasting negative effect on the collagen properties of articular cartilage, although some of the delay may be compensated for after weaning (literature review in van Weeren & Olstad, 2016; Barneveld & van Weeren, 1999a, 1999b; Baxter, 2011, 2020; Bell et al, 2001; Cherdchutham et al, 1999; Cornelissen et al, 1999; Hinchcliff et al, 2008, 2014; Jones et al, 2003, cited in Firth, 2006; Lawrence, 2004b; McIlwraith et al, 2016; van den Hoogen et al, 1999a, 1999b; van Weeren & Barneveld, 1999; van Weeren & Olstad, 2016).

These numerous studies cannot determine the exact physiological range of these processes, but they do observe that they promote biomechanical tissue strength and resistance to injury. Thus, exercise in foals would be a potentially powerful protective tool. Furthermore, as already noted[358], the first signs of DOD may already occur before or shortly after birth before physical exertion is a factor (Carlsten et al., 1993; Dik et al., 1999). Therefore, mechanical influences are most likely not among the primary factors of DOD. Nevertheless, it is necessary to examine the conditions that may trigger clinical signs of DOD in foals.

Several poor husbandry practices favour the expression of DOD

The factors that disrupt joint loading and promote DOD are multiple. They include poor stabling conditions (restriction of free-range movement, cramped pens, rough floors), poor conformation (legs, withers, kidneys, musculature) and biomechanical strains (inadequate exercise regime, trauma).

The mechanism of epiphyseal overload

The cartilage growth plate is not as strong as bone, ligament structures and the joint capsule. Its' strength varies according to the individual, nutritional factors (growth rate and energy rations) and genetic background (van Weeren & Olstad, 2016). The force applied to a joint and its neighbouring epiphyses can therefore result in overload, which undoubtedly causes damage to the blood vessels of the cartilage that, if severe enough, results in ischaemic necrosis. Thus, beyond the physiological limits of tension or compression, ossification is affected due to the failure of the epiphyseal functional adaptation to strains[359].

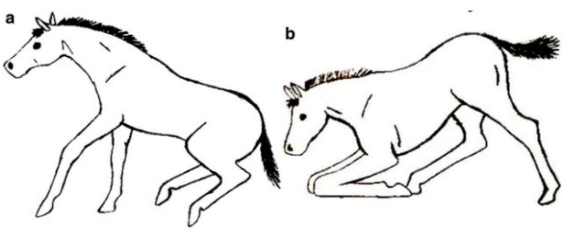

Figure 96 Diagrams of how foals stand up: a. forelegs first (the most common method) and b. hindlegs first, like cattle (less common) (Source: van Grevenhof et al., 2017, https://media.springernature.com/full/springer-static/image/art%3A10.1186%2Fs12917-017-1241-y/MediaObjects/12917_2017_1241_Fig1_HTML.gif ?as=webp, CC BY 4.0)

This exceedance of capacity also occurs when pre-existing lesions weaken the articular and epiphyseal structures or transform the kinematic and kinetic parameters of locomotion. Even if a foal with osteochondrosis does not show lameness, the vertical load of the limbs may be significantly lower. Asymmetry of gait may be observed in unilateral disease, a change in the way the horse stands up (Figure 96) or an increased risk of slipping (Gorissen et al., 2017; van Grevenhof et al., 2017). As a result, these animals are vulnerable during exercise.

An accident can also generate compression outside of the physiological range. For example, trauma that causes ligament rupture or fetlock dislocation in an adult horse results in a epiphyseal fracture of the distal metacarpal or metatarsal bone (cannon) in a foal (Baxter, 2011, 2020).

[358] 6.7.1.4.3 The early signs and evolution of DOD, p. 265

[359] 6.7.1.5 The adaptation processes of young horses to exercise, p. 270

Defective conformation increases vulnerability

The axis of an inflected extremity at the hock or carpus alters the physiology of the epiphyses (Figure 97), as the weight of the foal exerts an asymmetrical load on the joint(s). This stimulates growth on the concave side (due to compression) and slows growth on the other (convex) side. In many cases, this phenomenon allows the limb to straighten without intervention. On the other hand, excessive pressure or traction (trauma, lack of blood supply, shearing forces) can lead to inflammation of the epiphysis (epiphysitis) and lead to premature growth arrest or asynchronous growth. This weakens the joint and makes it vulnerable.

6.7.1.5 The adaptation processes of young horses to exercise

6.7.1.5.1 The biological approach of adaptation to early exercise

An equid adapts when its biological functions respond to the stimuli of its fluctuating environment (breeding, training) with the aim of compensating for occurring strains (exertion, climate) or to satisfy needs (movement, social contact). This concept can be approached in various ways, from the angle of the evolution of species, ontogeny, heredity, genomics, ethology, physiology or pathogenesis (Budzyńska, 2014; Chowdhary, 2013; Kawcak, 2008; Patterson-Kane JC & Firth EC; Price, 1984).

Figure 97 Deviation of the carpal axis (carpal valgus). Radiograph of the right forelimb (Source: Malone, 2022, https://open.lib.umn.edu/largeanimalsurgery/chapter/physeal-disorders/, CC BY-NC 4.0)

Despite some progress, there is a significant gap between the training methods used in the equine world in general, in horse racing in particular, and scientific advances. Protocols are still largely based on an empirical and traditional approach. There is still considerable room for improvement in the education and validation of knowledge in practice.

The intensity and nature of various activity regimes lead to varying effects depending on the tissue and age of the individual

Skeletal components mature at different ages, which opens up several time windows for their adaptation. The shaping of tendons, ligaments and perhaps articular cartilage, is most responsive to exercise during the first year of life, bones are most responsive up to two years of age. During growth phases, the gradual introduction of a training programme based on the transition from trot to canter reduces bone stress by 42%. This allows appropriate adaptation of bony architecture with less risk of damage. On the other hand, when specific training regimes suppress these gait changes (Trotters, Thoroughbreds), high demands at high speed predispose the horses to microdamage as adults. This shows the value of monitoring and increasing the exertion load step by step during development rather than imposing it on a naïve (untrained) skeleton. Finally, training results in less adaptive effects after the skeleton has matured (not before the age of five to six years), as remodelling (repair) takes on the primary role of modifying skeletal architecture under unusual loads (Rubin & Lanyon, 1982; Smith & Goodship, 2008).

This functional adaptability is individual and depends on the age and environmental conditions of the animal. In foals, movement applies muscle force and ground impact to the bones, which increases with speed. Tissues respond to this physical exertion as it occurs (Rogers et al., 2008, 2011; Rogers & Dittmer, 2019; Kawcak, 2008; Lawrence, 2004a). In a second phase, targeted training develops the fitness of young horses. In addition to this, the effects of the surface on which they are used (ground conditions and surface, gradient, climate of the tracks (humidity, solar radiation and temperature), turnout areas, pastures). However, these phenomena remain complex and obscure. On average, success in racing significantly corresponds to foal size and weight (Brown-Douglas et al., 2008; Firth, 2004a). That said, smaller foals are more likely to start training at the age of two and make more race starts during their career than their tall, heavy counterparts. However, tall - but not heavy - horses are more likely to become successful adult athletes in the most prestigious races (group races, high prize money). There are, however, some sound principles to guide thinking about adaptation to early exercise.

Adaptation to mechanical stimuli increases resistance to injury in young horses

The positive effects of exercise on the musculoskeletal development of foals, the significant risks of its deprivation, and circumstances that cause the load limit to be exceeded have been discussed above[360, 361]. In young horses, limb fractures have been shown to be closely related to interruptions in training (Carrier et al., 1998), while the accumulation of high-speed gallops protects against fractures (Boston & Nunamaker, 2000; Verheyen et al., 2006). Studies have specified the timing, type, amount and intensity of free and imposed exercise. The process for adaptation of the musculoskeletal system differs significantly in the various anatomical sites and their bone, tendon and cartilaginous structures (literature review in Firth, 2006; Rogers et al., 2008, 2011). The results (imaging, microscopy, biochemistry, experimental methods) show a remarkable effect. Thoroughbred foals trained during the first 18 months of life for short sprints up to 12.5 m/s show no adverse effects on their career at two and three years of age. Those kept exclusively at pasture show signs of musculoskeletal disorders earlier. This difference was significant for joint pain in the flexion test, reduced carpal mobility and hind leg lameness. These findings support the idea that the development of the cortical

[360] 4.4.1.4.3 Risks to the musculoskeletal system and the back, p. 64
[361] 6.7.1.4.6 Causes of DOD, p. 267

metaphyseal bone is insufficient for racing without a certain level of stress. Adaptation increases resistance to injury when cellular activity still has the capacity to shape musculoskeletal tissue.

Despite positive effects, it remains difficult to quantify appropriate exertion levels

Despite these significant findings, the nature, intensity and amount of tolerable exertion remain difficult to determine, including the cumulative workload and free movement. Additionally, the clinical examination and diagnostic tools of practical equine medicine are still insufficient to detect early abnormalities of the musculoskeletal system, especially those of joint cartilage (Back et al., 1999; Barneveld & Van Weeren, 1999a, 1999b; Brama et al., 1999; Brommer et al, 2005; Cherdchutham et al, 1999; Firth & Rogers, 2005; literature review in Firth, 2006; Patterson-Kane & Firth, 2014; van de Lest et al, 1999; van den Hoogen et al, 1999a, 1999b; van Weeren & Barneveld, 1999; van Weeren et al, 1999).

However, several practical tools remain available, including observation and a holistic understanding of the exercise physiology of bone, joints, musculature, tendons and other systems involved (behavioural response and cognitive abilities).

6.7.1.5.2 Bone adaptation

The previous paragraphs have dealt with the risk of fatal fractures in Thoroughbred racehorses[362, 363]. The focus is on those aspects of the adaptive process that can fail or succeed. The skeleton of the distal limbs undergoes long periods of loading at an early age, as foals and young horses lie down for only short periods.

Numerous scientific studies confirm the adaptive responses of bone size and strength

Locomotion, especially at high speeds, subjects bones to a complex combination of compressive, flexural, tensile, torsional and shear forces. The magnitude, orientation and nature of these loads (speed and biomechanical effects), as well as the specific conformation, shape and strength of each bone, determine its response (Patterson-Kane & Firth, 2014). To adapt functionally, it allows elastic deformation within physiological limits.

Numerous scientific studies provide convincing information on this response to exercise, especially in young Thoroughbreds. They are based especially on the examination (radiology, electron microscopy, computer tomography) and statistical comparison of groups (training and control). Their aim is to characterise the evolution of bone morphology and mineral density (literature review in Moshage et al. 2020 and Patterson-Kane & Firth 2014; Bennett 2008; Cresswell et al. 2019; Davies, 1995; Firth 2006; Firth et al. 1999a, 1999b, 2005, 2011, 2012; Firth & Rogers 2005; Hodgson et al. 2014; Kawcak 2008; KER 2018; McIlwraith et al. 2016; Murray et al. 1999; Rogers et al. 2008). Observations from other species also provide insight into the importance of sprints in increasing the fracture resistance of growing bones. A remarkably small number of very fast strides over a few hundred metres already seems to improve bone strength (Logan et al., 2019).

The scientific evaluation of various stress loads on bones, including determining what factors strengthen or fatigue them, is very difficult and sometimes unethical (induced injury). Therefore, researchers have developed mathematical modelling to better understand bone complexity (Hitchens et al., 2018; Hitchens & Whitton, 2021). Further studies are still needed, however, the explanation of some adaptive processes provides a better understanding.

6.7.1.5.2.1 Modeling and remodeling processes

Under the influence of different forces, growing bone constantly adapts through two related but distinct processes: bone modeling and remodeling (literature review in Kohnke, 2007 and Logan & Nielsen, 2021; Firth & Rogers, 2005; Hitchens et al 2018; Lawrence, 2004a, 2004b; Martig et al., 2014). Bone modeling is a dynamic mechanism involving the production of bony matrix that becomes mineralised over weeks, as well as bone resorption. If the bone is loaded above a certain threshold, osseous cells synthesise new bone (modeling). However, if the load falls well below the threshold, resorption begins. For this reason, young horses confined to the stable at the beginning of training show a significant deficit in bone density. This causes a higher incidence of injury, especially when they are stabled for 23 hours a day and receive only light exercise (Hoekstra et al., 2001; KER, 2009; Pagan et al., 2008; Whitton et al., 2013). Remodeling is critical throughout the life of an equid and occurs during and after initial developmental modeling. This restorative process responds to strains (growth, locomotion and exercise) that are at levels above the usual threshold and adapts the bone in order to reduce the relative strain to an acceptable level. The cellular matrix of the bone renews itself to maintain its quality, and to remedy the accumulation of microdamage. The latter is the result of repetitive high-intensity exercise.

In short, these phenomena prevent strains from reaching the point at which damage occurs. The mineralised matrix is thus continuously being resorbed and replaced by new bone. Normally, these mechanisms maintain a neutral equilibrium that ensures the bone's resistance to injury. However, certain circumstances can break this balance.

Acute periostitis of the dorsal metacarpal surface

Acute periostitis of the metacarpus (*shin soreness, sore shins, bucked shins*) is a common temporary failure of bone modeling. This painful condition affects the dorsal cortex of the forelimb cannon bone of two- and three-year-old Thoroughbreds in their first year of training. It is caused by excessive compression of a bone that is insufficiently modeled to accommodate that amount of

[362] 4.4.1.4 The risks of strain on equids in sport61

[363] 5.9 Doping and the medication of sport horses, p. 160

strain. The stressed bone reacts by forming a new bone layer at the point of stress; the periosteum becomes inflamed and thickens. This injury is most often the result of repeated loading during high-speed turns at the gallop. The forces on the forelegs are twice as great in a turn as on a straight line. The prognosis is excellent with appropriate treatment. The treatment consists of reducing the speed in turns and the training regime (Bailey CJ, 1998; Baxter, 2011, 2020; Hinchcliff et al, 2008, 2014; Lawrence, 2004a).

The importance and risks of rest periods

There are processes that balance bone formation and repair[364]. During periods of high exertion, the degree of deformation (viscoelasticity) or the frequency of the number of strains may exceed the threshold of tensile strength. Adaptive modeling and remodeling are less efficient; the risk of microfractures (cortical bone fatigue) as well as their accumulation and propagation increases. This adaptive failure is usually the result of repeated high intensity exercise. This damage often precedes fractures in equine athletes. The presence of other concomitant pathologies (DOD such as osteochondrosis or OCD) may also exacerbate the risk. The evidence supports the idea that bone tissue adapts normally if forces do not exceed certain values under strain. However, scientists are struggling to specify the threshold of strain intensity above which microdamage occurs and accumulates (Carrier et al., 1998; Hitchens et al., 2018; Hitchens & Whitton, 2021; Muir et al., 2008; Verheyen et al., 2006; Whitton et al., 2013).

In essence, the studies indicate that prolonged training periods are not suitable for Thoroughbred racehorses. Fatigue damage accumulates up faster than the bone can be regenerated, increasing the frequency of trauma and joint fractures. For this reason, Thoroughbreds should be rested regularly to allow bone repair. However, the bones begin to de-adapt (demineralisation of the previously heavily loaded areas) after a break of more than one week. The risk of injury increases in the case of sudden resumption of excessive training at high speed. A gradual return to training should be planned. It is expected that the bone loss resulting from a 10-day break requires 20 days to recover with careful reintroduction of non-high-speed exercise.

6.7.1.5.2.2 Literature review

In summary, numerous scientific publications confirm the adaptive responses of bone size and strength from an early age:

- After about four months of progressive exercise, bone density increases significantly (thicker trabeculae and cortex, increased bone mass) in the main loading axes. However, a gallop of at least 12m/s is necessary for young Thoroughbreds to achieve this adaptation. Training at lower speeds does not allow adaptation to the higher forces that Thoroughbreds have to endure in a race
- The adaptive response is greatest in areas that bear high and intermittent loads, particularly at the common sites of fatigue that coincide with fracture sites (e.g. dorsal aspect of the carpus). The benefit reaches almost 37% for the cannon bone
- The Authors consider that this response increases the ability to resist flexural and torsional deformation responsible for fractures. Mechanically tested bone specimens do indeed show superior resistance to impact and microfracture
- Horses trained and entered in races at the age of two and three years of age develop orthopaedic injuries later than control horses. Exercise, especially conditioning, produces young horses with stronger bones in their extremities

In addition, structural bone development (horses observed from one day to 27 years old) does not reach its peak until six years of age. The mineralisation curve resembles that of weight gain more than height, but its final state shows a delay in the growth of stature and body mass.

6.7.1.5.2.3 Standardbreds and Trotters

The study of adaptation to exercise has been more focused on Thoroughbreds than on Standardbreds and Trotters. The intensity of skeletal modelling and remodelling was found to be significantly lower in Standardbreds. It is assumed that the bones of the limbs are less stressed, as they are trained over longer distances at slightly slower gaits. In addition, Trotters have two feet on the ground (as opposed to one at a canter) during all gait phases (Patterson-Kane & Firth, 2014), which reduces the level of loading.

6.7.1.5.3 The adaptation of articular cartilage

After bone and tendons, articular cartilage (AC) is the most fragile tissue in young horses. Its integrity is closely linked to that of the subchondral bone. In the equine foetus, its biomechanical properties are homogeneous, i.e. unrelated to the anatomical site. During growth to maturity, its adaptability leads to a heterogeneity that varies according to the location and functional (loading) requirements of each joint (Brommer et al., 2005).

