REVIEW ARTICLE

# Welfare issues of horses: an overview and practical recommendations

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## ABSTRACT

The largest proportion of the world's horses are still used for work in agriculture and traction, however in the western countries they are increasingly kept for recreational and social purposes, breeding, sport and competition. It is often assumed that horses enjoys better farming conditions than other species, yet they have specific needs which should be fulfilled in order to have a proper welfare.

This paper will review the main welfare issues of horses and the following aspects will be considered: nutrition, housing and management, clinical problems, behaviour problems, training and riding, transportation, measuring welfare.

Horses are social animals that live in groups in close contact with conspecifics. They spend most of their waking hours moving at walk, grazing and eating grass. Some of the constraints imposed on horses during the last centuries conflict to their naturally evolved behaviour. Effective and humane handling of horses positively affects many important aspects like the safety of man, the performance level and the welfare of horses. It is an essential condition for keeping horses that handlers, riders, trainers, farriers and veterinarians have proper knowledge of the behaviour of the horse in order to fulfil their natural needs and guarantee their welfare.

*Key words*: Horses, Welfare, Behaviour, Management.

## RIASSUNTO

### PROBLEMATICHE DI BENESSERE NELLA SPECIE EQUINA

*La maggior parte dei cavalli allevati nel mondo vengono utilizzati come forza lavoro per il trasporto e l'agricoltura, tuttavia nei paesi occidentali essi vengono impiegati soprattutto per il tempo libero, il divertimento, lo sport e per scopi sociali come per esempio la riabilitazione equestre. È pubblica opinione che i cavalli godano di condizioni di allevamento migliori rispetto ad altri animali domestici, tuttavia essi hanno bisogni specifici che devono essere soddisfatti perché sia garantito un adeguato livello di benessere. Questo lavoro prende in considerazione alcuni importanti aspetti che influenzano il benessere nella specie equina quali la nutrizione, le strutture d'allevamento, alcuni problemi clinici specifici, la gestione e l'addestramento, i problemi comportamentali, il trasporto e la valutazione del benessere in allevamento. I cavalli sono una specie sociale e in*

*natura vivono in gruppo a stretto contatto con loro simili. Essi trascorrono la maggior parte delle ore di veglia pascolando e mangiando erba. Se gestiti in modo efficace e non violento, si hanno effetti positivi su aspetti importanti quali la sicurezza dell'uomo, le prestazioni sportive e il benessere. E' essenziale che tutte le figure che hanno interazioni frequenti con i cavalli quali il personale di scuderia, i cavalieri, gli addestratori, i maniscalchi e i veterinari abbiano buone conoscenze del comportamento equino affinché vengano soddisfatti i requisiti di benessere in questa specie.*

Parole chiave: *Cavallo, Benessere, Comportamento, Gestione.*

## Introduction

During 60 million years, horses have evolved as social, steppe dwelling animals, able to eat and digest low quality forage. This species has adopted the ability of detecting predators and flight as primary defence mechanisms, relying on the establishment of stable groups as main survival strategy (Hall, 2007). Today, the domestic horse is the result of this evolutionary pattern and much of its species specific behaviour and physiology are the same that evolved for grazing in group and living in a prairie environment (van Dierendonck, 2006). The process of domestication started relatively late in comparison with other domestic animals, around 4000 BC, and resulted in decreased reactivity and flight distance, increased adaptation to human husbandry and in an enhancement of features which yield human advantages, like speed and strength (Goodwin, 2002). There is scientific evidence that the organisation of horse behaviour remained relatively unchanged with domestication (Christensen *et al.*, 2002) and this suggests that some of the constraints imposed on horses during the last centuries conflict to their naturally evolved behaviour (i.e. being social and fearful) and may lead to welfare problems (Goodwin, 2002). After domestication, the human-horse relationship has evolved tightly, historically with an utilitarian approach by man: horses have represented food sources or tools of food procurement, means of transport, agriculture and warfare. Although the largest proportion of horses in the world are still used for work purposes, in western societies the aims for using horses have changed dramatically since the last decades, after horses have been replaced by machines in their traditional use. Nowadays horses are used in sports, recreation and for health purposes: this means that physical and mental humans' expectations on horses has changed accordingly (Waran, 2002). In Italy there is an estimated number of horses of 308,000 (ISTAT, 2006) increasingly kept as pet or companion animals. It is often assumed that the stabled horses are in better housing and living conditions than other domesticated farm species. Despite this, the intensive management of horses makes them vulnerable on a different range of problems so that their perceived level of welfare is far higher than the actual one (Waran, 2002). Relatively little research has investigated the welfare or the "quality of life" of the domestic horse and most knowledge is based on empirical findings rather than on scientific evidence. A search through literature databases (ISI Web of Knowledge CrossSearch) reveals more than 280 studies published in the last five years where the welfare has been considered in relation to horses: this is a highly encouraging number that tells us about an increasing interest in this field but it is distant from the 735 papers published on poultry or the 892 papers about welfare in cattle! The following paragraphs review general issues that impact on horse welfare and describe their measurable effects. Methods for a reliable assess-

