

The Welfare of Horses: Review of Recent Literature

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Introduction

Horses serve a number of functions throughout different parts of the world. They are the work animals in a number of third world countries, food livestock to specific countries, and are companion animals to many people in developed nations. They provide a means of entertainment, by being involved in a wide variety of sports, and leisure activities. The welfare of horses has been an issue in North America since 1641, when the Massachusetts Bay Colony included horses in legislation prohibiting cruelty to animals (Stuff, 1996). Since that time, legislation specific for the area's interest has been passed, for example drug testing requirements in show horses in California and banning of horse tripping in American states close to the Mexican border (Stuff, 1996). However, legislation covers only a small portion of potential welfare issues in the equine species.

Before welfare issues for domestic horses are considered, it may be useful to study the behaviour of feral animals. By doing this, behaviours important to the animal can be determined, and then related to present management practices. For example, social structure appears to be very important for feral animals, where horses exist in established groups of females along with a male (Waran, 1997). These groups of horses spend a large part of their day foraging. In contrast, domesticated horses often spend a large portion of their day in solitary stables, where concentrated food and high quality hay is provided for them (McGreevy, 1997). This housing arrangement is often considered to lead to a number of welfare related problems, and will be discussed further on in this review.

Creating a "list" of welfare problems in domesticated horses is often difficult to do, as what may be considered an issue may only be perceived to be a problem. Artificial insemination, embryo transfer, housing outdoors, or use of a twitch have all been accused of a reduction of welfare to the animal, but are in actuality, not a problem (Johnson, 1998). Areas that have proven to be of concern include transportation, improper veterinary care, poor owner management and nutrient-deficient feeding programs (Johnson, 1998).

How Is Welfare Assessed?

Welfare is often assessed by observing behavioural actions in horses, or by determining changes in physiological parameters. Each method has its advantages and disadvantages.

Behavioural assessment can occur when an observer watches a horse's reaction to a particular situation. However, terminology used across the scientific world is not standard, hence descriptions may mean something entirely different from one examiner to another. This was reported in an experiment (Mills, 1998) where many terms used to define equine personalities were not similar between observers. If this method is to be used in defining personality or determining welfare, efforts should be made to standardize all terminology used.

Physiological responses can occur to a wide range of stressors which can affect welfare of the animal. For example, transportation can cause an increase in stress hormone production, alteration of blood chemistry, a reduction in immune system functioning and hence disease status. Lameness can increase plasma cortisol levels, even exercise alone can lead to changes in blood hormone levels (Foreman and Ferlazzo, 1996). These parameters are often not easy to sample. In performance horses, tests are often taken before each show, usually via blood samples. However, other less-invasive methods may be possible. Lebelt et al (1996), using sperm donor horses, showed that stress could be effectively measured via cortisol levels of the saliva as compared to plasma which is often the standard. Use of this method would mean taking a simple swab of the horse's mouth, a less stressful technique than obtaining a blood sample from the vein

Using physiological responses as a means of stress assessment does have its challenges. Animals' responses to stressors are unique, hence one animal may respond differently than another to a given situation (Foreman and Ferlazzo, 1996). Canali et al (1996) also found that the length of time an animal is subjected to the stressor, as well as the age of the horse, can affect the responses seen in β -endorphins and lymphocyte levels. It must be remembered that before one can identify whether an animal is facing a stressful situation, the basal level of the parameter being measured must first be known.

Stabling of Horses and Stereotypies

Horses are often housed in individual stalls. As mentioned previously, this is very divergent from the conditions in which feral horses live. When housed in stalls, many horses exhibit stereotypical behaviours. In data collected by McGreevy (1997) observations on 4468 horses indicated that 10.8% showed stereotypies. This research also indicated that these behaviours increased with age, and were not curable. While stereotypies are considered to reduce the aesthetic value of the horse, they more importantly may reduce the health of the animal.

It is often believed that these behaviours occur because the animal is being kept in an unnatural situation. Social groups are not allowed, and the animal is often housed individually. Exercise is also limited. Foraging does not occur, rather feeds are often concentrated and require only a short amount of time to consume. Contrary to what many owners believe, these behaviours are not a vice of the animal, but rather an indication of improper management (Winskill et al, 1995).