The delay in AC development cannot be made up

Several studies (cited in Firth, 2006 and Patterson-Kane & Firth, 2014) show that mechanical stress through activity is necessary for strengthening the AC from birth onwards. A lack of movement (stall confinement) slows it down and subsequent exercise fails to compensate for this delay. Affected foals then suffer from a weakened capacity to respond to stimulation and adapt to a load. Specifically, a lack of early exercise disrupts proteoglycan and collagen synthesis, essential elements for the flexibility and strength of the AC. In addition, stall confinement also affects the normal development of subchondral bone as noted above[365].

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[364] 6.7.1.5.2.1 Modeling and remodeling processes, p. 271

[365] 6.7.1.5.2 Bone adaptation, p. 271

Exercise is not the primary cause of osteochondrosis

Using histological, morphometric and statistical evaluation methods, researchers (Kim et al., 2012; Rogers et al., 2008) have shown that at 18 months of age, 50% of foals show visible thickening of the calcified AC and substantial changes in its texture. These abnormalities were found to be early signs of osteochondral disease. Furthermore, they did not observe a clear difference between the exercised and the grazed group. This suggests that early conditioning does not deteriorate the AC. Other publications (cited in Kim et al., 2012) also do not associate this type of exercise with the presence of joint tissue damage. As noted above, these results support the presence of other factors that predispose to the development of DOD including osteochondrosis and OCD[366].

6.7.1.5.4 Tendons have limited adaptive capacity to exertion

In the tendon, the distribution of collagen fibre diameter changes significantly during growth, but not during early training. The ability of the tendon to respond adaptively to exercise in terms of composition and tensile strength therefore appears to be limited. However, training is associated with an increase in the diameter of some tendons, suggesting that this change may be an adaptive response and that tendon development can be modulated by exercise during growth. It is thought that this increase is due to a slightly higher water content in the non-collagenous or newly synthesised matrix.

The final response of the equine tendon to exercise is well documented (Cherdchutham W et al., 1999; literature review in Firth, 2006; Patterson-Kane & Firth, 2014), at least with respect to the superficial digital flexor tendon, where a partial rupture is preceded by localised macroscopic degenerative changes. Reduction of the mean diameter of the tendon is an early sign of progressive microdamage but the exact effect of prolonged training (amount and type) that causes these changes has not yet been determined.

Furthermore, in elastic tendons (especially flexor tendons), an increase in size can reduce the energy storage function, as rigidity increases with size. It is also known that the remodeling and adaptive capacity of the mature tendon is much more limited than in the young equid (Cherdchutham et al., 1999). The lack of adaptive response of the flexor tendons to increased work and age explains the increased risk of tendon injuries in older horses (Takahashi et al. 2004, cited in Firth, 2006). For this reason, many authors suggest that conditioning exercises should be started in young equine athletes rather than in older ones. This would increase resistance to subsequent tendon injuries (Smith et al. 1999, cited in Firth, 2006). Exercise also alters the biochemical composition of tendons, for example the ability of tenocytes to produce glycosaminoglycans (hyaluronic acid), substances that play a role in tensile strength, collagen production and reducing inflammation in tendonitis. However, the results of scientific investigations into these adaptive phenomena vary and the nature of the events leading up to tears in the superficial digital flexor tendon has yet to be elucidated.

6.7.1.5.5 Muscular adaptation

Characteristics of skeletal muscles

The muscular properties of *Equus caballus* are primarily the result of the natural evolution of a wild herbivore from the steppe pastures. Breed selection has also developed a high degree of adaptability in response to training (literature review in Rivero & Hill, 2016; Vermeulen et al., 2017). This makes the domestic horse a unique being capable of high velocity, endurance and strength that distinguishes it from other species. The anatomical and physiological adaptations to physical exertion have resulted in several characteristics:

- High muscle mass in relation to body weight
- High musculoskeletal efficiency due to specific tendon-muscle architecture
- An adaptable composition of muscle fibre types with a high speed of contraction
- A high mitochondrial volume that results in a remarkable aerobic capacity
- Large intramuscular reserves of energy substrates (glycogen in particular)
- Adaptive responses to energy demands and oxygen consumption fall into two categories
    a. Recovery (rapid return to homeostasis) after exercise by glucose sparing fatty-acid oxidation, recovery through glycogen resynthesis and repair of microdamages (fatigue)
    b. The adaptive response to physical training which, through the cumulative effect of repetitive exercise, strengthens the ability to maintain muscular equilibrium (homeostasis)
- Various types of highly adaptable muscle fibres throughout life.

A muscle is made up of several muscle fibres, each composed of a large number of myofibrils consisting of a long chain of successive sarcomeres[367]. During the first year of growth, a marked increase in the size and cross-sectional area of muscle fibres is observed microscopically due to the insertion of new sarcomeres near the tendon attachments. Several publications describe the metabolic and contractile properties of muscles (Bryan et al., 2017; KER, 2013; Stull & Albert, 1980; Valberg & Borgia, 2008; Valberg, 2014). These characteristics, as well as the proportion of slow (I) and fast (IIA, IIB) twitch fibres, also vary according to their development, load, the degree of exertion and the organs studied. The percentage of each type of muscle fibre differs according to anatomical site, breed and use. This diversity allows for a graduated response to demands ranging from posture maintenance to lively movement. A horse with a greater amount of slow twitch fibres (type I) will excel in long distance or duration,

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[366] 6.7.1.4 Developmental Orthopedic Diseases (DOD), p. 264

[367] The sarcomere, made up of myofilaments, is the fundamental unit of contraction.

low intensity, low speed activities. Conversely, a high proportion of fast twitch fibres (IIA and IIB) will be suitable for acceleration (jumping, sprinting) and brief, high intensity activities. This diversity of contractile and metabolic properties explains why some individuals are better suited to one type of exercise than another.

6.7.1.5.5.1 Muscular adaptation to exercise depends on several factors

Each horse has an individual muscle composition: fibre typology and practical properties (KER, 2013; Hodgson et al., 2014; Trachsel et al., 2016; Vermeulen et al., 2017). Its contractile and metabolic profile (including oxidative capacity) changes during growth under the influence of determining factors. The main function of the organ (skeleton, skin, respiration, heart), as well as the nature, intensity and duration of the activity (free movement, training, conditioning) are the primary determining factors. These adaptive phenomena also vary according to breed (racehorse, Warmblood, draught, pony), sex and age. In total, musculature is capable of a very wide range of responses, both immediate (during a one-off exercise) and long-term (ageing, training, nutrition). Feeding young horses in training remains poorly studied (Ringmark et al., 2013, 2017).

In an equine athlete, performance also depends on cardio-respiratory capacity, anatomical, musculoskeletal and behavioural characteristics. These characteristics allow an equid to react efficiently to an energy demand while avoiding fatigue as long as possible (Barrey, 1994; Padilha & Reis, 2019). However, muscle performance is modulated by several factors, including some that are genetic in nature[368].

6.7.1.5.5.2 Genomics

Functional genomics has become a powerful tool to better understand the biology of exertion in horses (Autry et al., 2020; Bryan et al., 2017; Chowdhary, 2013; Lee et al., 2020; McGivney et al., 2009; Valberg et al., 2019). It revealed over 3,000 genes associated with muscle performance and identified changes in the expression of structural and metabolic genes after training. These functional genes play a role in muscle growth, contraction and metabolism, including the regulation of intracellular calcium (Ca^{2+}) in muscle fibres. They may be relevant for the early assessment of athletic performance in horses.

6.7.1.5.5.3 Neuromuscular adaptation

The functional efficiency of muscle contraction requires harmony with the nervous system. It produces or resists motion to avoid unwanted movement and tissue damage (Hinchcliff et al., 2008, 2014; McGowan & Hyytiäinen, 2017). Neuromuscular physiology impacts static and dynamic body postures through learning and memorisation of movements, sometimes very subtle. This coordination of actions, called neuromotor control, requires precise peripheral proprioception *(knowing where the limbs are)* and, above all, the acquisition of musculoskeletal skills through the incremental repetition and duration of specific exercises, splitting them into different sections, and rest periods. With training, the young equine athlete develops skills (e.g. dexterity) that are critical for sports performance and injury prevention. In Trotters, training improves the symmetry and regularity of the trot until at least the age of five (Leleu et al., 2004).

6.7.1.5.5.4 The consequences of physical exercise

Several authors have described the two major consequences of muscular exertion: fatigue and the release of heat (Davis et al., 2020; Hinchcliff et al., 2008, 2014; Hodgson et al. 2014; ICEEP, 2020). Muscles consume energy and oxygen when they are active. If there is not enough oxygen, the muscle produces lactic acid, a toxic substance that contributes to pain and fatigue after exercise. Muscle contraction also generates a large amount of energy that the animal has to dissipate, mainly through evaporation of sweat and secondarily through exhalation of hot air. The horse overheats if it can no longer dissipate this energy, and can suffer from heat stroke (hyperthermia), which can be fatal[369].

6.7.1.5.5.5 Physical conditioning and training of the musculature

It is beyond the scope of this report to present further details on the training of the competition horse. However, the basic principles of any conditioning or training programme are outlined. The goal of training is to improve performance by inducing key physiological changes in the horses' bodies without affecting their health and welfare, especially in young horses.

The results of multiple scientific studies on training vary due to the number of breeds, the age of the horses, intensity, duration and type of exercise (sprint, endurance, strength), and discipline (Hinchcliff et al., 2008, 2014; Patterson-Kane & Firth, 2014; Rivero, 2007; Valberg, 2014). They are often presented at international conferences such as ICEEP (International Conference on Equine Exercise Physiology, https://www.iceep.org). Specific knowledge of equine training is progressing. Although knowledge is still limited, recent research has made significant progress in some areas of exercise and training:

- Physiology, cell biology and adaptation of musculoskeletal tissues
- Risk factors and epidemiological analysis of bone, cartilage and tendon injuries.

The most important adaptation occurs in the first six to eight weeks of training. It then reaches a plateau beyond which no further progress is observed when the training load is prolonged or intensified after 12 to 16 weeks. To ensure the welfare of the horses, riders and trainers should be alert to signs of overtraining. Finally, regular and progressive training of the young horse leads to hypertrophy of muscle fibres and an increase in their oxidative capacity, which improves performance and reduces the risk of

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[368] 6.2 Selection and occurrence of hereditary diseases, p. 225

[369] 5.5.1.3 Thermoregulation and the thermoneutral zone at low temperatures, p. 116

injury (Eto et al. 2003; literature review in Rivero et al., 2007, 2008). There is an optimal fitness level for each discipline. Exceeding it can create a detrimental effect known as overtraining (Tyler et al., 1998; Valberg, 2014).

The preparation of young horses must develop cardiovascular function before the musculoskeletal system. In the beginning, low intensity exercise (trot and canter <600m/min) improves the natural aerobic capacity (endurance). To prevent injury (structural damage, lameness), trainers should therefore not impose high intensity exertion (Ohmura et al., 2013) during this time. The possibility of enriching the vascularity of skeletal muscle remains debated (Nimmo et al., 1982, cited in Hodgson et al., 2014; Henckel, 1983).

Strength development improves performance and reduces the risk of injury. The main focus is to promote the energy passively stored by the muscles and tendons (flexor tendons and suspensory ligaments) that are stretched when the hoof lands on the ground and the fetlock is hyperextended. It is then released extremely quickly by the flexible connective tissue when the hoof leaves the ground and allows the limb to be propelled forward like an elastic catapult. How to train horses (interval training, strength training, plyometrics) to optimise this phenomenon and avoid failure of this system remains to be clarified (Galloux, 2017; Miyata et al. 1999; Parsons et al. 2008; Rivero, 2007, 2009; Rivero et al., 2007, 2008; Tyler et al., 1998; Wilson et al., 2001; Yamano et al., 2002). However, this is more difficult than for humans, probably due to the unique physiological characteristics of equine locomotion.

6.7.1.5.6 Ethological aspects and cognitive abilities

There are few studies on neurobiology and ethology in the fields of perception, emotion, cognition, motivation and behaviour of young horses during early exercises. They are complex. For ethical reasons, researchers generally observe responses to stimuli of a relatively low intensity compared to investigations in other species. Their experimental designs are almost always based on positive reinforcement, while avoiding situations resulting in negative reinforcement. This approach complicates the interpretation of cognitive processes, including the identification of problematic or undesirable responses (Murphy & Arkins, 2007; Murphy, 2007). The abilities of donkeys, obscured by the cliché of the stubborn animal, also remain poorly understood. Yet a better understanding would better respect their dignity and welfare (literature review in De Santis et al., 2021).

Furthermore, learning is individual, behavioural and adaptive in order to respond to environmental incentives. Despite the studies, the principles of learning (habituation, association, sensitisation, operant or classical conditioning, memorisation) remain complex. However, it is known that how equids perceive their environment and exercises plays an essential role for developing and adult horses.

6.7.1.5.6.1 Development of cognitive skills

By nature, domestic horses seem to have little ability to interpret human signals given to gain their attention and communicate with them. The style of early handling probably influences their cognitive ability and the success of future tasks. The postnatal and weaning period[370] is crucial in this respect. With early experience and increasing age, equids expand their competence to follow people's actions (Amici, 2019; Brubaker & Udell, 2016; Proops et al., 2013).

Ethologists have identified several factors that affect the cognitive processes of horses. In addition to welfare, they have identified emotional status, health status and behavioural characteristics such as temperament. For example, acute stress, depression (Figure 17, p. 61), fear and various pathologies reduce their attention and sensory capacity. More specifically, the type of training and reinforcement, interactions with humans, and stabling conditions influence learning ability and motivation at work (literature review in Brubaker & Udell, 2016 and in Hausberger et al., 2019; Fortin et al., 2018; Henshall et al., 2022; Nawroth et al., 2019; Trösch et al., 2021; Valenchon et al., 2013a; Waring, 2003). In addition, early exercises progressively develop neuromuscular coordination, which allows young equids to acquire discipline-specific skills (Denoix, 2014; Firth & Rogers, 2005; Valberg, 2014).

The equid interprets signals repeated by a human being as a reward or punishment. Some assimilate better after the compensation of a correct reaction, while others perform better when they can avoid an aversive stimulus. These differences become important for designing individual training programmes and methods (Visser et al., 2003a). Trainers are familiar with equids that have long-term psychological damage caused by a painful or frightening event. A single bad experience (material, location, handling) can cause negative emotions (anxiety, phobia) when a similar situation arises. On the other hand, positive experiences seem to improve cognitive skills and facilitate interactions with humans. It is therefore considered likely that horses with the greatest capacity for learning and conceptual understanding do better in the breaking-in and training environment (Murphy & Arkins, 2007; Murphy, 2007).

Early handling contributes to higher cognitive ability

Experience has been recognised for several decades as a factor that supports cognitive development (Gardner, 1937, cited in Murphy & Arkins, 2007; Hausberger et al, 2019; Heird et al, 1981, cited in Whitaker DD, 1982; Krueger et al, 2014; Mader & Price, 1980; McCall, 1990; Whitaker, 1982). Studies show that handling from weaning onwards increases cognitive development. Studies also show a negative correlation between age and learning ability. Young horses tend to perform better than older horses.

[370] 6.9 Weaning of foals, p. 310

The earlier they start competing, the longer their career[371]. It is also assumed that cognitive ability decreases with age, as equids learn to ignore the stimuli that are known and most often used in a given circumstance. This indicates the importance of varying tasks and regularly introducing new activities even without a direct practical purpose. Furthermore, age appears to be a major factor influencing attention span. Young horses can absorb information more quickly, but they cannot concentrate as long as their older counterparts. However, young horses have been noted to explore their environment more (Lindberg et al., 1999; Rapin et al., 2007).

A recent study (Valenchon et al., 2019) shows that horses reach behavioural and social maturity most likely at the age of four to six years. The young horse is thus in full development when it is commonly removed from a group setting to begin an active phase of breaking-in - these horses often enter an impoverished and restrictive environment. In contrast, life in a herd provides important benefits: it positively contributes to physical, social and cognitive maturity and as a rule, the horses are easier to handle (Søndergaard & Ladewig, 2004).

6.7.1.5.6.2 Stress, pain and cognitive abilities

The physical stress caused by exercise varies according to the circumstances and can affect the psychological health of the horse. It should be remembered that physiological reactions to environmental (flight in the event of danger) or physical stimuli (exertion, illness) mobilise resources that are essential for survival. The process thus aims to maintain or restore equilibrium by modulating the behavioural (coping), immune, hormonal, metabolic and vascular response (Broom, 2011; Coenen, 2004). For example, moderate exercise boosts immune function, while very intense training reduces it and leads to overtraining (Cappelli et al., 2020). Stress becomes chronic if the cause persists. The body can no longer adapt and exhausts its reserves. Its defences weaken and behavioural problems appear (aggression, apathy, stereotypy). But stress and learning are linked. An adequate state of welfare (training, nutrition, stabling, diet, mental state, health and good handling) reduces the level of stress. This paves the way for appropriate training (Christensen, 2018).