ment of welfare in horses are presented and discussed.

## Nutrition

In performance horses, food is traditionally concentrated in order to provide readily digested energy that can be consumed more rapidly than fibrous compound (McGreevy, 2004). The bulkiness of natural forages is thought to maintain gut-fill so that lung volume might be compromised during races. This is the most profound constraint to natural behaviour imposed by man on horses. Even though the nutritional needs may be met in a high-energy diet, the restrictions on feeding behaviour lead often to digestive anomalies and to the development of oral stereotypies (McGreevy, 2004). Foals are particularly vulnerable to a high level of concentrates as demonstrated by Nicol and colleagues (2002) that pointed out how crib-biting behaviour is more likely to develop at weaning time and that crib-biting foals present more gastric ulcers whose onset is probably linked to the hyperchlorhydria induced by a concentrated diet. When given the possibility, horses spend from 16 to 19 hours a day grazing at pasture (Gallagher and McMeniman, 1989) and choose specific plants according to their energy needs and individual preferences (Goodwin *et al.*, 2005). The diet of stabled horses is usually monotonous as most horses eat only one kind of roughage (Goodwin *et al.*, 2005). Well managed pastures that are not overgrazed, where horses may spend time in groups, satisfy the behavioural needs of horses while intensive management feeding practices present many factors which may negatively impact on welfare. Some of these factors are represented by: high energy diets with reduced fibrous components, very different from the ones that would be chosen in the wild (McGreevy, 2004), provision of meals twice a day implying that food is consumed rapidly, and eating while confined within a stable (Søndergaard *et al.*, 2004). Under these circumstances, salivation is reduced leading to a compromised buffering effect on gastric acidity and horses may still be motivated to forage, thus leading to behaviour problems like crib-biting, shaw-chewing or wood chewing (Waters, 2002). It is important that horses take up an important part of their energy in the form of roughage that has to be of high quality and dust free to reduce potential respiratory problems (Davidson and Harris, 2002).

The daily water requirements range from 20 to 70 litres depending on environmental and physiological factors. A preference for buckets over drinkers has been shown (Nyman and Dahlborn, 2001) in any case water should be available *ad libitum*. If drinkers are not regularly checked and cleaned, contamination with food or feces can result in severe diseases like diarrhoea, colic and dehydration (Søndergaard *et al.*, 2004).

## Housing and management

When possible, horses live in social groups in close contact with conspecifics. They spend most of their waking hours moving at walk and eating grass (Mills and Nankervis, 1999). Locomotory behaviour has a key role in horses because it has a positive physical and mental effect on them and because we take advantage from their ability to move when we use them for working purposes or in sports. It is therefore essential that their natural attitude for locomotion is considered in the management of domestic horses (Mills and Clarke, 2002). If a horse is solely exercised when ridden, its locomotor system is not warmed enough and it will be exposed to strain and possibly to a whole range of related diseases. Foals and young horses that are regularly exercised show a higher density of bones (Bell *et al*., 1999; Hoekstra