There are a number of theories as to the function of or why stereotypies occur. Many believe they may be coping mechanisms to environmental stressors (Cooper and Mason, 1998; McGreevy and Nicol, 1998; Waran and Henderson, 1998), genetics (Waran and Henderson, 1998), motivational acts or digestive system functions (McGreevy and Nicol, 1998).

Attempting to eliminate stereotypies may not be successful. Possible techniques that are used include physically preventing the behaviour, surgery, aversion techniques, or simply changing management tools so the animal no longer has to cope with an unnatural situation (Waran and Henderson, 1998). Enrichment devices such as the "Edinburgh Foodball", which creates an opportunity for more time to be spent foraging, may also redirect behaviours from stereotypies (Winskill et al., 1996). A simpler solution may be to consider the requirements of the animal

prior to housing so as to eliminate the possibility of stereotypies beginning in the first place (Winskill et al, 1995).

Air Quality in Housing Systems

The type of housing system used for horses can have a marked effect on the air quality. Systems that limit air exchange and include straw or hay, particularly dusty feeds or bedding, can lead to considerably higher levels of total and respirable dust endotoxins than those which do not have straw or hay. In comparison, pasture systems provide the best air quality (McGorum et al, 1998). Poor air quality in a housing system can lead to respiratory illness, thus reducing the welfare of the horse.

Bedding

Mills et al (2000) used preference testing to determine which substrate Thoroughbred horses preferred as bedding material in stalls. This is important due to the fact that these animals typically spend much of their time in a stall, and must be comfortable. The study reported that straw was chosen over paper or shavings material by the animals. It may also be possible that the use of straw over other materials may reduce the incidence of stereotypies that typically occur in this setting. However, it must be the owner's duty to ensure that any straw used is not dusty or moldy, which can lead to an increase in respiratory distress, hence reducing the welfare of the animal.

Nutrition

Nutrition is a very important aspect which must be considered when examining the welfare of horses. It can affect the situation in many different ways.

Neglect or ignorance of feeding programs may be common (Witham et al., 1998). In these situations, horses are not being fed properly because the owner does not understand the requirements of the animals, or possibly does not have the funds to provide what is necessary. Education of animal owners is necessary to reduce the incidence of this travesty.

How feed is provided can also be used as a technique to reduce incidence of stereotypical behaviours. For example, feeding numerous small meals each day rather than one highly concentrated meal can be used if horses are individually stabled. This can be accomplished through use of electronic feeding stations (Ullstein, 1998). Turning horses out to pasture to feed will provide exercise, which can also be helpful when stabling is necessary (Ullstein, 1998).

Weaning Methods

Weaning foals from their mothers is stressful for both animals. However, proper management practices can aid in minimizing this stress. Holland et al (1996) showed in two separate experiments that gradually weaning foals from their mothers is less stressful than an abrupt weaning event. Dietary constituents also may have an effect on reducing weaning stress. Ingredients high in fiber and fat can result in less indications of stress (Holland et al, 1996).

Euthanasia

While euthanasia of a horse may not be considered a welfare concern, the effectiveness of the method used may very well be an issue. Knottenbelt (2000) listed a number of acceptable euthanasia methods, and has indicated that correct performance of the procedure is essential. Each method has both advantages and disadvantages. For example, shooting a horse provides instantaneous death, hence no welfare concern when performed properly, although there may be danger to the administrator. A number of euthanasia-type solutions are also available. Care must be taken to administer the ethanol properly, as slow injections can lead to prolonging death, and a reduction of welfare to the animal during that time.

Equipment

Equipment used to control horses can have an effect on the welfare of the animal. Riding bits typically used on bridles cause a number of reactions to occur, including closing of the larynx and opening of the esophagus (opposite of what should occur when running). This causes negative changes to respiratory patterns, gait changes, center of balance changes, pain to muscles and teeth damage. Alternatives such as the “bitless” bridle are the alternative. This bridle applies pressure to the top of the head (behind the ears) and eliminates the negative reactions found when using a typical bit. It provides a simple means of welfare improvement (Cook, 1999). Other types of equipment can also be used to improve the situation of horses. For example, carts used for working horses can be designed for comfort of the animal, and will be discussed in the following section.