The search for and interpretation of sometimes subtle indicators that reveal the state of adaptation are key to assessing and ensuring equine welfare (Heleski, 2011). Preventing negative perceptions is not enough[372]. The horse must be able to experience positive emotions, including the satisfaction of its expectations and needs. For example, the welfare situation of a horse kept alone for 22 or 23 hours a day in an individual stall should be strongly questioned, even if it performs acceptably well in sport and does not show clinical signs of gastric ulcers, reduced bone density or stereotypy.

Stress affects learning performance

Acute stress is a powerful modulator affecting learning performance. Its impact differs depending on the type of reinforcement (negative or positive) and the individuality of the horse, including its temperament and the tasks required (Fortin et al., 2018; Lansade & Simon, 2010; Valenchon, 2013; Valenchon et al., 2013a, 2013b, 2017). Young horses that are high strung are found to be less trainable (Fiske & Potter, 1979, cited in Whitaker, 1982). Adolescent or inexperienced horses show indicators of stress (elevated heart rate, cortisol, glucose and lactate) compared to experienced or older individuals (Gregić et al., 2017, 2018a, 2018b, 2020). Removing youngsters from their group and stabling them separately in a stall for breaking-in and initial training has been shown to be an additional stress factor (Lansade et al., 2012). Stress is manifested, for example, by an increase in blood cortisol levels (Erber et al., 2012). Compared to experienced horses, stressed horses (higher cortisol levels) were less effective in learning, as they needed many more attempts to achieve success (Henshall et al., 2022). However, cognitive and behavioural outcomes and responses to training are not only the result of stimulus-response interactions. They are also shaped by states of arousal, emotion and attachment to humans (McLean & Christensen, 2017).

These results improve the understanding of how stress influences cognitive performance. They also illustrate the importance of a horse's nature (task-related or not), individuality and breed. One study shows that sport and Thoroughbred horses responded with higher concentrations of salivary cortisol concentrations than Franches-Montagnes horses (Sauer et al., 2019). Although the studies are still ongoing, they already provide fundamental insights on how to optimise personalised training and preparation of young horses through promoting positive reinforcement, whereas negative reinforcement has dominated traditional learning methods.

6.7.1.5.6.3 Addiction to aversive stimuli

The most common notion of horse-human interaction remains that the animal must be submissive to ensure successful use (Goodwin et al., 2009; McLean & McGreevy, 2010). To this end, in isolation from its conspecifics, it will learn to accept through failures and successes that any attempt to escape a restraint, such as avoidance, is futile (Waran et al., 2007). Several publications show the links between cognitive abilities and welfare during breaking-in and training (literature review in Baragli et al., 2015). The often crude methods (incorrect use of negative reinforcement) serve to argue for the application of ethical and ethological principles. These principles would minimise the price that horses pay for humans to enjoy pleasure. Specifically, proper training should be based on scientific knowledge of learning and psychology, in particular on an optimal horse-human relationship on the ground and under saddle (literature review in Hausberger et al., 2008).

[371] 6.7.1.6.3 Numerous studies reveal a significant advantage, p. 279
[372] 2.4 Welfare, p. 25

In this respect, ethical or natural horsemanship seems appropriate, as it bans coercion and punishment. However, the use of tack or a round pen still limits freedom of action (Henshall & McGreevy, 2014; Rozempolska-Rucińska et al., 2013; Warren-Smith & McGreevy, 2008). Clearly, any restraint or restriction, even one that is well accepted through habituation and learning, inflicts a certain amount of initial pain on the horse, known as discomfort when it proves to be low. Consequently, it is difficult to imagine a horse getting used to it without the use of aversive means, even if the strain remains minimal thanks to the use of ethical principles.

6.7.1.6 Selection and quality controls are part of the fundamentals of breeding

There is a growing demand for sustainably healthy, easy to manage (handling, training, exercising) and trainable horses in both leisure and competitive circles. As these qualities are partially transmissible to offspring, their selection is a logical part of a serious breeding programme.

Ethologists (Trösch et al., 2021) are becoming better at explaining equine cognitive abilities, i.e. the faculties that these animals use to understand their social (other living beings) and physical environment (places, objects). Studies on the factors that influence them remain rare. A few authors have explored heredity in the areas of learning and interaction with humans. They have described a mother and father effect (Bonnell & McDonnell, 2016; Wolff & Hausberger, 1996). Furthermore, early individual temperament traits predict a substantial part of what an equid will show later on (Visser et al., 2003a, 2003b). However, it remains difficult to characterise these faculties in order to calculate their heritability, as they exhibit diverse behaviours and are raised under unequal conditions. In addition, equids establish interactions with humans at a very early age. Their varied experiences influence these abilities and make it difficult to identify the transmissible and environmental factors necessary for such analyses. However, these authors agree that low cognitive competence delays learning and increases frustration or avoidance responses. Horses that assimilate faster and adapt quickly to the rapidly changing context of harness racing appear to be more successful. One study targeted several candidate genes related to learning ability (Velie et al., 2018).

The breeding value of a sire includes his genetic heritage (ancestors), his own merits and what he passes on to his offspring. The concept of breeding is based on principles that differentiate it from the random multiplication of animals. In essence, the goal is to select only the best animals. Breeders do this by applying a catalogue of measures (breeding programme). These are developed by a national or cross-border organisation dedicated to a specific objective (breeding goal) for a specific breed (e.g. Franches-Montagnes, Haflinger, Thoroughbred) or type of equid (pony, donkey, special characteristics).

Breeding therefore involves quality control of successive generations. Judges note the characteristics that can be passed on to the offspring and that are decisive for a discipline (aptitude in equitation, driving, leisure riding, jumping, galloping or trotting). These examinations are also based on criteria such as health, temperament, absence of hereditary defects, or robustness, to name just a few. All these evaluations take place either during short tests organised for this purpose or over a longer period of time such as competitions during the career of the horse.

6.7.1.6.1 Breeders and trainers recognise desired qualities early

During the various training and breaking-in sessions, breeders and training specialists are quick to spot young horses that are extraordinary. They can be described as gifted, talented or precocious, because they show skills from the start, sometimes already in the wild, that clearly surpass those of their peers. One can observe gaits suitable for dressage, the instinctive way of jumping obstacles, the natural biomechanics of trotters, the galloping stride for racing or a temperament suited to leisure activities. With little training, they master the basic exercises very well, learn very quickly and memorise the movements easily. Behaviourally, they are characterised early on by favourable aptitudes. Their psychomotor skills and high attention span are remarkable. These equids immediately establish a harmonious relationship with humans during handling and show less sensitivity to stress. When they are in perfect health, the stresses during daily training sessions are generally low, partly due to their largely innate skills. This allows for a variety of activities and avoids the need for intensive and specialised training of these adolescent horses.

Less talented young horses are at risk of being overworked

The second group consists of horses that do not have as much skill as the first group, to a greater or lesser degree. To reach the same level, they require a greater amount and intensity of training. Even if the expectations are realistic and the initial training period is longer, this initial phase subjects these horses to more stress and risk, especially for the musculoskeletal system. The lower skill level, as well as the economic and social stakes, encourage the reinforcement and multiplication of activities. This increases the number and severity of overload injuries. In the worst case, trainers ignore warning signs such as pain or resort to punishment and violence. These excesses greatly increase the risk of chronic stress and physical and mental burnout. The first signs of overwhelmed coping skills appear. The expected benefits of the exercises are then seriously compromised.

Success in racing is a major factor in determining the longevity and durability of a horse. Insufficient performance (earnings) in the first year influences premature retirement. For this reason, prize money should not be made too attractive for horses in their first year of racing (More, 1999; Sobczyńska, 2007). In addition, careful observation of each young horse's talent - physical, behavioural, individual and natural ability to make an effort, robustness, health - remains essential, as the less talented prove to be more vulnerable. Excessive strain on the musculoskeletal structures can cause lasting damage to them or aggravate micro-damage. This is particularly true when the growth plates are already weakened by DOD. This can manifest itself as a rupture (fracture) for example[373]. Indeed, very small injuries cause a surprisingly large effect on the mechanical properties of bone tissue similar to those of non-biological materials.

6.7.1.6.2 A goal of sustainability

Around the world, success in equestrian sports and racing remains the main objective of the breeding associations of competition horses. However, they devote most of their efforts to immediate, quick and short-lived success and much less to the sustainability of health and performance (Raub, 2010). Today, modern organisations should focus on preventing the early retirement of equine athletes, which is mostly related to welfare impairments. To this end, they need to take all necessary measures to avoid these risks, in particular by improving the health and robustness of horses, to foster a functional sporting longevity independent of an equid's skills (Lascaud, 2020). Relying solely on good conformation to guarantee these qualities is no longer sufficient (Koenen et al., 2004).

The necessary knowledge

Effective and convincing measures must be based on objective scientific and practical studies. They include a zootechnical component (breeding and selection) and an animal protection component (respect for dignity and welfare). Breeders should regularly update their knowledge and skills. This includes in particular the processes of physical and psychological development of foals, factors that present advantages and risks (stabling, training) and genetic aspects (heritability, early detection) favourable to functional longevity. In France, the first studies (Dumont Saint-Priest, 2019; Lascaud, 2020) observe and analyse several potentially related traits: morphology (general condition), locomotion, health and behaviour (temperament, relationship with humans, sensitivity to touch and stress).

Selecting for functional longevity

As seen above[374, 375], confinement, such as rearing in a stall, is detrimental to the development of the musculoskeletal system. However, domestic conditions rarely offer the duration and intensity of movement observed in an equid's natural environment. It is therefore reasonable to assume that any additional exercise given during growth strengthens the musculoskeletal system. In addition, young horses can adapt to training at an early age[375]. This process specifically depends on various factors such as individual characteristics (genome, experiences) and a regular and progressive workload (Firth, 2006; Firth & Rogers, 2005).

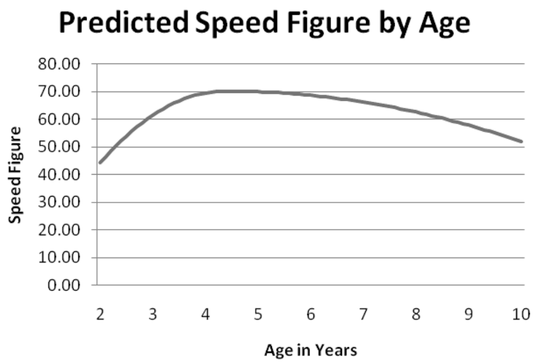

Figure 98 Graph modeling speed in Thoroughbred racing by age (Source: Gramm & Marksteiner, 2010, https://www.jstage.jst.go.jp/article/jes/21/4/21_4_73/_pdf/-char/ja, CC BY-NC-ND 4.0)

The age at which an equine athlete reaches peak performance also provides information about functional longevity and the beginning of a deterioration phase where health problems multiply. Monitoring of sport horses shows that individuals tested at five years of age do not perform better than younger horses. At four and five years of age, their physiology responds better to exercise than that of older horses (Lewczuk, 2015). For racing, a horse's peak ability (speed) is reached at about 4.5 years of age (Figure 98). The rate of improvement between two and 4.5 years old is greater than the rate of decline that follows (Gramm & Marksteiner, 2010). Trotters reach their maximum running speed on average between five and six years of age. Males, who are faster than mares, reach their maximum speed a year later than their female counterparts (Couroucé-Malblanc & Hinchcliff, 2014).

For show jumping, performance increases on average up until 10 years of age before decreasing (Neumann et al., 2020). One study found three types of effects from aging on these skills: 1. horses that gradually increase their potential as they age 2. those that respond early but gradually lose their ability as they age and 3. athletes who maintain the same potential for a long time (Bartolomé et al., 2013).

6.7.1.6.3 Numerous studies reveal a significant advantage

Data on competition results, monitoring and selection of performance and behaviour during physical exertion provide a good basis for measuring the functional longevity of sport horses. Already from the end of the 20th century, numerous publications in several countries showed that the beginning of breaking-in, training and competition at an early age significantly improves longevity (literature review in König von Borstel, 2018; Bourke, 1990, 1994, 1995, 1996, as cited in Bailey, 1998; Bokor et al, 2018; Braam et al, 2011; Firth et al, 2011, 2012; Friedrich et al, 2011; Huskamp et al, 1996; Jönsson et al, 2013, 2014; König von Borstel, 2018; Sloet van Oldruitenborgh-Oosterbaan et al, 2010; Ricard & Fournet-Hanocq, 1997; Ricard & Blouin, 2011; Rogers et al, 2008, 2011, 2012a, 2012b; Smith & Goodship, 2008; Seierø et al, 2016; Sobczyńska, 2007; Solé et al, 2017; Tanner et al, 2011, 2013; Todd et al, 2018a; Velie et al, 2013; Wallin et al, 2000, 2001, 2003).

[373] 6.7.1.5.2 Bone adaptation, p. 271
[374] 6.7.1.4.6 Causes of DOD, p. 266
[375] 6.7.1.5 The adaptation processes of young horses to exercise, p. 270

In summary, the authors consider these practices to be appropriate for the state of skeletal development at two years of age for Thoroughbreds. They cannot be questioned because of the physical strains imposed. For dressage and jumping, horses start about one year later. However, these publications show the same results: the younger the horse when it achieves its first success in sport, the longer the average length of its career. The authors accompany these findings with various comments. Healthy subjects with correct conformation have a better longevity in competition than the average horse. The improvement of these traits would at the same time favour performance capabilities or, in other words, individuals that are trained or running at the age of two can remain in good musculoskeletal condition longer. Finally, when young horses are engaged in various disciplines (a sign of versatility), at an appropriate level, they are likely to have a significantly longer sporting career. They also speculate that insufficient exercise quality at this age would explain why the skeleton would not gain the necessary strength. Under these conditions, a horse cannot withstand the strain of racing. There are many causes of musculoskeletal problems (stabling conditions, genetic factors, ossification problems).

Several of these studies have also compared horses that make a later start in training and competition or have lower performance. They are expected to reach a high level more quickly, increasing the risk of retiring for retraining, overwork and accidents. This reduces their functional longevity and length of careers (Bailey CJ, 1998).

In conclusion, the literature review shows that early exercise seems to generate beneficial effects on the musculoskeletal and behavioural systems and promote better physical development. This positive association could be explained by an early habituation to the competition environment and to the exertion required during competition and training. It would thus support the sustainability of a horse's career. Conversely, the risk of withdrawal from competition is greater when horses start to compete after the age of six. These results contradict the common belief that training young horses is detrimental to their health.

6.7.1.6.4 Functional longevity has a hereditary component

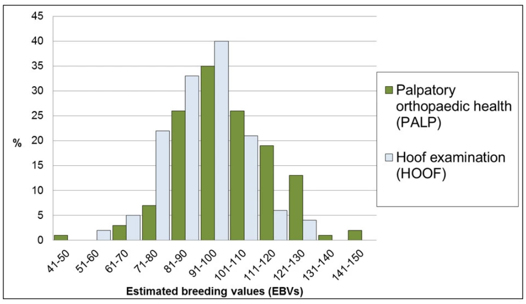

Figure 99 Distribution of estimated breeding values for palpatory orthopaedic health and hoof examination. Standardised scale of 100 (mean) and standard deviations of 20 (Source: Jönsson et al., 2013, https://actavetscand.biomedcentral.com/articles/10.1186/1751-0147-55-22/figures/2, Creative Commons Attribution License 2.0)

Publications have covered almost one million performances between 1972 and 2008 (210,000 sport horses). They identified factors of functional longevity and early retirement of sport horses in France (Ricard & Fournet-Hanocq, 1997; Ricard & Blouin, 2009, 2011). These studies show the presence of a genetic component. After seven years of competition, 50% of the progeny of the best stallion were still active in their eighth year (i.e., aged 12 years or more) compared to 27% of the worst sire. Other teams have evaluated the heritability h^2 of longevity for sport and racing. It varies between 0.10 and 0.25 (Braam et al., 2011; Burns et al., 2006; Jönsson et al., 2013; Posta et al., 2014; Ricard & Blouin, 2009, 2011; Seierø et al.) It is sufficient to select for it in breeding.

Despite their reliability, breeding values (Figure 99) estimated on the basis of longevity traits provide usable results only at a later stage when the sires have aged. They may then be ineffective. Breeders should therefore be able to use earlier, indirect indicators. These include accurate conformation and health testing at three years of age (field tests), or performance testing (health, behaviour) in racing. Genomic selection based on efficient genetic markers could one day have an advantage, as it will allow genotyping from birth (Dugué et al., 2020; Dumont Saint-Priest, 2019; Ricard & Blouin, 2011).

A measure for the future welfare of horses

These results support improvement of the welfare of equine athletes. They facilitate the effective and practical application of genetic selection methods for phenotypes favourable to the health of young horses and the longevity of their careers. Early monitoring allows the early identification - at the breaking-in and training stages, of individuals that are too physically and psychologically fragile to perform as expected. They can then be directed towards other activities of a less demanding nature and intensity.

The opportunity to eliminate deleterious mutations

It is known[376] that deleterious genetic mutations directly cause or predispose to many health disorders. Early selection allows horses without a suitable phenotype to be eliminated from breeding. It contributes, at least partially, to the purging of harmful alleles. It is assumed that it exerts a favourable pressure on the health and welfare of the Thoroughbred, one of the most influential and controlled breeds in the world. According to recent studies, Thoroughbreds appear to have a lower strain of deleterious mutations than initially expected (Librado & Orlando, 2020; McGivney et al., 2020; Orlando & Librado, 2019). Work on inbreeding coefficients caused by founder stallions shows the positive effects of selection in this breed. For example, inbreeding with the champion sire Herod increases the length of the career significantly (Todd et al., 2018b).