*et al*., 1999) and also their behaviour is affected by the possibility to exercise freely in an open space. McGreevy and colleagues (1995) found that horses are less likely to develop abnormal behaviour if they spend more time out of the stable and are easier to break in (Rivera *et al.*, 1999). Søndergaard and Schougaard (2000) showed that stallions move less when at pasture alone than when in groups, pointing out the impact of social contact on the willingness to move. The paddocks must meet the needs of horses for movement and social behaviour and provide access to water, fodder and shadow (Søndergaard *et al.*, 2004). Horses are kept in stables in order guarantee a protection against the cold and the environmental threats, offer the possibility to rest, eat, drink and perform good comfort and social behaviour. In a recent study Raabymagle and Ladewig (2006) found that box size exerted an influence on the duration of sternal recumbency, which was significantly longer in large boxes (2.5 X height at withers of the horse) than in smaller ones (1.5 X height at withers of the horse), and on the frequency of the rolling behaviour shown before getting up. Recommendations on minimal box sizes may be found in several countries like Scotland (4m X 4m) or Germany (2 X 'height at withers' long and 1,5 X 'height at withers' wide), however the relation between horse welfare and box size has not been investigated thoroughly yet (Søndergaard *et al.*, 2004). Singly stabled animals very often suffer from restrained possibilities of movement and social contacts. When these needs are not met in other ways, the risk of developing abnormal behaviour increases significantly (McGreevy *et al.*, 1995). Tie stalls highly restrain normal locomotory and social behaviour and should be avoided unless the horses spend most of the day outside the stall. The partitions in single boxes can be made as open as possible in order to guarantee a sufficient level of social contact (van Dierendonck, 2006). The risk of equine injury is substantial in group housing of horses. Preventive measures focus on the techniques used to introduce new horses to the group and the design of the housing facility (van Dierendonck, 2006). The risk of injury is lowered if there is adequate space for exercise, extended foraging and the possibility of benign social interactions. Horses are prone to respiratory diseases in connection with dust problems, so the best natural ventilation has to be provided as well as a large air volume per horse (Jacson and Pagon, 1992). Other important factors that affect the likelihood of developing pulmonary diseases are the quality of straw fodder and the position of mangers because if these are fitted too high, the dust will get easily into the respiratory tract due to the position of the throat while eating in an unnatural position (Søndergaard *et al*., 2004). Horses should always benefit from a dry, bedded litter. Optimal bedding should absorb ammonia, not cause hygienic problems and be attractive to the horse. It was shown that horses spend more time in a box with straw bedding than in a box with chip or paper bedding (Mills *et al.*, 2000) and that they rest for longer in a lateral position, necessary to reach a deep sleep, on straw bedding in comparison to chip bedding (Pedersen *et al*., 2004).

## Clinical problems

This paper only reviews specific aspects of clinical problems that may be associated with intensive housing conditions or high performances in competitive disciplines. Diseases may arise when particular practices compromise the welfare of horses like in the case of gastric ulceration: 82% of thoroughbred racehorses were found to be affected by some degree of ulceration (Johnson *et al.*, 2001) probably as a reflection of a

high energy diet with a low forage proportion. Moreover, active racing is associated with frequent transports and with housing systems that do not allow enough social contacts among conspecifics, conditions that may enhance the risk of developing stereotypies (Waters *et al.*, 2002). Stabled sport horses spend most of the time immobile in their boxes and they are required to perform sudden challenging muscular activity during training and competitions. This can lead to rhabdomyelitis, a disease that involves a painful damage to the muscular fibres, and to clinical problems to feet and tendons (MacLeay *et al.*, 2000). Mares are seasonally polyoestrus with a natural breeding season from May to October and they give birth from April to September. In Thoroughbred racing, foals compete within age categories and, as they are aged from the 1st of January of each year, those born earlier in the year have better chances of winning races as they are older and stronger than those born later. This led to the common use of hormones that induce oestrus earlier in the year, moreover in many studs today is practised the "in-hand mating", where stallion and mare are both restrained, thus preventing the normal pre-coital behaviour. A reduced fertility in breeding mares and stallions is often associated with the stress induced by forced matings during the seasonal anoestrus period and by the prevention of the natural pre-coital courtship behaviour. The stress induced by this practise causes a release of ACTH and cortisol that results in a reduced activity level of hypothalamus, pituitary gland and gonads (Dobson and Smith, 2000). Every competition activity predispose the horses to develop specific diseases, i.e. endurance horses that race over long distances are more likely to suffer from hyperthermia and dehidratation (Fowler, 1980), especially if they are not trained adequately (Hodgson and Rose, 1987). A prolonged period of intense and differentiated athletic activity is typical of the three day event competition where traumatic injuries and lameness are the major concerns, particularly during the cross country phase (Casey, 2002). Horses used in dressage competitions suffer from problems caused by the particular gaits used in this discipline that involve a high degree of joint flexion. As a result, joint and back diseases may be found more frequently in dressage horses (Casey, 2002). The most frequent kind of injuries in show jumping horses are injuries in the lower limbs caused during the landing after jumping and by the hardness of the ground (Hertsch, 1992). Last but no way least, the effect of poor riding skills on the development of diseases and on the overall level of welfare of horses is as much important as common to all the disciplines and has to be always considered with due care. There are no easy solutions to clinical problems in performance horses, however the awareness of physical and behavioural limits of horses should suggest that beyond these limits the welfare of animals is compromised, their health and their performances too (McGreevy, 2007).

