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Equine Welfare (4-Dec-2001)

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The only way that all risks to a horse's welfare can be eliminated is to not use horses. If we did not use horses for recreation and, in some parts of the world, for power and transport, horses would exist only as feral animals in a few locations or in zoos. Not only would elimination of horses result in hardship to those veterinarians, feed manufacturers, jockeys, and drug companies who depend on horses for their livelihood, but the world would be a poorer place. Instead of eliminating horses, we should try to create an optimal environment in which the horse is content, healthy and comfortable, but in which we can use the animal. In this article, we shall consider welfare issues of housing, transport, performance enhancing drugs and physical manipulations.

Housing

There are several acceptable methods of housing horses. The traditional box stall may not actually be the best accommodation even though it is the largest. Whether or not a box stall is acceptable depends on its walls more than its size. Based on the decrease in stereotypic weaving that occurs in proportion to the number of sides with windows - a multi-directional view is the most important aspect [1]. Because mirrors can substitute for windows in decreasing weaving [2], the views should be of another horse. Although one might suppose that horses would prefer the larger box stalls, straight or tie stalls may be more acceptable if the horse has another horse on one or both sides. Horses restrained in straight stalls for long periods - weeks - do not develop stereotypic behavior or physiological signs of stress, although they do exhibit compensatory locomotion when released [3-5]. No one has actually measured how often horses turn 360°, but they usually face forward in their stalls when no windows are available. This may be predator avoidance behavior or vigilance behavior when the horse is protected on three sides by a barrier.

Perhaps the best housing environment for horses is a run-out situation in which the horse can choose to be inside or out. Except in the most extreme cold conditions, the horse should be able to thermoregulate either behaviorally or physiologically. Keeping horses outside is probably the most natural, but welfare problems can arise when horses do not have adequate shelter from the sun and when there is no dry place for them to stand. Cold, dry weather can be tolerated well by horses who have grown adequate coats [6], but cold wet weather, when the horse must stand in mud, is a stress. Horses are reluctant to lie down in muck and prolonged exposure to mud may lead to "thrush". Skin problems *dermatophilosis* "rain scald" or "rain rot" can also develop in horses kept outside.

Housing of incompatible horses can be a welfare issue. A horse can be kept from food, water and shelter and kept in motion even if it is not injured by bites or kicks. For example, the worst injuries to horses during transport to slaughter are inflicted by other horses (see below).

Bedding

Horses spend 90% of their time standing. Most of their lying time occurs during the night so people are unaware of the animal's resting behavior. Horses can sleep standing up due to the stay apparatus of their hind limbs, but the only sleep possible is slow wave sleep. In order to Rapid Eye Movement (REM) sleep, the horse must lie down because otherwise the total muscle relaxation that accompanies REM sleep will cause the horse to collapse on its knees. There are several circumstances when a horse can be sleep deprived. The most common circumstance occurs when the horse is reluctant to lie down. Lack of a suitable substrate is a frequent cause of reluctance to lie down if the substrate is wet - as occurs in horses kept outside or if there is insufficient or no bedding in a stall the horse may not lie down. Another situation is an unfamiliar environment [7,8]. Horses rarely lie down the first few days in a new place. Horses unaccustomed to straight stalls may refuse to lie down in them for months at a time [5]. A final situation is the horse that is reluctant to lie down because it is in pain. Old, arthritic horses may be reluctant to lie down because lying down and, especially, standing up hurts them. In all these situations where the horse does not lie down for some days, it may enter REM sleep while standing and fall to its knees.

This could be called pseudo-narcolepsy. If bedding is present but inadequate, the horses may lie down as soon as fresh bedding is added to the stall, even in the morning, an unusual time for lying under more optimal circumstances.

Transport and Slaughter

Horses are slaughtered for meat. This can result in improvement in welfare for old horses because they are not allowed to starve, but their welfare can be very poor just before slaughter because transport to slaughter involves water deprivation, extreme environmental temperatures and sometimes injuries. The markets for horse meat are in Japan, French Canada and Europe. There are few equine slaughter houses and for that reason horses must be transported by truck for long distances. The majority of slaughter houses are in Texas, so that in summer time, the horses are heat stressed, losing 10% of their body weight in a day [9]. In addition to dehydration, they may be injured. Horses transported in double decker trailers designed for cattle are more likely to be injured, not because of the low ceiling but because of narrow doorways [10]. Although one might suppose that horses on a crowded trailer would hold one another up, instead they are less able to avoid injury and cannot arise if they fall [10]. The worst injuries occur not on the vehicle, but when the horses are in holding areas where the unacquainted horses kick and bite one another [11]. Although a law (HR2433) has been passed to regulate height of trailers to at least 6 ft inside (2 m), much remains to be done to increase watering frequency and especially aggression among the horses.

Urban Horses

Horses were once the only means of transportation, so cities were full of them and of the consequent manure. Now, the only remnant of the urban horse population are a few police horses and carriage horses. The number of carriage horses is small, but their welfare has been a popular issue with humane groups. There are several problems that can arise: stress, lameness, risk of vehicular accidents, housing conditions and untrained drivers.

The tourist season usually coincides with the warmest weather, so horses may be expected to pull a carriage full of people in the hottest part of the day with no water available. Many cities have rules that restrict carriage rides to the cooler parts of the day. Lameness, a common problem of horses, is exacerbated by the hard surfaces on which the horses must walk and trot. Some carriage horses are kept in old, narrow, dark stalls because space is at a premium and permission to keep large animals in a new venue in the city is difficult to obtain. All of these problems are exacerbated by ignorant drivers who do not know the signs of heat stroke, of lameness and any other illness. They may also be unable to drive well enough to prevent car-carriage collisions. The solution is to either remove the carriage horses or monitor their welfare carefully and educate the drivers.