[376] 6.2 Selection and occurrence of hereditary diseases, p. 225

6.7.1.6.5 Breeding events for young horses

Introduction

Young horses participate in the majority of events whose results allow the estimation of breeding values useful for selection. These events are also used for auctions and to orient an equid's career toward sport, breeding or leisure. They take several forms: the presentation of six-month-old foals, qualifications for Standardbreds and Trotters, races for Thoroughbreds or Trotters at least two and a half years old, one-day field tests or station tests for several weeks, competitions for horses at liberty, under saddle or pulling a carriage. At these events, the judges assess or measure various characteristics. Speed (Thoroughbreds, Standardbreds and Trotters), jumping and dressage skills (Figure 100), behaviour and aptitude under saddle or being driven as well as health, including hereditary diseases are all evaluated (Mele et al., 2007; Studer et al., 2007).

Tests with a level of difficulty adapted to the age of the horses

Figure 100 Test (Promotion CH) to assess the natural aptitude of young horses for dressage (Photo: Sandoz Images)

In harness racing, only those horses that have proven their ability can start in a race. At the starting line, young horses have an advantage over older horses, up to 50 metres if they are five years old or younger. Two-year-olds are not allowed to compete against older horses over longer distances. The handicap weight of Thoroughbreds takes their age into account. Two-year-old Thoroughbreds and three-year-old Warmbloods may not race before June 1st on the flat. Two-year-olds must compete in their own age group until September 1st. Only competitors aged four years and over may enter a flat race on snow. Winter hurdle races (on snow) are reserved for horses at least five years old. The distance is also limited according to age, for example on the flat: 1,900 metres at two years old, 3,000 metres at three years old and 4,000 metres at five years old. There are no restrictions on the number of starts per year in harness or Thoroughbred racing.

Field or station tests are reserved in principle for three-year-olds (Franches-Montagnes, Haflingers, Warmbloods in sport). The judges score natural ability and temperament (Figure 101), not high-level performance that would result from extensive training. In general, horses only participate in one test. However, these tests are not performed at a level that poses a risk to the health or welfare of the candidates. Rather, there is a fear that the intensity and duration of effort required by the less gifted horses, particularly during their training, can be detrimental if the breeder does not pay attention to this issue. The horses may be subjected to unjustified strains that lead to physical and mental overexertion if their training is based on constant negative reinforcement or even punishment.

Pre-selection

Figure 101 Ground work with a three-year-old Franches-Montagnes stallion during the station test including heart rate measurement stress monitoring (Photo: Swiss National Stud)

There are no institutions that register equestrian leisure activities or the reasons for early exit from the equestrian industry. There is also no possibility to trace horses before they are entered in a register. To the Authors' knowledge no survey has analysed losses before the start of a career. However, it is known that a certain number of foals disappear permanently, because they do not meet the desired conditions (morphology, temperament, illnesses, accidents). In breeds used for equestrian leisure, many foals are sold before breaking-in and their new owners often do not subject them to a thorough selection process. In contrast, all racehorses (in principle) are intended to be trained for horseracing.

In addition, breeders export several promising young horses to be competitive, as international trade can be quite lucrative. The Swiss equine market is constantly fluctuating, but the sources (HNS, 2017) only provide global figures of transfers abroad without age or breed. A detailed study on losses (of good stock) in all disciplines would exceed the aims of this report.

Young Thoroughbreds that do not go into training

Some publications provide information on young Thoroughbreds that do not begin training at the age of two to three years (Flash et al., 2020a, 2020b). The most common reasons for foals not being trained are illness, injury, loss during early life and career change. In Australia, 66% of the 13,677 foals born in 2014 were started before the age of four. 5% were exported and 28% were never trained: 6% died before the age of one and at least 7% were trained in another discipline. The authors cite a study in the UK that indicates that 6% of foals die within the first two years of life and another in Australia which states that 7% die before weaning.

6.7.1.7 Synthesis of knowledge and answers to questions

At this point, the questions posed at the beginning of the chapter will be reviewed[377]:

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[377] 6.7.1.2 Answers can be found in scientific knowledge, p. 262

- Can maturity level be a relevant criterion to help define a minimum age for young equine athletes to start training where their physical and psychological needs are being respected?
- When and to what extent does early exercise cause health problems and undue strain?

Several scientific publications[378] provide the principles for responding to these questions and serve the objective of outlining ways to better protect the dignity and welfare of equids. However, each equid will be considered as an individual. For these issues, it would be inappropriate to apply a concept (age, maturity, discipline) to all breeds and their individual representatives, without differentiating between miniature ponies and the heaviest draft horses. Thus, each case will be subject to a detailed weighing of interests.

6.7.1.7.1 The question of the maturity level

Those opposed to early training of young horses are very vague about the ideal time to start using them (in the broadest sense) in a way that respects their welfare. Many take the ossification process and growth as a criterion of maturity. This is why some suggest five to six years old to start their training.

The horse does not reach maturity late in life

Maturity is not only characterised by the completion of skeletal development. The process includes the structures and functions of several other body systems (cardiovascular, respiratory, immunological, hormonal and nervous), as well as the development of temperament. The different tissues that make up the various parts of the animal grow asynchronously. Furthermore, the asymptotic shape (Figure 91, p. 251) of the growth rate curve makes it impossible to determine the exact moment when it ends.

The domesticated horse does not reach physical, behavioural and social maturity before the age of five or six years. By cross-species comparison of physiology, human athletes would reach this stage at around 25 years of age (Johnson et al., 2009, cited in Stein, 2020), when many athletes have already completed their careers.

A young horse must be able to develop its own behavioural profile

In each equid, temperamental development proves to be constitutive of its own individuality. Thanks to its cognitive faculties and the gradual learning process, it knows good experiences (positive emotions), for example in interactions with humans and other animals. These enrich an equid's behavioural profile within the framework of the genetic suitcase inherited from its parents. In short, the animal must be able to perfect its adaptive capacities by responding to the stimuli of a variable environment. This living environment is characterised by the presence of other living beings, a particular stabling system (food, infrastructure, geography, climate) and daily activities that are as extensive and diverse as possible. More specifically, the relationships with humans as well as the types of training and reinforcement (positive, negative) strengthen its cognitive faculties and motivation. Equids with the greatest capacity for learning and understanding of the environment are more successful during their initial training. Early training also develops step-by-step neuromuscular coordination and the acquisition of sport-specific skills[379] and completion of dressage training is expected to take at least two years for many disciplines. Young horses show better results than older horses[380].

The risks of starting a horse late

Equine abilities increase with age from day one, but some may diminish relatively early depending on the breed[381] (Figure 98). They peak at four and a half years of age for Thoroughbreds, at five or six years of age for Trotters and between nine and 11 years of age for show jumpers. Starting racehorses at four or five years of age would therefore be very close to the time when their best ability to race begins to weaken. For example, there is a progressive and significant decline in aerobic capacity and oxygen consumption (VO_{2max}) from the age of four (Walker et al., 2009). Tendon stiffness decreases on average by eight years of age (Addis & Lawson, 2010). There is still a lack of clear knowledge about when different tissues, metabolism, adaptability and cognitive faculties begin to degenerate. However, several authors have described the effects of age and non-use of horses (literature review in McKeever & Lehnard, 2014).

It is therefore reasonable to ask whether significantly delaying education and training in young horses results in equids beginning training in a zone where their learning capacities and memorisation of movements are no longer at their peak. Their development could have started several years earlier. As a result, the horse could be put under undue strain to achieve a good result. Longer and more intensive training can cause physical and mental overexertion. This can have a negative impact on the animal's welfare and increase the risk of premature retirement. Moreover, by waiting until a later age the opportunity to identify health problems at an early stage, including sub-clinical and pre-existing musculoskeletal conditions, is lost. Indeed, these issues often only become apparent under exertion. Consequently, the decision to train an animal that has been out to pasture for several years and is gradually losing its physical abilities is problematic in terms of breeding strategy (sustainable health) and ethics.

Conclusion: age is not a sufficiently relevant criterion

In conclusion, age is therefore not a relevant criterion in practice, especially if it is based on the fusion of epiphyses and morphology. On this basis, no consistent statement can be made about when the horse reaches full and decisive maturity to withstand

[378] 6.7.1.3 When does a horse reach an appropriate maturity?, p. 262 until 6.7.1.6 Selection and quality controls are part of the fundamentals of breeding, p. 277

[379] 6.7.1.5.5.3 Neuromuscular adaptation, p. 274

[380] 6.7.1.5.6.1 Development of cognitive skills, p. 275

[381] 6.7.1.6.2 A goal of sustainability, p. 278

exercise without causing injury. The postponement of the age of initial training carries the additional risk of reducing functional longevity. The Authors therefore feel that it is appropriate to address the relationship of training young equids with the state of their health and welfare i.e. the satisfaction of their physical and psychological needs.

6.7.1.7.2 Early exercise in young horses and its effects

A lack of exercise is common and affects adaptive processes

Even under optimal domestic conditions, foals and young equids rarely enjoy the degree of locomotion (time, intensity) that they would experience in the wild or on very large pastures. They are too often kept in individual stalls, in groups with modest turnout areas or in small pastures that do not allow a lot of exercise in total freedom. However, a lack or deprivation of exercise at an early age has a lasting negative impact on the equine musculoskeletal system, particularly the chemical composition of the skeleton, tendons and joint cartilage. Some accumulation of stress and compression promotes their continued and normal growth and prevents injury. Accentuation of these activities (more exercise) accelerates the density and size of their bones and, conversely, a decrease in exercise reduces these qualities.

These adaptive processes are not only intended to counterbalance the effects of exerted forces but above all they contribute to the step-by-step development of an equid's constitution and functionality. They enable young animals to better equip themselves to meet their natural needs in a fluctuating environment. Indeed, during free-range movement in the pasture or during handling (initial and advanced), they are exposed to risks - diseases (infectious, hereditary), accidents and management failures (movement, social contacts, feed rations, human-horse relations) - to which they must adapt. At the same time, their emotional status (depression, fear) and various pathologies reduce their attention span and sensory abilities. In this context, the aspects of resistance, endurance, flexibility, learning, physical conditioning and training play an important role.

In order for the tissues to respond, a minimum intensity must be reached by the muscles, bones and articular cartilage, tendons and ligaments as well as the cardiovascular, respiratory, metabolic and immune systems. Several studies show that early exercise answers this need in a targeted manner. They have also found that neuromuscular adaptation develops motor coordination. In this way, the equine athlete acquires skills, such as dexterity, that will make a positive difference in sport performance and injury prevention.

Finally, to the Authors‘knowledge, there is no publication that disputes the following: confinement and lack of physical exertion slow down the adaptive changes of the organism and reduce resistance to injury. Exercise during early life is therefore a powerful tool for protection against injury. Furthermore, it does not play an etiological role in explaining the occurrence of juvenile osteo-articular diseases (DOD). The Authors agree that movement in young equids offers enormous short- and long-term benefits, both in terms of animal welfare and economics.

Joints may be weakened

To avoid excessive exercise and its undesirable effects, any early training or exercise should be conducted in an optimal balance between exertion and rest. It has been observed that foals can gallop within hours of birth and can support a fairly significant load in the wild just after weaning. For example, physical conditioning according to a controlled protocol (1030 m at a speed of up to 12.5 m/s for five days per week) appears to be possible without resulting in negative impacts on the structure or function of articular cartilage.

Excessive force (beyond the physiological limits of tension or compression) exerted on a joint and the neighbouring epiphyses causes damage. This is because the growth plate is less resistant than the surrounding bone, ligaments and joint capsule. This situation is most commonly observed when a foal has an accident (slip, collision) or when an angular limb deformity at the level of the carpus (carpus valgus) or pre-existing DOD weaken these structures.

6.7.1.7.3 Juvenile osteoarticular diseases appear at birth

DOD, including osteochondrosis, remain the main source of economic losses for the equine industry. These disorders of the musculoskeletal system occur very early in life. The prevalence of these disorders can be very high in foals of sport and racehorse breeds, long before their owners begin training them. The balanced feeding and exercise regime of the broodmare and subsequently the foal are major determining factors in development. These factors are responsible for the health and metabolic development of the future sport horse until 18 months of age. After that, spontaneous recovery from DOD is no longer possible. However, even if certain less clinically relevant lesions can disappear, it is not known which sequelae remain present but asymptomatic. Tissue microdamage can cause problems in their development, affect an equid's abilities, behaviour and, by way of consequence, reduce sports performance and longevity.

In any case, the Authors deem it wrong to rely on the hypothetical natural good health of young horses and to claim that their early use by humans is detrimental to this health. These findings make it necessary to identify health problems as early as possible, particularly DOD. The aim is not only to be able to treat them, if necessary, but also to avoid entering these horses into a breeding programme. Individuals should be selected for breeding that do not have deleterious characteristics for their physical and mental constitution. This method is still the only one that significantly increases the proportion of young horses with the potential to have a long career while remaining in good health.

6.7.1.7.4 Summary and conclusions

Tendons and ligaments are most responsive (modulation) to exercise in the first year of life and bones until two years of age. After the skeleton has matured, training has less of an adaptive effect on these tissues. Instead, remodeling (repair) responds to the need to modify the skeletal architecture under unusual loads. The juvenile period thus appears to be the only open window during which the normal composition and development of the joint system can be favourably influenced. Therefore, the Authors conclude that any means of providing movement to a young horse helps to support the growth of the musculoskeletal system.

6.7.2 Policy and regulatory context

6.7.2.1 Legislation

In Switzerland, animal protection legislation (laws and ordinances) contains general principles but does not specify conditions for the use of animals (CF, 2020). Insofar as its purpose permits, anyone who cares for animals must ensure their welfare (Art. 4, Para. 1, Letter b AniWA). They shall not cause them unjustified pain, suffering or harm, or put them in a state of anxiety or otherwise violate their dignity. These provisions are accompanied by a prohibition on mistreating, neglecting or unnecessarily overworking them (Art. 4, Para. 2 AniWA). As for the Swiss Animal Protection Ordinance, it defines the use of an equid (for production or companionship) as work under saddle, in hand or driving and exercise in a horse walker (Art. 2 Para. 3 Letter o AniWO). It specifies that after weaning and until the age of 30 months or the start of their regular use, equids must be kept in groups in such a way that they have the ability to withdraw or separate themselves from the group (Art. 59, Paras. 4 and 5 AniWO).

6.7.2.2 European legislation

EU legislation does not deal with the use of equids in the various fields of sport or with the age of training or use. It focuses on the five freedoms described in a convention and directive that set out general rules for the protection of animals. However, the main focus is on cattle, pigs, and poultry (EU, 2017, 2020). To the Authors' knowledge, no country has legislated a legal minimum age for beginning training of equids. Most legislators rely on the responsibility of those involved to regulate these issues.

Germany provides an example of the difficulties of implementing specific legislation. In 2019, the Federal Ministry of Food and Agriculture (*BMEL Bundesministerium für Ernährung und Landwirtschaft*) put forward a draft for consultation[382]. It was intended to set the minimum age to begin training horses at 30 months and to only allow them to be kept in individual stalls in exceptional cases. These proposals were immediately challenged. One petition called for a minimum age of three and a half years but did not elaborate on why this was a particularly appropriate time, although it argued that skeletal growth was not complete until six years of age (Fechner, 2019). On the other hand, competitors were opposed to the idea of setting a minimum age limit out of respect for equine welfare and because they consider the obligation to impose group stabling during training not doable (FN, 2019).

Following discussions with stakeholders, the German authorities withdrew their proposal. Pending the findings of the *Horse Watch* project[383] (BMEL, 2022), the current guidelines (BMEL, 2020) set out general principles. They focus on the management of equids from initial training up until the first competitions, equipment and materials, and doping. The persons responsible shall ensure that the equid's physical and psychological condition develops in accordance with their readiness to perform. Work, rest and relaxation sessions should be alternated in a sensible manner. These provisions consider the age of 30 months as the minimum age to begin training. Exceptions may be made to lower the minimum age for the training of racehorses (Thoroughbred and harness Racing) if conditioning for speed is moderate, gentle and appropriate in terms of development and performance required.

6.7.2.3 Good practice codes or guides

In general, no breeding, equestrian or racing federation specifically regulates the training of young horses intended for breeding or competition. However, several federations, in collaboration with public authorities or private associations, publish good practice codes or guides for stabling and using horses. Most of them include recommendations for young horses (BHS, 2017; Collective, 2016; DEFRA, 2009, 2017; IFHA, 2017; MPI, 2018; NFACC, 2013).

Published under the auspices of the EU Platform on Animal Welfare, a 2017 guide to good practice (EU, 2017) encourages equine-friendly methods, including the use of positive reinforcement. However, it notes that training for activities such as riding or driving should not begin until the horse has reached a stage of development where it is capable of performing the required activities without risk of short- or long-term injury or distress. In particular, it notes that no fixed minimum age can be defined for this purpose as it varies not only between and within breeds, but also according to the intensity of training.