## Behaviour problems

Differential diagnosis between physical causes and behaviour causes of unwelcome behaviour should always be undertaken by a veterinarian before taking any decision on how to treat the problem (McGreevy, 2004). Here we will not focus on physical problems nor on handling problems, even though these are very relevant topics, but we will restrict to "stable vices", better defined as stereotypies. Stereotypic behaviour in horses can be morphologically classified as locomotor and oral stereotypies and they have been well described (Houpt and McDonnel, 1993) as apparently functionless, repetitive behaviour.

McGreevy (2004) reports an exhaustive list of stereotypies that include chewing, lip-licking, licking environment, wood chewing, crib-biting, wind-sucking, box-walking, weaving, pawing, tail-swishing, door-kicking (front feet), box-kicking (hind feet), rubbing self, self-biting, head-tossing, head-circling, head-shaking, head-nodding, head-extending, ears back and nodding, kicking stall (hind feet). A single stabled horse may perform more than one stereotypy while no free-living feral horse has ever been found to suffer from stereotypies, thus these behaviours are considered to be caused by some management practices. Table 1 reports the results of studies on prevalence of stereotypies in horses of different breeds or use in Italy.

The prevalence of crib-biting and weaving was found to be greater in Arabians than in other breeds probably because they are very intensively managed, however it is difficult to separate the effects of breed from the ones of management as they frequently overlap. No certainty has been reached about the heritability of stereotypies but there is some evidence that certain family lines are more likely to develop stereotypic behaviour (Hosoda, 1950; Vecchiotti and Galanti, 1986; Marsden, 1995). A possible underlying cause common to all stereotypies is considered to be arousal generated by frustrated motivation (McGreevy and Nicol, 1998). A study by Minero *et al.* (1999) investigated if crib-biters and control horses present a different heart rate and behavioural response to two acute challenges: restraint with upper lip twitch and a fear reaction. The stereotypic horses presented a higher overall mean heart rate than controls which suggests they have an increased basal sympathetic activity (sign of arousal and chronic stress) and showed a decrease in heart rate during crib biting. One theory is that streotypies enable stressed animals to cope with stress. Crib-biters showed a lower reactivity to the lip twitch both in terms of behaviour and heart rate probably because the higher the sympathetic activity the more considerable the decrease in heart rate when twitch is applied.

Management factors that might frustrate behavioural needs of horses and that are recognized to pay a major role include the amount and type of forage, the bedding type, the quantity and quality of social contacts, the amount of time spent in the stable (Cooper and McGreevy, 2002). Stereotypic horses are undesirable for more than one reason: they have lower economic values, they do not have an agreeable appearance, moreover health and performance problems have been associated with these behaviours (Kiley-Worthington, 1982). Unluckily the owners often "treat" the stereotypic horses ineffectively by isolating them or with the physical prevention of these behaviours. These practices may further impair the welfare status of stereotypic horses and should be discouraged (McGreevy, 2004). On the contrary, changes in everyday management so that animals are subjected to reduced