Draught Animals

Horses, along with a number of other domesticated species, are still used for work power animals in many developing countries. In some situations these animals experience the worst cases of abuse and neglect seen in all classes of horses. Owners of these animals usually find it difficult to make a living, and animal welfare is not their biggest concern. The horses found in these situations are often overworked, abused and beaten as a method of extracting more work from the animal. Money is not available for proper nutrition or veterinary care (Ramaswamy, 1998). Equipment used often does not fit the animal properly, causing damage to the skin, and stress to the animal. As an example, poorly fitting harnesses can cause saddle sores and girth galls (Hovell, 1998). Improper design of carts can result in weight being carried solely on the horses' back, leading directly to injury (Hovell, 1998). When a horse becomes too injured to be of further value to the owner, it is sent to slaughter, often under horrendous conditions with no considerations for the welfare of the animal (Ramaswamy, 1998). Recommendations for improving the welfare of these animals can include education of owners on nutritional requirements and management practices, improved design of equipment, money for research, extension and law enforcement of animal welfare regulations, and finally improved genetics to supply animals which can better withstand workloads (Ramaswamy, 1998).

Pregnant Mare Urine Farms (PMU)

Pregnant mare urine is routinely collected for use in the human pharmaceutical industry. This PMU industry faces constant welfare criticism, however it has been very proactive in making changes to improve the welfare of the horses. Representatives from the World Society of Protection of Animals (WSPA) have inspected a number of PMU farms, and created a list of improvements that would enhance animal welfare, including stall size, bedding, water access, exercise, grooming, handling and veterinary care (Black, 1995). Since that time, many of these changes have been implemented. Producers are required to treat animals as outlined in the *Recommended Code of Practice for the Care and Handling of Horses in PMU Operations*, and allow access to veterinarians, industry officials and International League for the Protection of Horses representatives when required. The industry also employs equine specialists to aid in improving programs. A new initiative has also been put into place to breed high-quality mares so that the foals resulting can be used in other fields, such as sports and leisure activities (Luba, 1999).

One area of criticism in regards to the welfare of PMU mares is non-continuous access to water. However, it isn't known if this is actually a welfare concern, or a perceived problem. Experiments performed by Freeman et al (1999) and McDonnell et al (1999) focused on this issue. PMU mares were allowed access to either continuous or various types of intermittent watering systems, then behavioural and physiological welfare was assessed. It was concluded that no differences existed in the behaviour of the horses on either watering system, or that horses provided limited access to water were more stressed over those given continuous water access. However, horses given continuous water did have more spillage in their stalls.

Sports and Performance Animals

Horses that participate in sports or show events represent a particularly different set of welfare challenges. Horses are very willing to obey their riders, and can easily be manipulated into over-exertion (Anonymous, 2001). To prevent this from occurring, many of these sporting events require a series of checks to be performed throughout the event. A three-day competition event requires inspection of the horses by veterinarians upon arrival of the animal, before the dressage section, and prior to and following the cross-country events. At any time, the veterinarian can demand the removal of the horse from the competition (Jeffcott, 1995).

Special events require even more welfare consideration. In the equine sports events that took place at the Atlanta Olympic Games, the heat and humidity required extra precautions be taken. The Humane Society of the United States participated in the monitoring, by having representatives present to perform check-ups of the animals throughout each event (Anonymous, 1996). This stringent monitoring is vitally important as body temperature of the horse increasing near or past its upper critical limit can lead to a reduction in health and welfare of the animal (Kasper and Beck, 1997). Environmental temperature effects should be constantly considered with all performance horses. Kasper and Beck (1997) have shown that behaviour of the animal can be used to determine if this temperature is reaching excessively high levels, as the horse will show increased frustration and annoyance with an elevated temperature. Horses that participate in endurance rides (often over a number of days with distances of 400 kilometers) can present a special challenge. The animal must be observed often during the ride. These horses will lose electrolytes persistently throughout the ride, therefore the rider must take all precautions possible to not cause injury to the horse. Schott et al (1996), reported that horses that were not properly trained or experienced in this type of ride

often suffered the most. Once again, responsibility is on the owner to play a large part in maintaining the welfare of the animal.