6.7.2.4 Regulation of young horses by the various federations

6.7.2.4.1 Breeding

The breeding federations define the conditions (age, duration, number of starts) of the events in their regulations. However, they rarely restrict techniques or aids. In most cases, the events are open to three-year-olds, sometimes four-year-olds[383]. The Swiss Icelandic Horse Association sets the minimum age at five years for under saddle events (IPV CH, 2020). All such events are

[382] This project is no longer available online.

[383] 6.7.1.1 Introduction and premises, p. 260

intended to test the natural abilities of young horses and do not have the classic characteristics of competition such as the distribution of winnings.

6.7.2.4.2 Equestrian sports

Following the example of foreign equestrian federations, the SE sets the minimum age for young horses to participate in competitions at four years of age (FSSE, 2021a, 2021b). It then raises the age to five, six or seven years of age depending on the discipline and level of the competition. In show jumping, the requirements are based on the construction of the course and results during the season. To a very large extent, the SE observes the international regulations. The FEI (Art. 136 of the General Regulations) states that each discipline sets a minimum age for each degree of difficulty. For example in driving and eventing the minimum age is set at five or six years old, six to eight years for dressage, five to eight years for endurance, nine years for show jumping and seven years for vaulting horses. The FEI does not open up events to four-year-olds (FEI, 2022a). In addition, all horses entered in an international competition undergo a veterinary check before FEI regulated events (FEI, 2022c). In contrast, the SE only requires participating horses to be monitored by the judges or a veterinarian when present (FSSE, 2021c).

6.7.2.4.3 Racing

Thoroughbred racing

Galop Suisse allows horses between the ages of two and 15 years to race, restricts the participation of young horses and limits the distance they are allowed to race (Galop Suisse, 2022). The regulations, in accordance with international agreements, take into account the age from birth. From January 1st of their second year of life, young horses are called yearlings, and two-year-olds from January 1st of their third year of life. They are therefore three years old after January 1st of their fourth year of life.

Thoroughbred racehorses may not be entered in flat races until they are two and a half years of age (3rd year), and not before August 1st. For these horses, the distance is limited to 1,900m and they may not race against older horses. The maximum distance of flat races is 3,000m for three-year-olds and 4,000m for four-year-olds and older. Hurdles and steeplechases are run over a slightly longer distance but are still closed to two-year-olds. AQPS horses (horses other than Thoroughbreds, French term to denote other breeds used in racing) can only start at the age of three, and not before June 1st. Racing on snow is only open to horses aged four years and over. Furthermore, a horse may not start if it has run within the previous two days.

Harness racing

Suisse Trot allows horses between the ages of two and 15 years to race. This organisation defines the age as per Galop Suisse (Suisse Trot, 2022). Two-year-old horses may only race from August 1st onwards and only with horses in the same age group. Each horse may only be placed on a training list at the earliest age of 24 months. For trotting races, the distance can vary between 1,600m and 4,100m. Two-year-olds may not run farther than 2,400m.

To avoid overexertion and to ensure fairness in the races, some horses may be given a 25m lead at the start of the race. This advantage is granted if horses five years of age or older start with higher winnings. In addition, the allocation of starting positions is based on total winnings. The race stewards may therefore position the fastest horses (higher total winnings) 50m behind the rest of the field at the start.

The veterinary service

In Switzerland, the FSC regulates the veterinary services (FSC, 2018). This includes emergency services (tarpaulins, veterinary ambulance), doping controls, as well as the mandatory fitness examination of all horses before the start, the detection of health problems after the race and the keeping of the veterinary logbook.

6.7.3 Stakeholder interests and areas of conflict

6.7.3.1 The interests of horses and equine welfare communities

People and communities concerned with the dignity and welfare of young horses ensure that the required exertion during training and competition or racing, as well as the change in stabling conditions (from pasture to individual stalls) do not exceed their cognitive and adaptive capacity. Those in charge of equine care and training know the importance of a rhythm adjusted to their physical condition and an appropriate speed of learning in order to avoid overwork and the risk of premature wear and tear. They reject the use of punishment and emphasise methods that promote positive reinforcement and habituation, short sessions and the development of a harmonious relationship between human and animal. They also look for horses that show those early qualities that prevent future over-stressing and place importance on the further development of trainers.

Furthermore, Article 59(5) of the AniWO[384] has practical consequences, particularly for young equids housed in pairs in a single stall and turnout after weaning (OSAV, 2018). As soon as the animal reaches the age where training begins, the owner transfers it to a specialised training stable. Here, equids are almost always housed in individual box stalls - the vast majority of these stables do not have the infrastructure to board multiple equids together. Regular pasture turnout in groups is therefore required, which is rare. However, it would be beneficial to at least stable them in pairs in a group stall, especially if they remain with their breeder or if they have long periods of turnout with a conspecific.

[384] 6.7.2.1 Legislation, p. 283

6.7.3.2 Breeders

Breeders and breeding organisations seek to discover the potential of young stock as early as possible and to publicly promote their results. They are motivated by zootechnical rules (estimation of breeding values, speed of selection success) and economic imperatives. The most perceptive breeders count on progress from each generation and know in this respect the advantage of breeding only precocious horses. Indeed, those who show natural dispositions early on - without trainers having to resort to excessive strain that is usually detrimental to welfare and costly in terms of resources - transmit this predisposition to their off-spring. Their market value is then higher, as customers are particularly interested in healthy animals that provide the desired results. In other words, young horse events allow breeders to select those horses that have the qualities desired for a breeding career (stallions in particular) and plan the next stages of training according to obtained results. On the other hand, they also have to train the horses with less natural aptitude. This requires more time and intensive training, which can be detrimental to the physical and mental health of these horses. The easier training of young horses compared to adults can also lead the owner of a less talented horse to neglect its welfare. This may include overtaxing the horse during training, inflicting long periods of work and pain, administering chemical substances (sedatives) or using coercive aids. Thus, the financial interest (breeder, dealer, owner, trainer) is opposed to the horse's interest in receiving quality training at an adequate pace, but which generates costs. In order to respect the dignity of the horse, the conflict therefore lies above all between investments made in order to obtain immediate effects and those made to ensure long-term welfare.

In addition, when breeders cultivate expertise and social interactions at public events this contributes to the reputation of a breed.

6.7.3.3 Economic interests

On the international scale, the racing industry (stallion and broodmare selection, the breeding market, yearling auctions, stake races) is built on a programme of events open to horses aged two years and over. The economic impact of this sector internationally is gigantic. In Europe alone, there are 300,000 jobs, €35 billion in betting on the 80,000 races annually (€12.9 billion in Great Britain and €9.5 billion in France), €1.6 billion paid in taxes to the states and six million hectares cultivated for forage production (EPMA, 2009). These considerable figures sometimes play a dominant role in the weighing of interests and lead to early develop-ment of equids at all costs.

6.7.3.4 Areas of conflict

In equestrian sports and racing, human and equine athletes are engaged together in highly competitive situations. The risk of pushing their abilities beyond their limits is very high. Decisions made regarding the protection of their health (both equine and human) are not always ethically sound. For example, in the case of very serious injuries (fractures, tendon ruptures), the measures taken to treat them are less extreme for animals than for humans. In order not to impose unjustified strains[385, 386] on horses through treatment (pain, aches, harm, excessive instrumentalisation), euthanasia is sometimes unavoidable. This is due to the different value placed on animal and human lives[387].

Intuitively, humans tend to favour visible and immediate effects. Take for example the case of a young horse that shows pain (lameness) during its initial training. A simple and spontaneous approach would be to associate this musculoskeletal problem with the exertion required under these circumstances. The challenge is to look at the situation objectively and not to misunderstand cause and effect. It would be a mistake to conclude that the abolition or restriction of movement would eliminate the reason for the lameness[388]. In fact, lameness may be a clinical sign of a pre-existing juvenile osteoarthritis lesion. The ethical question should therefore be how to prevent horses with an unknown previous health status from subsequently manifesting musculoskeletal dis-orders during early training.

6.7.4 Alternatives that achieve the same results with less strain

At present, there is no alternative to early selection of horses to identify those suitable for a future sporting career. Advances in genomics could eventually be used for similar purposes. In addition, scientific studies will still be needed to provide answers to several unknown factors.

The idea of postponing the age of initial training, an attractive solution at first sight, does not bring the expected benefits. On the contrary, it prevents the physical and mental constitution from being strengthened at the most favourable time of development, reduces functional longevity and may involve strains of its own. Even if some points remain to be understood, scientific studies to date show that early and well-managed exercise of a young horse does not damage its health or prove to be unjustified effort. In order for it to be effective and durable, early training must meet three requirements to provide significant welfare benefits: 1. a preliminary examination to ensure that the foal is free of disease, even if asymptomatic 2. adequate measures are taken to guarantee that living conditions and opportunities are available to satisfy the equids natural needs; 3. the training programme is progressive and favours the adaptation, development and monitoring of physical and mental capacities.

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[385] 2.2 Dignity, p. 20

[386] 2.3 Strain, p. 20

[387] 5.11 The end of life of horses: euthanasia or retirement?, p. 212

[388] 6.7.1.4 Developmental Orthopedic Diseases (DOD), p. 264

6.7.4.1 Continuing scientific studies

Necessary scientific studies include research to increase knowledge of bone regulation (epiphyseal fusion, dimensions, metabolism) during growth and the possibilities of early detection (radiography, biomarkers). This knowledge would make it possible to identify those critical moments that prepare the developing skeleton to sustain load or, conversely, that put it at risk (Moshage et al., 2020). For ethical and cost reasons, this research cannot experimentally subject young horses to intense exertion with high risks of fracture in Thoroughbreds. Therefore, mathematical models must be used to better understand these complex processes. One example already shows (Hitchens et al., 2018) that it takes at least 16 weeks of training for the skeleton of a beginner to adapt to racing speeds. Furthermore, advances in genomics also offer hope for the development of screening techniques for hereditary traits favourable to physical resistance and longevity that may also justify certain ethical approaches in the future (Campbell & McNamee, 2020).

6.7.4.2 A training period should be followed by a rest phase

Trainers and persons responsible can minimise risks. Appropriate exercises improve the structural properties of the skeleton. Introduced at the beginning of growth or early training, such exercises appear to be the most effective approach to reducing the incidence of stress fractures, one of the major categories of bone damage affecting equine athletes (Firth EC, 2006).

In practice, more time needs to be taken in training in order to slowly increase speed and avoid damage to a musculoskeletal system that is not yet sufficiently adapted. On the other hand, importance should also be given to the fairly rapid loss of bone density after a break in training. Even a relatively short rest of 10 days results in a high porosity of subchondral bone and makes it fragile. The bony loss can be up to 10% in areas that are subjected to high load during galloping. Horses become prone to injury if high speed exercise is rushed back. This is why horses returning to training after a period of rest need time at lower levels of speed and intensity for the cortical bone density to increase again. Increasing the number of days worked at a slow pace may be more effective in preventing health problems than allowing them to rest completely (Crawford et al., 2020, 2021a, 2021b).

It is expected that careful preparation requires 20 days of training without high-speed exertion to replace the bone degradation resulting from a complete break in training. However, it remains difficult to make practical and detailed recommendations on the appropriate extent of training and recovery periods for each horse. The researchers have not yet clarified how quickly and to what extent equine skeletons adapt in response to forces of widely varying types, duration and frequency. There are also large individual variations in the resting response of the subchondral bone that cannot be explained by the nature of the previous training, age, sex or the type of rest provided (Carrier et al., 1998; Verheyen et al., 2006). The genetic make-up of the horse, prior health status of the musculoskeletal system, the amount of exercise each animal receives at pasture or controlled exercise before training begins and administered medications are all factors that influence osseous modeling and remodeling.

In conclusion, caution should be exercised in limiting the training phases to 18 weeks followed by a two-month break twice a year for two- and three-year-olds.

6.7.5 Results of the balancing of interests and justification of strain

Determining the age to initiate training based on the fusion of epiphyses and bone morphology is not a sufficiently relevant criterion. It does not characterise the right moment at which young horses can withstand increased exercise without causing injury. Numerous scientific publications show that the first disorders of the musculoskeletal system (osteochondrosis, OCD, congenital tendon contracture, defective morphology) occur very early, from birth, well before the musculoskeletal system is actually put under any strain. Studies also show that heredity determines the predisposition to DOD and that stabling conditions, mainly the lack of movement and unbalanced, energy-rich rations favour the appearance of orthopaedic pathologies.

The tension and compression of the growth plates during movement is essential for the continuous and normal development of the musculoskeletal system. Conversely, lack of activity inhibits these processes. Bones, joints and tendons respond to the mechanical stimuli of stress during exercise and training. These tissues respond by increasing neuromotor control and resistance to injury, which provides them with critical skills for future performance, including fitness. In addition, experience supports cognitive development. Ethologists show a negative correlation between advancing age and learning ability. Thus, young horses deliver, on average, better results than older horses. Moreover, the earlier they start competing, the longer their careers.

The exercise of young equids is justified insofar as it is carried out in a measured way and adapted to the individual needs of the equid and of the discipline. This takes into account the alternatives presented above[389]. The focus should be on sustainable outcomes (welfare protection, the development of the horse and functional longevity) and not short-term goals (immediate return on investment). Early physical preparation must consider whether foals that are turned out to pasture actually benefit from additional training. The latter is detrimental to foals kept in individual stalls without access to turnout areas. This highlights the importance of providing young horses with incentives for continuous movement in adequate facilities (group and pasture boarding), as well as complementary exercise (König von Borstel, 2018).

The self-worth (dignity) of young horses must not be compromised during breaking-in and subsequent training. To justify the strains, trainers should examine all possibilities to optimise the behavioural and physical development of the horse until it reaches

[389] 6.7.4 Alternatives that achieve the same results with less strain, p. 286

six years of age. Enriching their environment and social contact is undoubtedly the most appropriate way to foster positive emotions and experiences. This will have a beneficial effect on the performance of young horses and on their interactions with humans.

However, as part of a broader approach, this requires buy-in and understanding from trainers, owners and their organisations. This includes all stakeholders increasing their knowledge about learning methods, being able to evaluate behavioural profiles, and the state of welfare of an animal as well as the physical and psychological capacity of horses during this crucial phase of their lives (Rogers et al., 2012a).

More precisely, the potential effort (performance) that can be asked of an equid depends on several genetic, epigenetic and environmental variables such as adaptability, resistance, training, temperament, nutrition and the rider's aptitude. There is a fair amount scientific knowledge on this subject (Chavatte-Palmer et al., 2017; Hausberger et al., 2019), but some points still need to be detailed:

- To characterise the importance of physical and mental fitness during early exercise, including the links between cognitive abilities and positive emotions
- To clarify the relationship between resistance to injury and the increase in bone density of those bones subjected to exercise, in particular the characterisation of the adaptive processes to biomechanical loads
- To deepen knowledge of hereditary and epigenetic factors and their impact on metabolism and musculoskeletal health
- To develop the means to detect and prevent metabolic disorders of the musculoskeletal system (using diagnostic imaging, biomarkers, genomics).

6.7.5.1 Initial and further training

A recent literature review (Logan & Nielsen, 2021) assessed scientific epidemiological studies and the impact of training and racing on the bone structure, articular cartilage and tendons of two-year-olds. In summary, two-year-old horses are no more at risk of injury than older horses. Those who start at this age have greater success and longer sporting careers. Exercise of a dynamic nature over moderate distances, such as access to pasture or controlled sprints, is then shown to be beneficial for musculoskeletal development and prevention of injury during racehorse training. The tissues are better adapted to this type of exertion. Many studies also show that confinement is detrimental to normal growth. The literature supports training and racing for two-years-olds but advises caution in the use of drugs to alleviate pain (especially corticosteroids), as this put horses at greater risk of injury.

Based on the current state of knowledge, the initial training and education of young horses will have to meet several conditions to be justified:

- Diverse activities in early and subsequent training and environmental enrichment for young horses. For example, opportunities for pasture turnout and exercise in groups should be provided to encourage close social contact and satisfy the need to explore during outdoor exercise
- Consider that a high degree of specialisation in sport and training exercises increases the risk of injury and physical and mental overtraining
- Monitor the duration, intensity and strain of training sessions in young horses to prevent their physiological and cognitive abilities and adaptive capacities from being exceeded. Reduce these factors (duration, intensity and strain) to the optimal minimum
- Take the basic needs and temperament of young horses at each stage of their training into account so that each horse can express its athletic potential.

Most establishments involved in the breaking-in and training of equids for equestrian sport and racing do not have group stabling set up on their farms. Conversion requires considerable resources or is often impossible. The majority of young horses over 30 months of age are therefore stabled in individual box stalls. This boarding system meets the legal requirements. However, several equestrian stables have stalls that could be modified to stable at least one pair of horses in a single stall. This solution would not comply with the law unless it also has modifications in place to allow the horses to avoid each other or to withdraw (Art. 59, Para. 5 AniWO).