Table 1. Prevalence of stereotypies in horses as reported in different studies.

| Authors | Canali and Borroni (1993) | Garberi (1994) | Zambotti (1999) | Colombo (2000) | Leonardi (2001) | Normando *et al.* (2002) |
|---|---|---|---|---|---|---|
| Breed or use | Thoroughbred | Standardbred | Arabian | Saddle | Mixed breed | Saddle |
| Prevalence | 5.7% | 3.1% | 16% | 4.7% | 14.2% | 7% |

frustration is very helpful. Possible solutions are: giving more fibre, exercising more in the paddock, environmental enrichment, turning stabled horses out to pasture, giving more possibilities for social contacts (McGreevy, 2004). Alternative approaches that have been investigated are foraging devices like the Equiball® feeder, anti-acids administration and mirrors in the boxes (Mills and Riezebos, 2005). These solutions will certainly be of benefit to the overall horse welfare but will not always erase for ever the stereotypic behaviour, indeed, once stereotypies are established, they tend to persist even though the environment is changed.

## Training and riding

Many equine behaviours can be modified by learning and well behaved horses, as well as problem ones, are the result of learning and training. There are two major points that have to be carefully considered when speaking about training: the first one is that we cannot require horses to do what is beyond their physical and mental capabilities, the second one is that horses may be learning even though we are not perceiving it (Mills and Nankervis, 1999). Overestimating horses mental ability may lead to adopt an anthropomorphic attitude with many negative implications for horse welfare and rider's safety. During the second International Equitation Science Symposium, held in Italy on 2006 (Minero *et al*., 2006), many researchers stressed the importance that trainers apply the appropriate use of learning theory in order to reduce the risk of wastage of horses.

Here we aim to discuss the welfare implications in failing to train a horse. In fact, training does not always produce the desired responses, some horses learn to evade stimuli by bolting, kicking, biting, bucking with the result that they are sold rapidly or even slaughtered. What did go wrong? Very often these horses described as "crazy" or "nasty" have been subjected to inconsistent signals, such as the lack of release of pressure of the rider's hands after the horse displayed the right response (McLean, 2003). Horses learn during their training that the pressure on the bit or of the rider's legs disappears when they stop or go forward, respectively. When they cannot obtain release from that or when the rider gives signals of "go" and "stop" at the same time, they suffer of a detrimental chronic conflict that may result in removing the cause of that conflict, that is to say the rider (McLean, 2003). Painful punishments inflicted after undesirable behaviour further ruins the human-horse relationship in an escalation of pain, fear and avoidance reactions. The welfare implications of poor riding and training are evident in a study performed on more than 3000 non-racing horses (Odberg and Bouissou, 1999). This study revealed that 66,4% horses were slaughtered between 2 and 7 years old, mainly because of inappropriate behaviour. Of particular current interest in dressage is the topic of hyperflexion of the neck as part of warming-up before dressage test: it can compromise welfare as it restricts vision, respiration and head movement. Moreover horses learn that there is nothing they can do to remove the pressure (McGreevy, 2007). The most relevant topics that are currently addressed in scientific research about welfare of ridden horses are how to measure the rider-horse interactions, how to define the stimuli currently involved in competitive equitation and how to measure pain and learned helplessness (McGreevy, 2007).

## Transportation

Differently from other farmed species, horses are transported many times in their lives with a growing trend in the number