Transportation

Horses are transported for a number of reasons, including transportation to sporting or show events, and to slaughter. All of these animals face stress to varying degrees, depending on load and equipment circumstances.

Orientation of horses in a trailer can influence the level of stress an animal may undergo. If horses are not tied during transport, they will often choose to face the rear of the trailer, in which case balance appears to be improved (Kusunose and Torikai, 1996). This was confirmed by Waran et al (1996), where horses backed into trailers and tied to face the rear had lower heart rates, less movement, and a higher incidence of resting than did forward facing animals.

Trailer design itself can also affect the animal. Many injuries occur during transportation by an animal rubbing against material on the trailer sides. This could be alleviated by the driver placing soft materials over the problem areas (Mansmann and Woodie, 1995). The driver must also be observant and responsible when hauling horses, checking trailer floors to ensure they are able to hold the weight of the animals, and removing any sharp protruding metal pieces.

Horses being moved to slaughter are moved in many different situations, with few regulations at this time. Large numbers of unfamiliar horses are mixed prior to shipping, which can lead to injuries (Grandin et al., 1999). They are then loaded into large pot-bellied, straight or double deck trailers. The type of trailer used can have an effect on stress level, with animals transported in pot-bellied units having higher white-cell counts and lower neutrophil:lymphocyte ratios and cortisol levels upon arrival (Stull, 1999). There are few slaughter plants in the United States, so animals must be transported long distances. The number of animals that reach slaughter plants in poor condition can vary according to trip length and amount of space allowed per animal in the trailer (Stull, 1999; Whiting, 1999). Grandin et al (1999), on examination of 1008 animals received at two Texas slaughter plants, found 92% of animals received to be in good condition, while Stull (1999), observing 306 animals, found injuries occurring in 19.6% of the horses. Grandin et al (1999) points out that a number of injuries observed in the study were due to owner neglect and abuse rather than transportation itself.

Physiological responses of transported horses can also be a welfare concern. Dehydration of the animal can occur, particularly during hot weather and long trips (Mansmann and Woodie, 1995; Friend et al., 1998). Horses that are previously dehydrated may not be fit for travel (Friend et al, 1998). For those animals that are moved, use of electrolytes in the water and resting breaks throughout the trip can help to alleviate any problems. Respiratory illnesses can also occur in transit, and may be related to poor air circulation in the trailer (Mansmann and Woodie, 1995).

There are many areas that can reduce the welfare of horses during transit. Many of these can be minimized, such as allowing horses to become familiar with each other prior to moving, rest and water breaks throughout the trip, proper trailer maintenance, proper care prior to transport, and responsible management in general.

Conclusions

Domestication of modern day horses has created a number of situations in which the welfare of the animals is reduced. Proper management can reduce or eliminate many of these situations. Balanced animal nutrition and veterinarian care is important in the health and welfare of the animal. Legislation on transportation regulations will help to eliminate dehydration, injuries or disease that may occur on long, difficult trips. When housing horses, and keeping in mind the behaviours that are important in feral horses such as exercise, social interaction, and foraging, allowing modern day animals to perform these behaviours may go a long way to eliminating stereotypies. Proper fitting equipment which allows the horse to move naturally and without pain, can keep the horse healthier. Adequate training of sporting horses can help them perform better and remain healthier, thereby improving their welfare. Working horses, particularly those in under-developed countries, must be protected by legislation. Education programs for owners and the necessary resources for training and law enforcement are crucial for protection of these animals. In general, improving welfare of domestic horses can often be accomplished through proper management.

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Abstract or Summary of Interesting Publications

Foreman,J.H. and Ferlazzo,A. 1996. Physiological responses to stress in the horse .
Pferdeheilkunde 12:401-404.