6.7.5.2 Breeding events

Breeding events including inspections, field tests and approvals, are justified, in particular, because they increase the possibility of early identification of characteristics that have a long-term effect on the conditions of life and use of the equid. Joint disorders can develop from birth, become permanent after weaning, and occur particularly in two- and three-year-olds. Their physical constitution is not sufficient. On the other hand, a majority of them have adequate skills and mental constitution. The selection of the best young horses for a wide range of equestrian uses (leisure, sport, competition) is not detrimental to their welfare and respects their dignity if the effort required by the equids meets several requirements:

- The change from group boarding to individual stabling at the beginning of training is made carefully and in a manner that is adapted to the young horse's psychological state. The new stabling conditions allow the horse to benefit from daily exercise and movement in a group, as well as daily social contact with other horses

- The persons responsible for training organise a veterinary examination before commencing training. In the case of health issues, including musculoskeletal, training will not be initiated until the horse is healed, or the horse should be started later and trained in a less demanding discipline
- All horses with sufficient health should be subject to regular and documented longitudinal monitoring during training. Early signs of musculoskeletal overload, low body mass index and behavioural changes require further investigation
- Event and competition organisers should subject all participants to a veterinary pre-examination before they are allowed to start and monitor them during the event
- A minimum age is set for participation in competitions: 30 months for racehorses and 36 months for other disciplines
- To avoid undue strain on equine health and ensure that they are not forced to exert themselves unjustifiably during convalescence, doping and medication controls need to be set up during competitions and if possible during training
- The level of physical and mental demands is adjusted to the age and level of training that can legitimately be expected of young equids. The measures are aimed to satisfy several points: 1. The event does not compromise the development of a young equid's future career 2. It offers less talented equids the opportunity to show their current abilities without undue strain 3. The judges will eliminate those who are obviously overtaxed
- A regulation limits the number of annual competition starts per year and the necessary time interval between them. The breaks will allow young horses to recover, i.e. to promote anabolism, which balances and restores the catabolic effects of exercise
- Current scientific research has not developed a solution to significantly increase the chance of survival after a very serious injury. Therefore, steps need to be taken to reduce the risk of injury. These include, in particular, monitoring injuries and treatment and an assessment of risks: nature of the terrain, course length, duration, frequency of participation, rest period, stakeholder education, and good practice guidelines

In the end, successful prevention relies first on the awareness and training of breeders as well as of trainers, who are the only ones able to spot the subtle signs of biomechanical failure before and during exercise. For their part, veterinarians have the ability to use modern technology wisely and diligently to detect problems. Their job is to encourage clients to take measures to support the sustainability of a horse's career.

6.7.6 Recommendations for implementation

Legislative or enforcement authorities need to consider whether to include monitoring obligations or the regular publication of reports. They are also considering the possibility of approving, under certain conditions, the stabling of young horses over 30 months of age in a single-compartment group stalls to avoid the more restrictive situation of keeping them in individual stalls (the most common stabling system in professional establishments).

The equestrian sports and racing federations should develop a holistic approach to the health of young horses undergoing early exercise with the aim of reducing the risk and number of musculoskeletal injuries and the negative effects of inappropriate training, thereby improving equine welfare and longevity.

On the basis of current scientific knowledge, alternatives[390]and the weighing of interests[391], several recommendations are addressed to the federations:

- To examine the possibilities of a proactive integration of the various stakeholders in health, ethology and genetics in key processes:
    a. Increase the skill sets of breeders, trainers, owners, responsible parties in federations, event organisers, health professionals and scientists in relation to the topics covered in this chapter
    b. The development of measures for the improvement of equine welfare and respect for their self-worth (dignity)
    c. Training and education of young horses (living and working conditions, provision of rest periods)
    d. Development of research projects (genetics and genomics of hereditary diseases, juvenile musculoskeletal pathologies and longevity)
- Encourage breeding federations to monitor the results of measures taken in their programmes to reduce the prevalence and incidence of hereditary or genetically predisposed defects, in particular DOD
- To reflect, if possible jointly, and define both the level of performance as well as the frequency of entries of young horses in the various disciplines
- Breeding and sport federations and event organisers should examine their regulations in the light of the above conditions and revise them where there are shortcomings
- Where this is not already the case, distinctive events for young horses should be set up with levels of difficulty adapted to the age of the participants
- A minimum age should be set at which a horse may participate in the various levels of competition. For this purpose, stakeholders shall take into account the average time required to acquire the essential training for the discipline in question

[390] 6.7.4 Alternatives that achieve the same results with less strain, p. 286

[391] 6.7.5 Results of the balancing of interests and justification of strain, p. 287

- Slow down the notion of ranking horses and the search for economic gain to encourage learning more about the conditions of competition. Springboard races can be organised (e.g. *premie* races in Scandinavia (Todd et al., 2018a) for two-year-olds where each starter receives the same amount of money if they finish[392]) or by improving competitions currently in place
- Take measures (at a minimum) to ensure that horses participating in breeding events are healthy, free of medication and doping products[393] and not being influenced by other auxiliary equipment[394]
- Ensure that breeders, riders, trainers and officials are aware of the importance of the issues discussed in this chapter. In dressage, for example, do not reward a horse that reaches a much higher level than expected for its age with high marks. There is a significant probability that the horse was trained with force to achieve this level at that age. To this end, guides or codes of good practice are available, addressing the specific needs of different disciplines or issues
- Finally, a well-structured monitoring should be set up (system of indicators, objectives, results, deviations, data recording and evaluation) of events during training and competition (health, welfare and dignity), violations and sanctions.

6.7.7 Thematic bibliography

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[392] In Scandinavia, *Premie* races are mainly used as a first stepping stone for trainers and owners to assess the current physical and mental abilities of two-year-old Trotters. They potentially provide an opportunity to prepare the horses for qualifying and better equip them for competition. However, it should be noted that the prize money is not counted as part of a horse's official career earnings.

[393] 5.9 Doping and the medication of sport horses, p. 160

[394] 5.6 Auxiliary equipment and the use of force, p. 126

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6.8 The use of pregnant or nursing mares

6.8.1 Description of the current situation, trends, strains and risks

6.8.1.1 Risks during pregnancy

In breeding, the use of broodmares in foal or with a foal at foot is very frequent for zootechnical reasons. The gestation period for the mare[395] (*Equus caballus*) is about 11 months (345 days on average, varying between 320 and 370 days). Foals are born in the spring and weaned in autumn. Today, broodmares must prove their performance (equestrian sports, racing). It is important to know at what stage (gestation, lactation) and with what intensity broodmares can be used to test their abilities without compromising the health of the mare or of the foetus.

The use of broodmares in foal for sport or recreation is controversial

Broodmares living in complete freedom on pasture remain active throughout pregnancy and show a similar use of space and time to their non-pregnant counterparts (England, 2005). In addition, maintaining good body condition requires exercise to prevent oedema and obesity until parturition (Dascanio & McCue, 2014; Davies Morel, 2008; McKinnon, 2011). However, many observers consider gestation to be a delicate and fragile situation. For them, stress during this period can cause adverse effects on the broodmare and foetus. However, it is difficult to completely call into question moderate and adequate exercise under saddle or being driven, as pregnancy is not a disease.

Moderate exercise does not necessarily harm the pregnancy

The early days of the embryo are perhaps the most precarious. Exercise during heat and in the first seven days after ovulation appears to be detrimental. Early pregnancy losses can be reduced by reducing hyperthermia and social strains of the mares (Malschitzky et al., 2019; Mortensen et al., 2009; Smith et al., 2012). In practice, a break of about 30-40 days after breeding is recommended and then moderate exercise under saddle or in the harness (driving), which should be stopped a few weeks before foaling. In the past, farm work required the use of broodmares carrying heavy loads until the gestation period was well advanced but at relatively slow speeds. Some studies have shown that regular exercise does not significantly affect pregnancy and the foetus (Anton et al., 2014; Lehnhard et al., 2009).

Athletes sometimes misuse gestation

In order to improve the effectiveness of regulatory protection, there is a particular need for interdisciplinary scientific studies on the effects of maternal stress (physiological and psychological) on animal foetal life (Campbell et al., 2014), in contrast to the human species. For example, the inactivity of sedentary pregnant women is shown to be detrimental to the health of their offspring (Nyrnes et al., 2018). The participation of pregnant mares in jumping or dressage events does not appear to be a major problem in the first four months. They are often even more able and willing to perform under the influence of the pregnancy hormone progesterone. This favourable state is abused when some people breed mares and then abort the foetus after a few months or at the end of the competition season.

[395] In the domestic donkey (*Equus asinus*), the gestation period varies between 12 and 13 months.

The strains of a mare in foal increase around the fifth month of gestation

The uterus and foetus descend into the abdominal cavity and their joint mass exerts increasing pressure on the diaphragm after the fifth month of gestation. This strain gradually reduces the capacity of the respiratory and cardiovascular organs. It can reduce the oxygenation of the musculoskeletal system and cause increased physical and psychological fatigue in the broodmare. This appears between the seventh and ninth months, depending on the strength and tone of the abdominal wall. At this stage, the mare is no longer able to perform the usual sporting activities. This condition is easily recognised by the rider or driver by observing the behaviour, breathing frequency and signs of weakness. It is important to then adjust the effort required. However, correct adaptation remains difficult, if not impossible, during competition, especially towards the end of the gestational term. The risk of exhaustion, injuries, falls and gestational problems increases. In addition, complications such as abdominal hernia or uterine torsion can occur. There is also the danger of abortion caused by viral infections (herpes, viral arteritis) contracted during the numerous contacts with other horses on the show grounds.

6.8.1.2 Risks for the mare-foal dyad

Reasons for and consequences of a temporary separation

The owner can separate the mare from her foal for a shorter or longer period of time due to a number of reasons: breeding events, training, sporting event, care, examinations or breeding. The risks described above[396] are additional if the mare is already in foal again. The temporary severance of close social ties is a strain on the broodmare and her foal. The problems and consequences are still poorly assessed in scientific studies (McGee and Smith, 2004; Moons et al., 2005; Waran et al., 2008). However, this topic should not be confused with the weaning process[397].

The artificial separation of mare and foal within the first six months of birth, even if only for a short time, generates a situation that differs in every respect from what is observed in nature. It causes a medium to high level of anxiety and stress. It is manifested by a frightened mare displaying agitation and negative emotion. The foal has similar reactions, but of even greater intensity (vocalisation, defecation, calling, sweating, panic). During the immediate postnatal period (within the first five days) separation causes the highest level of stress. The measurement of catecholamines makes it possible to objectify these signs (Niezgoda & Tischner, 1995). In subsequent isolations (20 and 50 days postpartum), stress responses are weaker, especially in mares.

Some authors argue that human presence can serve as a substitute for conspecifics and reduce the distress of the foal when it is separated from its dam. (Budzyńska & Krupa, 2012; Górecka et al., 2007; McGee and Smith, 2004). The presence of humans would theoretically facilitate habituation to a new situation, enrich its environment with an unfamiliar subject and limit signs of distress and the likelihood of injury. However, to the contrary, one study shows that the exposure of young, naïve horses to social distancing did not reduce stress responses (Hartmann et al., 2011). This method also appeared to result in increased sensitivity to permanent weaning and therefore does not offer a practical and effective solution (Moons et al., 2005).

Discussions focus on the legitimacy and justification of temporary restraint

The strain of separation is not only psychological, but also physical, including nutrition. After 30 days, the milk production of a 600 kg broodmare reaches 16 kg per day, then rises to a maximum of 20 kg in the third month before dropping to a low level after about 150 days. The mare should be fed rations adapted to these needs. The temporary separation of the mare from her foal can be dangerous. If the udder is not emptied regularly (through nursing or milking), it dilates. Heat, pain and spontaneously ejected milk can be observed. These signs may indicate an infection (mastitis). In the event of additional physical strain (training, sports event, transport), the mare may be overexerted and the foal can consequently suffer from malnutrition due to insufficient nutrient intake (fewer feedings, less nourishing milk). It is also regularly observed that situations of uncontrollable stress in the mare and foal are linked to an increased risk of injury and accidents depending on the location (stable, vehicle). This traumatic situation can act as a trigger for behavioural disorders in the animals concerned, especially if they are predisposed.

6.8.2 Policy and regulatory context

The legislation on animal protection (AniWA, AniWO) does not explicitly regulate the use of mares in foal or lactating (CF, 2020). Its basic principles apply, in particular the principle that all persons dealing with animals must ensure their welfare insofar as the purpose of their use permits (Art. 4, Para. 1, Letter b AniWA). In addition, they must not unjustifiably cause them pain, suffering or harm, put them in a state of anxiety or otherwise violate their dignity. It prohibits the mistreatment, neglect or overexertion of animals unnecessarily (Art. 4, Para. 2 AniWA).

For all other situations, the national and international regulations of the breeding, equestrian sport and racing organisations apply. They set out the periods during which they do not allow the participation of mares in foal or with a foal at foot.

6.8.2.1 Breeding

To the Authors' knowledge, no breeding federation publishes specific provisions on the occasional separation of mare and foal at events. For breeding events in Switzerland, the judges check whether the animals are overexerted and, if necessary, exclude them.

[396] 6.8.1.1 Risks during pregnancy, p. 306

[397] 6.9 Weaning of foals, p. 311

A veterinarian on site can give their recommendation. Sometimes the regulations are very brief (FSFM & FSH, 2019): *"Broodmares and mares with foals may be entered. However, care must be taken to ensure the health and welfare of the horses."*

6.8.2.2 Equestrian sports

The FEI regulates the question of mares in foal or nursing mares in the same paragraph (Art. 2, Letter e) of its code of conduct (FEI, 2013). It deals with the physical condition necessary for participation in sporting events (*Fitness to compete*). The FEI excludes mares during the entire *foal at foot* period or after four months gestation. This code is also included in the FEI Veterinary Regulations (FEI, 2022). In principle, most of the affiliated national organisations follow these guidelines.

The SE also deals with these subjects but differs from the FEI. Annex I (Code of Conduct for the Welfare of Horses) of the SE Veterinary Regulations RVet (FSSE, 2021a, 2021b) refers to the FEI Code of Conduct. However, the SE allows pregnant or nursing mares to compete for a longer period of time. They are only excluded from competition in the first three months after foaling and from the seventh month of gestation.

6.8.2.3 Racing

In comparison with equestrian sports, racing offers greater protection to mares in foal or nursing.

6.8.2.3.1 Thoroughbred racing

The IFHA considers the participation of pregnant or nursing mares as a prohibited practice (IFHA, 2021), but delegates the definition of the time limits to the authorities in each country. In Switzerland, owners must wait at least six months after a mare has given birth to a live foal before the mare can run again. In the case of an abortion or a stillbirth after four months of gestation, the mare can run after three months of the pregnancy loss at the earliest. A pregnant mare may run up to a maximum of four months after the last cover (Galopp Schweiz, 2021).

6.8.2.3.2 Harness racing

Article 10 of the International Agreement (UET, 2021) provides that no mare may take part in a race beyond 120 days after the last date of service. She may continue to compete if she is declared to not be in foal. No mare may compete within 150 days of the birth of a live foal. In case of abortion or stillbirth after 120 days of gestation, a mare may be allowed to compete after at least 90 days. In Switzerland, the Suisse Trot organisation has adopted all these regulations (Suisse Trot, 2022).

6.8.3 Stakeholder interests and areas of conflict

The interest of mares and foals

Physical and mental overexertion should be avoided in order to maintain the welfare and dignity of pregnant mares, embryos, foetuses and foals. In addition to the risks of exhaustion, the animal protection community sees a risk of excessive instrumentalisation of gestation and broodmares for purely economic purposes or to satisfy personal objectives. However, these stakeholders struggle to set a limit for each individual to define what is acceptable or excessive. In addition, they oppose the use of nursing mares for leisure or competitive purposes, especially because of the temporary separation that is detrimental to both the broodmare and foal. They argue that this practice imposes excessive and unnecessary psychological and physical strain on the equids concerned. These circles, like the insurance companies, also seek to minimise or eliminate the risks of injury, disease, infection and abortion. They also consider the consequences of the foal's short-term separation from the mare when she is transported to the breeding station.

Interested parties

These topics concern breeders, riders, drivers, owners, enforcement authorities, and insurance companies (for equids or humans). More specifically, broodmare owners support zootechnical considerations. Indeed, the performance of the dams and sires serve as an early basis for planning breeding pairings and reduces the intervals between generations, improving the success of the selection. Very good results also allow their offspring to be entered in a very valuable category of the studbook.

Some breeders have strongly opposed the SE's proposal to prohibit competing with mares in foal after the end of the fourth month of gestation. They want to preserve zootechnical advantages. Others, however, want to put animal welfare before commercial values and, from an ethical point of view, cannot defend the exertion required in competition from five months of gestation (Nido, 2013).

The owners of racehorses are less concerned than breeders of other breeds (leisure, equestrian sports). In this sector, fillies with mediocre racing results (earnings, wins, level and type of events) are generally not suitable for breeding. If a mare is extraordinary (e.g. successful in group races), her career as a broodmare begins immediately after she has retired from racing. The traditional value of prioritising performance and then breeding only successful bloodstock is still very much alive in the racing industry. The participation of a pregnant or nursing mare is still on the list of prohibited practices. The racing authorities treat it as a violation of the sporting and stakes integrity rules of horse racing. In addition, they consider that pregnancy, parturition or any event during these phases may alter physical and psychological condition of the mare. These conditions would then reduce or improve a competitor's chances against other horses. Organisers and bettors are therefore very motivated to take precautions against this kind of bias.