Drugs

An area of equine welfare which has received almost no attention is the effect of drugs. Most drugs are given for therapeutic reasons. These drugs include antibiotics, vaccines, anthelmintics and antacids. Other drugs are given for restraint. Ketamine is a drug routinely used for pre-anesthesia in horses. It produces hallucinations and other unpleasant effects in humans and may also do so in horses. Another class of drugs used for restraint are the alpha agonists such as xylazine (Rompun®) and detomidine. Xylazine produces a conditioned taste aversion in cats and non-human primates [12]. A conditioned taste aversion is a unique form of learning in which the unconditional stimulus is gastrointestinal malaise, i.e., nausea. Conditioned taste aversions differ from other kinds of learning in that the conditioned stimulus - the taste of a particular novel food - can be separated from the unconditioned stimulus, nausea, by hours but an association can still be formed. Many humans have specific taste aversions to foods, a particular flavor of ice cream, a particular spice or a particular type of preparation.

It is difficult to determine if horses are nauseated because they do not vomit, but if xylazine makes them ill, they should form a conditioned taste aversion. Preliminary experiments revealed a weak effect when xylazine was paired with a novel taste - grape or cherry Koolaid®-flavored oats 5 of 8 horses decreased their intake of the flavor paired with xylazine, whereas they increased their intake of the flavor paired with a control injection.

Ketamine and xylazine are usually used for restraint during procedures that will benefit the horse. Another category of drugs that does not benefit the horse directly and which may actually decrease its welfare directly are the performance-enhancing drugs. Most performance-enhancing drugs cannot be used legally in the performance horse, but two drugs in that category are: the anti-inflammatory phenylbutazone, and the diuretic furosemide. Phenylbutazone may reduce the immediate pain of an inflamed joint, but if the horse runs harder, faster or longer because the limb is less painful, more damage can be done. An undesirable side effect that definitely reduces the horse's welfare is the production of gastric ulcers. The mechanism is blockage of the arachidonic acid cascade so that the prostaglandins which act as protectants of the gastric lining are inhibited.

Furosemide is given to horses to prevent exercise-induced pulmonary hemorrhage [13]. It is a diuretic that acts by inhibiting sodium and chloride reabsorption in the loop of Henle. As a result, a large volume of isosmotic urine, rather than a small volume of concentrated urine, is produced as water is drawn by the sodium ions into the urine. The loss of water and Na⁺ and Cl⁻ ions from the plasma produces a hypovolemia. The hypovolemia lowers blood pressure (and is the reason diuretics are used to reduce blood pressure clinically). If blood pressure is lower, rupture of blood vessels in the lungs of the horse is less likely. The diuretic is probably beneficial to the horse, but the actual therapeutic efficacy of furosemide is questionable. What is not questionable is the effect of furosemide on performance. Two studies have shown that horses treated with furosemide before racing ran faster and were more likely to win [14]. The reason for the enhanced performance is probably the lower weight due to the loss of 6 kg of urine. Administering furosemide is akin to reducing the handicap on the horse. There is another side effect of furosemide. The hypovolemia triggers the renin angiotensin cascade and thirst. The lower renal arterial pressure stimulates renin release from the kidney. Renin activates angiotensin from angiotensinogen. Angiotensin has several actions:

1. direct effects on blood vessels to increase blood pressure as the name implies,
2. stimulation of aldosterone release to enhance renal reabsorption of sodium,
3. stimulation of thirst and
4. stimulation of salt appetite. Stimulation of thirst by furosemide and of salt appetite has been shown [15]. Horses treated with furosemide will be thirsty and later will crave salt.

Performance

The worst abuse of show horses is "soring" of Tennessee Walkers in which caustic compounds are applied to the pasterns and then chains or some other physical irritant is added to increase the pain and cause the horse to extend its forelimbs. There is a law against soring in the USA (The Horse Protection Act of 1970, Public Law 91 - 540) but enforcement is not uniform. Other specific practices deal with tails of horses so the horse does not switch its tail and, therefore, betray excitement. Horses, primarily Quarterhorses, are shown as Western pleasure horses and are judged on their non-reactivity to stimuli. The goal is a horse that would be suitable for trail riding - one that would not shy at startling sights or sounds and that would not be impatient when kept from moving quickly. A lashing tail is a sign of impatience or aggression and would mediate against the horse winning in that event. For that reason, the tails may be deadened, either permanently by severing the motor nerves or temporarily by injecting a local anesthetic in the region of the nerves. Fortunately, these practices can be detected by a simple electromyogram and the horse disqualified [16].

The other practice involving tails is "gingering" of Arabian horses. In contrast to the western pleasure horse, the Arabian should be spirited and reactive. Therefore, his tail should be held up. In order to achieve high tail carriage in phlegmatic horses, ginger is inserted into the anus or rectum. The stimulation, presumably of pain receptors in the mucosa, causes the horse to raise its tail. It takes more manual pressure, as measured by a pressure gauge such as a penetrometer, a device for measuring the pressure necessary to penetrate the fruit, but there are both false negatives and false positives. The sensation of heat produced by the application of ginger leads to vaso-constriction of the perianal area and consequent cooling of the surface temperature. This can be measured accurately by thermography under constant conditions, but not under field (i.e., show) conditions [17].

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