of transports per year (Waran *et al.*, 2002). They are transported by land, sea and air, usually for reasons like competitions, breeding, meat production and slaughter. Every different kind of transport includes a range of potential stressors that can impact upon horse welfare. Loading can elicit strong fear reactions in horses that naturally regret from entering into an enclosed space. Ramp climbing was investigated by Waran and Cuddeford (1995) who found foals under 3 years resisting more to load than older and more experienced horses. The step-up into the vehicle seemed to be the most problematic phase that elicited fearful reactions and the highest heart rate values. It is suggested that the horses have to be gradually accustomed to loading as foals. Making the ramp less sloping and more solid would render it more stable, rubber mats and straw over the ramp would further decrease the fear reactions induced by the hollow sound of climbing hoofs. Once loaded, horses are confined in a restricted space, once more a situation which they have learned to instinctively fear during a millenary evolution. The presence of windows and of half-height partitions may be of some help coping with the effects of confinement and isolation. The presence of conspecifics or of the usual handler may also have a calming effect during transport (Waran *et al.*, 2002). The moving vehicle is likely to produce vibrations and sudden decelerations that challenge the balancing ability of the horses: many studies found that horses transported facing the rear of the vehicle can balance better, have lower heart rates, lean less against the sides of the lorry and carry their heads and necks in a more natural position (Waran *et al.*, 1996). Independently by the orientation within the vehicle, it is very important that they are tied in such a manner that they can easily raise and lower their heads which is fundamental for keeping a good balance during transport. Few studies have investigated the effects of transport on performance during competitions, however there are indications that long journeys impact upon performances especially when horses do not have enough time for recovering before competing (Linden *et al.*, 1991). The importance of horse air transport has increased constantly in recent years and represents a peculiarity among farmed species. Thoroughbred stallions may be mated with mares in both Hemispheres and different Continents during the same year and it is not infrequent that sport horses travel by air to many international destinations in order to participate to very important competitions (Waran *et al.*, 2002). The whole process is quite complicated and it is organized and supervised by transport specialists. Here we only report the most frequent diseases whose onset may be related with long distance air transports. Respiratory diseases like "shipping fever" has been known for over a hundred years and refers to a serious pneumonia and pleurisy favoured by the environmental conditions in the aircraft and by holding horses heads in a high position for a long time (Raidal *et al.*, 1996). Very dry air can further dehydrate the respiratory system and favour the incidence of this disease. Traumatic injuries, colics and body cooling may be treated promptly if there is an adequate veterinary presence at altitude.

**Measuring welfare**

Several methods for assessing welfare at farm level have been developed in recent years but only few studies dealt with horses (Beyer, 1998; Petersen *et al*., 2006). This could be due to the fact that horses are not perceived as farm animals which live in intensive housing systems. However housing systems and management can deeply affect the welfare of horses. Some protocols

for measuring horse welfare at farm level can be found in Switzerland at the Swiss Federal Institute of Technology of Zurich, in Italy at the Servizio Sanitario Regionale Emilia-Romagna, Azienda Unità Sanitaria Locale di Modena and at the Istituto di Zootecnica of the Veterinary Faculty of Milano.

Environmental parameters (such as dimensions and characteristics of stable and paddocks; type and quality of bedding, feeding management and working schedule) and animal-based parameters (such as body condition score, skin injuries, scars, presence of behavioural problems and reaction to unknown person) are used on establishments for horses (farms, riding centres, training centres). The data have to be collected by direct observations and questions to the farmers by trained experimenters. Preliminary analysis on data collected by Milano experimenters (Canali *et al.*, 2002) showed differences between the environments where horses are kept which affected some animal-based parameters (i.e. establishments where horses spent many hours per day in group paddock showed less behavioural problems). This scheme seems to be an objective tool which can be used to evaluate different housing systems as it permitted a good discrimination between different establishments for horses and showed a good inter-observer reliability from direct observations.

## Conclusions

The advances in understanding horse behaviour and welfare induce to encourage a greater sharing of knowledge among scientists and practitioners. Significant improvement can be reached in the housing design and in the development of management and training systems that reduce chronic stress conditions. In most husbandry systems horses are kept confined and can only eat high energy diets. Many horse owners and veterinarians consider these husbandry systems optimal as they prevent injuries and allow individual monitoring, however these systems often ignore basic needs of the horses as social contacts, foraging and locomotion needs. Abnormal behaviours may arise in these conditions or can also be induced by inappropriate training methods or inconsistent application of learning principles. In conclusion, the following factors should be considered as priorities in protecting horse welfare: housing and management conditions which allow social contacts and not only shelter, daily free movement, provision of enough roughage, correct application of the learning principles in training, moreover particular attention should be paid to horse welfare during phases at risk as weaning or transport. Further scientific studies may provide valuable knowledge necessary to elucidate how to accomplish basic needs of horses kept under human control.

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