The owners (horse owners, those active in sport or breeding) have several objectives. Some well recognised objectives are the start of a competition, the selection of horses for skill and health, training, leisure, work (agriculture, forestry, riding school) or tasks such as live cover, insemination, care or transport. Stakeholders are looking for an optimal solution and possibly added value (trade, zootechnical value). Some are motivated by personal ambition (participation in an event, race or competition). In the opinion of these stakeholders, several cases make the separation of the mare-foal dyad indispensable. To limit the risk of accidents as much as possible, the owner or person responsible of a nursing mare generally restricts the foal's freedom of movement during a period of separation, leaving it in its stall or in the transport vehicle, sometimes tied up. The only interests defended in this situation are those mentioned above, in particular the advantage of simplifying handling to enhance the mare's value and save time. In addition, everyone benefits, consciously or not, from the suppression of sexual behaviour and the mare's subsequent increase in willingness and ability to exert herself.

Conclusions

In short, the conflicts are between the defence of traditional and economic values and the interests of the animals concerned, supported by the animal protection community, particularly in the areas of safety and the risk of excessive instrumentalisation.

6.8.3.1 Alternatives that achieve the same results with less strain

The alternatives are to not breed the mare in order to use her intensively (sport, agricultural work), or to have her bred and then wait for her foal to be weaned[398]. If the interest in obtaining offspring from a mare is to be able to use the resulting horse, embryo transfer may, under certain conditions, offer an alternative solution[399].

With the right infrastructure, it is possible to transport the broodmare with her offspring. It is possible to transport them together over short distances and without taking the foal too far away, the mare can be examined, taken to the stallion or inseminated, to mention a few possibilities.

Temporary separation from the foal is less restrictive if they are kept in a harmonious herd of broodmares and foals (Erber et al., 2012; Henry et al., 2012; Waran et al., 2008). This significantly reduces the foal's stress when the dam is briefly absent. This effect is more calming as the foal approaches the age of weaning, as it has developed a certain degree of behavioural autonomy. If short-term separation remains unavoidable, environmental enrichment (other horses, unfamiliar objects) can help calm the foal.

6.8.4 Results of the balancing of interests and justification of strain

According to current knowledge, there is no justification for the use of pregnant mares in competition or for intensive leisure time exercise. The overriding arguments are based on respect for the dignity of the mare, the guarantee of welfare, the risk of overexertion to the mare and her foetus, as well as the reduction in safety for both horses and humans. On the other hand, it is not appropriate to deprive a healthy mare of movement and exercise. Activities should be restricted to moderate exercise necessary to maintain good physical condition as outlined at the beginning of this section[400]. A quiet ride is justified in certain circumstances, taking into account the situation (character of the equids, environment and stabling during the absence of the dam, emergency intervention). Breaking in and careful training of talented young horses for breeding competitions is still possible before the fifth month of gestation as long as there is a break following breeding.

In the months following foaling, the transport and use of a nursing mare without her foal for sporting events or breeding tests as well as for training is not considered to be of primary importance due to the strains and risks imposed on the animals concerned. After an abortion or stillbirth, the resumption of training in broodmares should be planned taking into account the stage at which gestation was termination and the time needed to get the mare back into sufficient shape.

6.8.5 Recommendations for implementation

- Include the subjects of exercising pregnant and nursing mares and the problem of temporary separation of the mare and foal in training courses; raise awareness among participants, including those directly involved in the use of equids
- Sporting and breeding organisations should issue clear and specific rules for the various disciplines that take into account the requirements and potential risks for animals and humans
- Develop and promote transdisciplinary research on the physical and psychological overexertion of broodmares (gestation, nursing, separation) and their foals; develop indicators that can be applied in practice.

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6.9 Weaning of foals

6.9.1 Description of the current situation, trends, strains and risks

6.9.1.1 Weaning under natural conditions

Under natural living conditions (family group, syn. harem), the weaning process occurs spontaneously. It is well documented (Crowell-Davis et al., 1986; Crowell-Davis, 1986; Crowell-Davis & Weeks, 2005; Henry et al., 2018; Waran et al., 2008; Waring, 2003). The bond between the broodmare and her foal is exclusive from the moment of birth. During the first weeks, the foal remains close to the mare and nurses very frequently (up to seven times an hour). In this context, the mare fulfils a central function as a model for the behavioural development of her foal when she interacts with the environment. As the foal ages, it gradually distances itself from its dam, as the volume and nutritional content of mare's milk (fat and protein) decreases. It regularly stops nursing, showing signs of rejection. By nursing less frequently, the foal's dietary diversification is favoured; as the mare's milk becomes less nutritionally rich, the foal slowly moves from a liquid to forage-based (grass, hay) diet. By imitation, the foal learns to graze, which allows for the gradual adaptation of its digestive system, in particular the establishment of a flora necessary for the assimilation of plant forage. In addition, the foal develops social contacts with other foals of its own age (mutual grooming, playing) or with adults (snapping).

Natural weaning does not induce stress in the animals concerned. The mare initiates weaning when the foal reaches the age of about nine to 10 months, or even one year. There are large individual differences. Some authors even report mares that continue to nurse their young for more than a year (cited in Dubcová et al., 2015; Crowell-Davis & Weeks, 2005). In a harem, the ultimate breakdown of the mare-foal bond, including social preference, occurs when the two- to three-year-old equids leave their natal family to join another association (single males, new harem).

The results of French research (Henry et al., 2018) involve 16 mare-foal dyads of the Icelandic Horse breed living in three stable groups in a semi-natural extensive environment consisting of grassland with supplemental hay in winter, permanent salt supply and water available in natural streams or as snow. The study clarified the effect of weaning on dyad interactions. In the two weeks before weaning, the mare and foal spent the majority of their time in close proximity to each other. Within the group, the foal chose its dam as its preferred partner. In turn, the mare expressed a strong liking for her foal. During this pre-weaning period, the mare's agonistic behaviour towards her foal occured less than once an hour, both during and outside of the nursing period. This frequency was maintained. After this phase, there was no change in spatial proximity; both spent the majority of their time in close proximity to each other and their social preference remained stable. Finally, apart from the suppression of nursing, which had completely disappeared, no significant changes in the foal's time budget were observed. Feeding and resting remained the two predominant activities during the two weeks before or after weaning.

In summary, weaning is a natural process that does not trigger a stressful event for either the mare or her foal. It contributes to the emancipation and autonomy, particularly with regard to food, that are essential for the development of young equids until they reach sexual maturity.

6.9.1.2 Early weaning

6.9.1.2.1 The various weaning methods

On domestic horse farms, stable managers oversee the weaning of foals. Weaning on domestic horse farms is almost always done much earlier than in the wild, for a variety of reasons. However, no one seems to be able to give precise reasons as to why[401]. The standard weaning method is well documented from an ethological standpoint. For the foal, it is a traumatic event and is considered one of the most stressful events in its life. The period before and after weaning is a critical time for behavioural development (Foury et al., 2017; Henry et al., 2020; Waran et al., 2008). For this reason, researchers have focused primarily on ways to mitigate negative emotions and identify best practices for animal welfare.

As a general rule, the foal stays with its dam for at least four months, traditionally five to seven. During this phase, the dam serves as a role model through interactions with her environment and humans. While still closely linked to her, the foal gradually emancipates itself and faces nutritional, social and environmental challenges. The cessation of nursing and milk consumption, the disruption of gregarious habits and changes in its living space generate disturbances (Erber et al., 2012; Foury et al., 2017, Waran et al., 2008). For a few days after the final separation, which is usually abrupt, sometimes gradual, the youngster shows typical distress reactions: high-pitched vocalisations, very active locomotion, defecation, escape attempts (in case of confinement), occasionally weight loss. The stress causes an increase in cortisol levels for a short period of time (a few days). Behavioural problems

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can also be observed for a longer period of time: disturbance of feeding and resting habits, aggressiveness, reduced play with fellow animals, redirection of feeding to other animals (foals or adults).

The abrupt method seems to induce more distress in fillies than in colts (Wulf et al., 2018). Paired weaning was shown in some studies to be less distressing than individual weaning (Houpt et al., 1984), but other authors have shown the opposite (literature review in Apter & Householder, 1996). Studies (cited in Beaver, 2019 and Parker et al., 2008) consider this stress as a risk factor for stereotypies or other abnormal traits. They note the occurrence of these problems in animals that are separated overnight, confined or fed a high energy feed (grain, hay substitutes). High carbohydrate rations increase the likelihood of these disorders fourfold. Foals whose dams are low ranking seem to be better protected. In addition, stall confinement just before and after weaning has a negative impact on the behaviour, welfare and learning ability of the foals. In particular, aggression, handling problems, and oral and feeding disorders were observed.

The weaning process is complex, with many variables that are difficult to compare. A few of these variables are separation patterns, feeding practices, stabling conditions and available infrastructure. These are difficult to manage in order to reduce risk and achieve an optimal outcome (Erber et al., 2012; Foury et al., 2017; Lansade et al., 2017, 2018; McCall et al., 1985, 1987; Parker et al., 2008; Waran et al., 2008; Waters et al., 2002).

Compared to abrupt weaning, gradual weaning is spread over several short periods. The broodmares are removed from the herd one after the other, either in groups according to the age of the foals, or at the same time. Thus, either the foals or the dams are housed in a new spatial and social environment. However, studies show that physical separation is the factor that causes the most impact (Merkies et al., 2016). Therefore, to minimise the stress of weaning, practitioners should focus on managing the major parameters:

- The distance between mare and foal allows, hinders or excludes visual, olfactory and acoustic contact
- The stabling, known or new, with or without the presence of other horses of similar or very different ages, or even unrelated mares
- Feed transitions (quantity and quality; roughage, grain).

The application of the variants depends on several socio-economic and local factors. In practice, owners or stable managers use the available infrastructure and animals. Even today, the abrupt method is still the most common (Waran et al., 2008), at least in some regions. However, the stepwise procedure is gaining ground (Williams & Randle, 2016).

To date, several questions regarding the ideal way to wean remain open. Several comparative studies (Erber et al., 2012; Foury et al., 2017; Lansade et al., 2017, 2018; McCall et al., 1985, 1987) highlight the welfare benefits of step-by-step weaning. Foals do not express as many adverse reactions as after abrupt separation. They are less fearful, less gregarious and less active in the three months after weaning. However, they compensate for this difference in the following three months. The type of weaning could also influence the behaviour of the horse as an adult when it is again subjected to stress (Foury et al., 2017). In summary, stress responses appear to be fewer and less intense if two conditions are met during weaning: a <u>gradual approach</u> is taken that allows for <u>social interaction</u> with contemporary or older conspecifics.

Other authors (Moons et al., 2005), however, have not shown any decisive benefit from gradually dissociating the mare-foal dyad. They observe that foals do not become accustomed to the distancing; their distress does not decrease during the procedure. Worse, at the end of weaning they show a higher increase in salivary cortisol than the abruptly weaned controls. Successive separation would therefore constitute a series of unnecessary stresses whose effects may accumulate. These conclusions are debatable, as the study chose a very early weaning protocol. The gradual weaning process began in the second week of life and terminated in the 12th, and therefore did not correspond to the normal practice, which is much later (Lansade et al., 2017).

6.9.1.2.2 The importance of the bond between mare and foal

Mal and McCall (1996) suggested several years ago that foals handled early are at risk of developing a sense of learned helplessness (See above note[156]). They perceive a loss of control over environmental contingencies and subsequently decrease their overall activity level. One team (Henry et al., 2009) highlighted the importance of prolonged mare-foal contact after birth. Specifically, it showed the lasting negative impact of stress caused by a one-hour episode of separation from the mare and neonatal and postnatal handling (imprinting as described by the veterinarian R. Miller in 1991[402]). The study concludes that the disruption during these handlings impacts the development of the foals. Later, the foals show increased dependence on their mothers and impaired social skills (social withdrawal, aggression). These impacts continued until the weaning period at the age of seven months. Even four days after final separation, these foals show high levels of vocalisations and non-nutritive nursing and fewer were engaged in play.

A more recent study (Henry & Hausberger, 2017) explains the importance of individual differences in the relationship between foal and mare from the third month onwards. The observation of these traits provides an excellent opportunity to identify predictive traits of future temperament, including emotionality at weaning and later in adulthood. The authors showed that foals that are easily separated from their dams at three months correspond to adults with low emotionality who tolerate social separation well. They

[402] As a reminder, this practice involves handling foals within 10 minutes of birth, immediately after routine postnatal care (disinfection of the umbilical stump). They are stroked all over their body, exposed to new tactile stimuli (white towel, plastic bag, water jet) and held still in a lying position before they are allowed to stand up.

noted the opposite behaviour in foals that needed to be comforted by maternal contact. These foals were found to display non-nutritive nursing (without swallowing milk), also called comfort nursing. This type of nursing is expressed precisely in anxiety-provoking contexts: a sudden and unusual event, unknown place, or temporary absence of the dam. Furthermore, the authors showed that foals that spend more time nursing or making attempts at four to five months of age are more likely to develop stereotypies later on. Other studies show that considerable stability can be observed from the first week of life in individual differences in behaviour and physiology in response to brief and significant stressors (Pérez-Manrique et al., 2019, 2021).

6.9.1.2.3 The effects of weaning on the dam

The separation of the foal from its dam leads to a series of physiological processes in the broodmare. If care is taken to reduce the grain ration the week before weaning, milk production will cease a few days after weaning. This is because it is no longer stimulated by nursing, which secretes oxytocin responsible for the milk ejection reflex. Surprisingly, there is little data on the behavioural and hormonal effects of weaning on mares. It remains to be seen what procedures might be less worrying and more respectful to the welfare not only of foals, but also dams. It has been observed that most mares settle down more quickly than their offspring, particularly those that have foaled more than once in recent years. The time required for them to return to a normal attitude varies from a few hours to several days.

Only one study (Falomo et al., 2020) shows that artificial weaning is a stressor for broodmares, but the abrupt or gradual method does not significantly influence behavioural or hormonal parameters.

6.9.2 Policy and regulatory context

Animal protection legislation (CF, 2020) does not explicitly address the issue of weaning. As with pregnant and nursing mares the basic principles of the AniWA and the AniWO apply[403]. To the Authors' knowledge, no livestock organisation has published regulations. Some provide a practical guide for farmers (FECH, 2015). On the other hand, the AniWO (Art. 59, Para. 4) requires the stabling of young equids in groups after weaning and until the age of 30 months or the start of regular use.

6.9.3 Stakeholder interests and areas of conflict

6.9.3.1 The interests of the equids concerned

The interests of the animals concerned (the foal and its dam) lie primarily in the possibility of avoiding traumatic experiences due to weaning, including stress to their health and development. Owners and stable managers need to spare them from anxiety, pain, discomfort or harm. Therefore, they must pay particular attention to feeding, condition and behavioural traits to ensure equine welfare and respect for their dignity.

6.9.3.2 The interests of breeders

Several publications describe the practical and economic interests of breeders and the arguments for early weaning by the stable manager (Henry et al., 2018, 2020; Waran et al., 2008). These are based more on tradition and habit, perhaps even preconceived and untested ideas. Clearly, the improvement of welfare required by ethical principles that protect the interests of the animals is often not given a prominent place. However, owners and stable managers are still confronted with contingencies whose importance will be weighed:

- The competence of the person responsible to implement the chosen method of weaning, as well as the amount of time that can be devoted to this period
- The availability of resources and the stabling environment offered
- The number of foals to be weaned, the age, stage of development and temperament of each one
- The intensity of attachment, or conversely emancipation, within each mare-foal dyad
- The ability of each foal to adapt to social and physical changes
- The gynaecological status of each mare with a foal at foot (barren or in foal); the level of milk production, mare health and behaviour
- Weather conditions.

6.9.4 Alternatives that achieve the same results with less strain

6.9.4.1 The fundamental principles

Without deciding at this stage on the exact weaning procedure to be carried out, it should be remembered that the aim is to reduce stress in foals and dams and to favour positive emotions. In addition, the measures taken should prevent the development of behavioural problems. To this end, the environment during the period of weaning should be rich enough to encourage the foals to explore it, to reinforce their curiosity and to keep them occupied. If possible, a familiar living space should be maintained. In this respect, confinement that deprives a foal of interaction with at least one other foal is very detrimental. In all cases, alternatives should be adapted to the circumstances. For example, a owner with only a few horses will not be able to take the same measures

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to wean the offspring of one or two broodmares as a stud farm with a dozen broodmares. More than half of all breeders keep very few broodmares (Deutscher Galopp, 2018; IFCE, 2020; Karwath et al., 2013).

In addition, while natural weaning is certainly the least stressful method, it is generally impossible to keep mares without human intervention. The breeding conditions of traditional breeds in Switzerland and neighbouring countries (sport, leisure, agriculture) do not allow permanent natural or semi-natural boarding conditions. Finally, many breeders had hoped to reduce the stress of weaning by applying pheromones, but these substances do not seem to provide significant effects (Beaver, 2019).

6.9.4.1.1 Ensuring social interaction

To wean one or two foals, the method often proposed is to physically divide each mare-foal pair, but to ensure that each member can continue to nurture social contact with one or more conspecifics. It is essential to avoid the danger of the young equid bonding more with a caretaker than with a representative of the equine species. Therefore, an owner who has only one mare-foal pair should have a pen for the foal and a second pen for the dam. These turnout areas should have solid fencing to separate them. Such an arrangement ensures safety, allows visual, olfactory and acoustic interaction, but prevents nursing. The risk of frustration remains low if the foal has already achieved a sufficient degree of independence to graze. The threat is greater if the foal's behavioural development does not ensure satisfactory independence. The stress factors remain powerful[404]. The breeder should then provide separate, contiguous housing, including fencing allowing social contact. In addition, the breeder should carefully consider the possibilities of improving the living conditions of the foal by giving it the freedom to communicate with an older, known companion. To this end, the breeder should look for an unrelated equid (other than the dam), for example a gelding or a mare that is not in foal.