Active horses face many types of stress daily, and can include stress from transportation, exercise, lameness and external environmental conditions. Transportation, whether by truck or by air, can cause both physical and emotional stress to the animal, and can result in stress hormone production, changes in blood chemistry, reduction of the immune system effectiveness, and altered disease status. It is up to the owner of the animal to attempt to reduce this stress as much as possible, by including such factors as feed and water, proper bedding material, and a clean environment throughout the trip. Exercise can be also result in stress, and again can be identified by increases in blood hormone levels, and immune responses in the horse. Lameness, common in equine athletes, can cause plasma cortisol levels to increase as well. It must be noted that there is considerable variation between reactions to stress in individual animals. Care should be taken to minimize the negative effects of these stressors.

Stuff,C.L. 1996. History of U.S. equine welfare and legislation. Pferdeheilkunde 4:391-392.

This article reviews the history of equine welfare and legislation that has taken place in the United States. The first law was passed in 1641 in the Massachusetts Bay Colony which prohibited cruelty to animals, including horses. The first legislation to take place specifically for horses occurred in New York in 1866. Since this time, the Horse Protection Act was passed in 1970, which does not allow use of substances to alter the gaits of some show horses. Specific states have legislation in place for a variety of issues: California and Wisconsin prohibit poling to be used in teaching horses to jump, California requires drug testing to take place at public horse shows since 1987, and states close to the Mexican border often disallow horse tripping to occur. Rhode Island has legislation in place to control calf roping, and the Professional Rodeo and Cowboy Association governs rodeos. Legislation issues currently in progress include transportation of slaughter animals.

Waran,N.K., Robertson,V., Cuddeford,D., Kokoszko,A., Marlin,D.J. 1996. Effects of transporting horses facing either forwards or backwards on their behaviour and heart rate. *Veterinary Record* 139:7-11.

It is well known that transportation is a very stressful event for all species of animals, including the horse, as has been shown by an increase in adrenocortical function leading to a rise in plasma cortisol levels. Minimizing this stress would be beneficial to the horse. There is some evidence that having the horse face away from travel (backwards) in the trailer may be less stressful than facing forward. This study examines the effect of transportation either forwards or backwards on the behaviour and heart rate of horses. A total of 6 horses were separated into pairs. All horses were housed in box stalls and allowed daily exercise. On transportation days, horses were equipped with heart rate monitors while still in the stalls to determine resting heart rates. The monitors were left on the animals during transport. Horses were loaded into the trailer – those that would be travelling backwards were backed in to the trailer, the forwards travelling horses walked face-first into the trailer. An observer was located in front of the horses to monitor behaviour throughout the trip (1 hr in duration). Behavioural differences were noted, with the backwards facing animals moving less than the forward, resting on the rump more, and allowing their head and neck to move down into a natural resting position more often. Heart rate in all animals increased during loading and unloading, however the mean heart rate and peak were higher in the horses facing forwards. It is concluded that the horse will suffer less stress by being allowed to travel backwards.

Waran,N.K. and Henderson,J. 1998. Stable vices: what are they, and can we prevent them? *Equine Practice* 20:6-8.

Behaviours commonly called "stable vices", or stereotypical behaviours, can be common among stabled horses. These behaviours not only reduce the aesthetic value of an animal, but more importantly can have a negative impact on its health. These behaviours often arise when the animal is placed by owners in situations that are not natural, and can include confinement, limited or non-existent social interaction, very little exercise, feeding programs that provide nutrients consumed in a short period of time, and reduced gut fill. It is not known why some horses react to these situations through stereotypies while others do not. Theories for these reactions include a possible effect of genetics, learned behaviours from other horses, or too young an age at weaning. There is some evidence to indicate that performing these behaviours actually results in a physiological change where circulating stress hormone levels are reduced, and endogenous opioid levels increased, hence may be a coping mechanism used by the animal. Once stereotypies begin to be performed by a horse, it is difficult to stop them. Methods that are used include physical prevention techniques, surgery, aversion therapy (which may become a welfare issue of it's own), or simply changing the management tools currently in practice to accommodate the animal's needs. It is the responsibility of the horse owner to create a housing and management system in which the horse does not have to cope with excessive un-natural situations – if this can be accomplished then stable-vices will not be such a problem.