The solution is easier on large breeding farms with many broodmares. Those in charge will organise weaning in at least two sets of two or three mares depending on when the offspring are born. This method seems to cause less stress in a familiar environment, when the foals can continue to interact with other herd members that remain in the group, but without seeing and hearing their dams.

6.9.4.1.2 Stress factors to avoid

Critics of the progressive weaning method focus on the effects of stress that can accumulate. However, several studies show that foals show fewer signs of distress when the amount of time spent with the dam is gradually reduced. This procedure also offers the foals the advantage of becoming accustomed to new living conditions, but these changes should not occur at the same time. The foals can become accustomed to an unfamiliar stable and setting, the dietary transition (from a largely milk diet to forage) and the use of water troughs and a hay feeder in stages through exploration. Furthermore, this method favours the drying up of milk production when the frequency of nursing decreases providing that the mare's grain ration is drastically reduced.

It is also important not to add additional sources of stress during the weaning process and the following month. Therefore, successive changes of accommodation, transport, handling (other than basic education) and groundwork training should be avoided. If the foal is to transition to a solid diet, the use of grain is discouraged as it may encourage the development of stereotypies. Finally, the foal must be in excellent health to withstand the major disruption of weaning. A vet can advise on the timing of any specific needs such as vaccinations or worming.

Weaning before the age of five to six months of age significantly increases stress levels, as nursing foals are still very dependent on their dam's protection and emotional support. Too early weaning can hinder normal behavioural development. Most often, they have not yet become well accustomed to a solid ration (hay, grass) and the mare's milk production remains quite high.

6.9.4.2 Additional conditions

The person responsible also need to take additional measures, in particular with regard to safety. There needs to be an emphasis on the close supervision of the foals. The weaning procedure presents a risk of accidents when the foal tries to reach its mother by overcoming whatever obstacle separates them. To this end, walls and fences can ensure safety. Metal wire fencing, cords or electric tape are not sufficient.

During weaning, particular attention should be paid to the expression of acute stress that lasts too long: defecation, musculoskeletal activity, neighing, aggression, panic and attempts to escape. Initial signs of overwhelming stress are apathy, withdrawal, indifference to the environment and eating disorders. The most alarming signs are a lack of appetite and the early signs of a developing stereotypy (licking, biting walls or posts, trying to nurse on another horse).

During the period around weaning, the ration should not consist of grain or other energy-dense hay substitutes. A high carbohydrate content increases the likelihood of stereotypies.

6.9.4.3 Preparation of the mare-foal pair for weaning

As shown above, gradual separation helps to reduce milk production in dams and allows the foal to become accustomed to (forage (grass, hay). This provision of solid feed is particularly important for the early weaning of foals (Hoffmann et al., 1995). If possible, the breeder should provide a shelter in part of the pen with covered feeders for the offspring. To prevent the mares from accessing

[404] 6.9.4.1.2 Stress factors to avoid, p. 315

the feed, a barrier should be placed at an adjustable height of 15cm above the withers of the foal. In addition, the device needs to be sturdy enough to withstand repeated attempts by the mares to get through it. There are also feeders on the market with adjustable bars to allow only the nose to pass.

It was also pointed out that the nutrition of pregnant mares can affect testicular and bone development, glucose metabolism and response to overfeeding in foals up to two years of age (Robles et al., 2017). To prevent the development of these disorders[405] and behavioural problems, rations should contain a balanced amount of energy, protein and minerals. Several books deal with these topics (Geor et al., 2013; Juliand & Martin-Rosset, 2005; Lansade et al., 2020; Lawrence, 2004; Pagan & Nash, 2008).

6.9.5 Results of the balancing of interests and justification of strain

The natural weaning system, without any human intervention, may not be suitable for all farms. This should not, however, deter owners from considering this option when conditions allow. On the other hand, it is necessary to avoid abusive practices, especially when the appropriate infrastructure and or practical experience is not available. However, to the Author's knowledge, no controlled weaning method can completely eliminate stressful situations. The negative emotions and strain of the animals concerned can only be justified if the alternative measures described in the previous paragraphs[406] are implemented. In summary, the breeder should take appropriate precautions:

- Facilitate the transition to solid food from the age of five to six months
- Allow the foal to eat on its own without the dam's interference, especially when it is fed grain
- Teach the foal to be attentive to humans at a young age
- Appropriate handling and training, e.g. for breaking in or presenting
- Encourage the simultaneous weaning of several foals on large farms
- Group several autumn weanlings together to go to the winter pasture
- Limit the potential negative impact of prolonged lactation on the subsequent reproductive efficiency of broodmares.

Several procedures remain unjustified:

- Separating a foal from its dam and then isolating it in a stall, even for a day, without regular interaction with at least one other foal
- Weaning a foal if it has not previously become accustomed to drinking water on its own and consuming the roughage to which it will have access
- All weaning procedures are abusive if the foal is not at least five or six months old.

It can also be argued that the development of behavioural problems during and after weaning is a sign of unacceptable mismanagement. For this reason, the person responsible must take care to avoid strain and ensure adequate living conditions and feed rations. Finally, it is also abusive to take advantage of the weaning period to push human interaction with the weanling to the detriment of the social bonds between equids, which are required for normal equine development.

6.9.6 Recommendations for implementation

- To reduce stress and strain breeders should carefully consider the resources available to them and the means to plan the whole weaning process. They should then select the best solution to achieve this
- Breeding organisations should support their members with guides on the various weaning methods and, if necessary, update them regularly.

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Conclusions and perspectives

In recent years, the equine industry has witnessed a fundamental growth in the number of equids and the socio-economic impact of equestrian activities; the introduction and various sections of this document refer to this development. However, the quality of the conditions of stabling and use of equids has not progressed at the same speed.

Societal grievances are increasing, as the population perceives living things differently in recent decades. Today, their needs are manifested above all in new expectations regarding dignity and animal welfare. The more prominent a species is in the hierarchy of domestic animals, the higher these demands are. In this respect, the great peculiarity is that humans no longer respect equids, but, due to anthropomorphic momentum, love them. Unfortunately, *"the more we love them, the less we know them"* (Digard, 1995).

The question of what action to take remains of paramount importance. This report clarifies the nature of the pressures exerted on equids by the conditions in which they are bred, kept or used and now the implications for the parties involved need to be determined.

The responsibility to prevent hardship (Art. 10 AniWA) is primarily the responsibility of the people around the equid (breeders, owners, the equestrian population, grooms, veterinarians and therapists). It is up to these stakeholders to carry out an evaluation of interests in each case. For their part, the various federations, professional organisations and institutions should support the ethical point of view. They should integrate precautions into their regulations, breeding goals and training programmes. The aim is to protect the horses and to prevent the restriction of organic or sensory function or deviation from species-specific equine behaviour.

However, these responsibilities cannot be carried out without in-depth knowledge. The equestrian associations and supervisory institutions thus play an important role. In view of the ethical objectives, it would not be appropriate for associations to hide behind the duty of the individual, as knowledge must be available, disseminated, assimilated and applied in practice.

Despite the increasing demand and supply of training opportunities, several studies show that the knowledge of those working in the equine sector generally remains low compared to that of professionals in other sectors (Bachmann, 2002; FABRE, 2007; Poncet et al., 2007, 2009, 2011). It can be observed that the availability of educational opportunities in the equine sector is becoming abundant, but not always of a quality aligned with the issues of welfare and dignity. It can be also seen that, for many owners, profitability is not as important economically as the performance of livestock. Many are not concerned by the current knowledge and do not see any essential benefit in it. Worse, they often see these improvements as a hindrance or an attack on tradition. This is why a significant number of people deal with equids as a dilettante or see it as a hobby, without informing themselves about the potentially ethically problematic issues. Finally, farmers are very well educated in topics related to food-producing livestock (meat and milk). Unfortunately, the level of education is lower in the equestrian field. Agricultural schools in Switzerland, with a few cantonal exceptions, have practically given up teaching these subjects.

Education on welfare issues has progressed significantly. Knowledge of the horse, its anatomical, physiological and behavioural characteristics and its needs is part of the curriculum, for example, of the SE Brevet certificate or professional training. However, for a long time, these subjects were treated in a superficial manner or skimmed over. After all, the students are there because they want to ride or drive a carriage. Moreover, the teachers themselves do not always realise the importance of this subject or do not feel that they have a sufficient knowledge base to teach it.

These shortcomings have negative consequences for the respect of the dignity and welfare of equids whether in terms of breeding, boarding or use. There are multiple repercussions for society and the equestrian world. These include safety issues, a reduced contribution to socio-cultural activities and to the sustainable development of rural areas, economic losses as well as the unfavourable image seen by the public and the media. *Ultimately*, this could lead to an increased restriction of equestrian activities.

Alternative measures exist. Animal welfare legislation requires training for those who board more than five horses. Although this basic knowledge is essential, it is minimal and only relevant for beginners, though it is a step in the right direction. For example, several private institutions and associations have recently started to offer a number of courses. All of them aim at the same goal: a better relationship with horses. However, this goal is still difficult to achieve, as there are different interests and opinions on how to handle, train and work with horses.

This report repeatedly highlights the crucial role of the findings of recognised experts and researchers. In the future, objective knowledge must prevail over judgements that are based on assumptions, emotions or references to an idealised nature. Scientific knowledge about equids has developed and diversified considerably in recent years in Switzerland (Burger et al., 2010; Poncet PA et al., 2007, 2009, 2011) and abroad. However, it is still lacking in several areas that are essential for the search for an adequate ethical attitude. Equine research networks aspire to address the questions and needs of the industry. Future studies should address more of these fundamental and practical issues.

COFICHEV recommendations for scientific research topics

Issues relating to the welfare of equids should be systematically explored, particularly with regard to the physical and psychological impact of strain in various situations. Areas where there appears to be considerable scope for further progress are mentioned below:

- Development of assessment tools to recognise manifestations of overexertion, stress, pain perception, adaptability and discomfort during activities with equids
- The impact of auxiliary equipment in certain disciplines: bits, bearing reins, fixed and side reins, blinkers
- Descriptions of training and coaching methods that rely on motivation and positive reinforcement
- Improvement of transport and slaughter conditions
- Objective exploration of the effects of temporary separation of the foal from its dam
- Development of breeding and genetic programs for improving equine health and behaviour
- Causes of equine mortality in Switzerland and an analysis of their evolution (ageing of the equine population, age pyramid)
- The impacts of euthanasia and recovery of dead animals (energy costs, environmental damage, loss of valuable protein sources)
- Refinement of the content of training courses and verification of trainer qualifications.

In general, projects addressing the social and economic relations of humans with equids need to be broadened. It is important that they not address the requirements of dignity and welfare solely in monetary terms but also take into account non-monetary assets (better public image of owners and riders/drivers, improved animal health, reduction of behavioural problems).

In addition, the federations and various institutions are encouraged to participate in the financing of scientific studies and intensify their efforts in the field of communication, awareness raising and knowledge transfer. They should go beyond a focus on sports results or breeding progress. This can be done through regular dissemination of knowledge through courses, events or publications, including recommendations and information on sensitive issues:

- Behavioural development of young equids
- Weaning
- Healthy foals during growth: prevention (intensity of physical exercise, breeding selection measures; training methods for young horses)
- Strains imposed by the retirement of a horse and the different methods to put a horse down
- The damage and harm caused by the means of coercion still in use
- Typical equine sexual behaviour
- The use of electricity
- Gene therapies and genetic doping
- The skills and ethical attitude of officials
- The number of competitive starts and the intervals between them, as well as the time spent in a transport vehicle during a competition
- The minimum age of an equid per event level
- Health checks (physical and mental condition, medication or doping) during events
- Monitoring the use of medication supported by regular updating of a treatment log
- Restricted participation of broodmares with a foal at foot or past five months of gestation.

In particular, federations should invest more in defining and promoting non-monetary values that go beyond the extensive use of equine athletes on the competition circuit, especially at high level, for purely economic or prestige purposes. One way forward would be to openly acknowledge the moral status of equids and to change attitudes towards them.

More specifically, breeding organisations are encouraged to develop regulations for organising controls of young horses. They will serve to certify that all participants in selection tests are in good condition (physical and mental), healthy, free of medication and doping substances and not under the influence of unsuitable aids. The organisations should also publish transparent results:

- Implementing screening tests for hereditary diseases, monitoring and publicizing results
- Setting conditions for the use of embryo transfer
- Prohibiting the production and use of cloned equids.

The veterinary profession plays a key role in improving equine welfare, especially in the fields of equestrian sports and racing. The veterinary study and development programme is undoubtedly well designed to transmit the cardinal values of the profession and supported by several social qualities. These include listening to the client (empathy, sensitivity, respect and mutual trust), responsiveness, reliability, taking responsibility, and transparency (Held, 2005). Even though the teaching focuses on the issue of animal ethics, a large proportion of veterinary practitioners still find themselves at a loss. They have difficulty carrying out a detailed and honest weighing of interests, especially in assessing the natural needs of equids, as well as their dignity and welfare. Many therapists (including veterinarians), like their clients, have relationships with equine athletes that are primarily characterised by control, use and submission. With this socio-cultural model they emphasise a humane view of welfare. Specifically, they place weight on their operational responsibility to satisfy self-defined needs (e.g. pain management). Concerned with treating their patients well, many find it difficult to recognise horses as subjects of their own existence seeking to fulfil their own needs (Bergmann, 2019; Bornemark et al., 2019). Veterinarians struggle to understand the animal's point of view. In other words, how an equid perceives its environment. For example, when caring for an equid, many have problems identifying behavioural signs of discomfort during exercise or pain in an older horse or donkey. The veterinarian can therefore be unable to provide appropriate advice or delay the appropriate time for putting the equid down.

Veterinarians are thus challenged to apply their knowledge to assess what is ethically right for a horse in a given situation. In doing so, they must advise or persuade the client to establish a more caring relationship with the animal. This relationship should be characterised by an attitude and practices that take into account an equid's sensitivities to its environmental conditions. They will provide the owner with the basis for accepting personal responsibility for the animal, avoiding causing it unnecessary stress and maximising its welfare beyond legal requirements. This can result in serious ethical dilemmas and conflicts of interest to be resolved, especially during competition or if the owner or trainer has unrealistic expectations (Campbell, 2013; Gröbly, 2010).

Finally, legislative bodies must continue their efforts to improve equine welfare and respect for their dignity, above all when they are being used by humans (ridden, driven). By funding research and communication projects, it will encourage stakeholders to reflect on ethical issues and help them to make appropriate decisions. If this is insufficient, the legislative bodies can then issue guidelines. If necessary, these can be made into binding legal provisions, especially in cases where the various federations do not feel particularly concerned or competent. This may be the case, for example, in the field of reproduction techniques or the monitoring of treatment logs in relation to the health controls mentioned above.

Perspectives

In an open society, and when several parties are involved in the same issue, opinions differ. It can therefore be expected that some actors will cry out with over-sentimentality or express doubts about the feasibility of implementing all these recommendations. In many cases, the financial benefits will be wrongly presented as the most important factor in weighing interests. Proponents will use financial interests to justify inaction or opposition.

However, these attitudes will not change the persistent ethical questioning of the dignity and welfare of equids. Indeed, the public, or at least a significant part of it, will continue to express its disagreement and will consider certain practices unacceptable if serious strains are linked to major health risks. In these situations, the balance of interests should be in favour of the equid, especially when reasonable alternatives exist. Indeed, the ethical nature of the relationship between humans and equids is historically determined, but is evolving; as the recent past illustrates, the balance is increasingly tipped in favour of equids. The debate is therefore not over, as the way society looks at equids has changed and will continue to change in the future. However, the question will remain the same: how to find a balance between the interests of humans, economic realities and respect for the equid, its dignity and its welfare?

Several issues remain to be addressed in detail. The time to address them will come quickly if strains prove burdensome or if certain uses develop and raise ethical questions. Several subjects are listed below, in no particular order of importance and this list does is in no way exhaustive:

- Retraining of horses to specialise in a new discipline
- Potential problems with stable changes
- Foals used as prizes in raffles
- Equids used for equestrian therapy
- Exploitation of equids for the production of milk or medication
- Breeding of particular interspecific hybrids (*Equus caballus x Equus zebra*, *Equus asinus x Equus zebra*) or extreme types (dwarf equids)
- Ethical positions in various professional environments, training institutions, farriers, or veterinarians, for example.

In view of the constant questioning of certain sporting behaviours or stabling systems and the polemics relating to certain practices, it is necessary to not leave the duty of vigilance to the animal protection movements or to the authorities in charge of enforcing legislation. There is reason enough for individuals and associations involved in equestrian activities to prevent problems and to carry out regular and honest weighing of interests. Specifically, these parties need to accord prominence to the welfare and respect for the inherent value of equids (animal dignity) and not only improve these issues for the benefit of humans. Therefore, an independent and permanent commission financed by concerned organisations and institutions would be welcomed, with the task of reflecting on ethics in the equine sector (*think tank*).

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