

Horse Welfare Since 1950

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CHAPTER

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Introduction

There are approximately 6.9 million horses in the United States, more than in any other country in the world (American Horse Council 2000) (Table 1). That fact alone should inspire Americans to improve equine welfare, although it must be said that the state of domesticated horses is better now than it was fifty years ago.

The advances that have been made in veterinary medicine, including surgical technique and, especially, anesthesia, mean that diagnosis of an intestinal torsion or displacement is no longer an automatic death sentence. Improvements in surgery for lameness and in anti-inflammatory drugs have eliminated such painful practices as blistering or pin-firing a lame horse's lower limbs, ostensibly to expedite the healing process. Improvements in nutrition and in control of infectious disease have allowed many horses to live into their twenties, thirties, or beyond.

Horse husbandry has improved in one respect: unlike in days past, few horses are kept tied with halter and lead rope in narrow "tie" stalls in dark and dirty stables. But horse husbandry has worsened in another: more horses live in box stalls or isolated in small, grassless corrals than in natural herds on pasture now that fewer horse owners live in rural areas. Box stalls (typically 10–12 feet square) allow the horse to turn around, walk several paces, and lie

down in lateral recumbency, but they do not provide a natural social environment that even tie stalls—where horses are stabled closely one to another—provide. Typically a stalled horse seldom has access to a natural, high roughage diet and is fed limited amounts of high-concentrate feed and/or hay that are quickly consumed. Such management leaves a horse in a virtual wooden box with long periods of physical inactivity. This unnatural state leads to the development of stall aggression, stall walking, weaving, wood chewing, or cribbing, or to difficulty in handling. Controlling these "vices" often is done using inhumane methods.

A situation unchanged since the

days of Anna Sewell's *Black Beauty* (2001), published originally in 1877, is that a horse seldom is kept by one owner for his or her entire adult life. Often a horse changes hands—and careers—a number of times over his or her lifetime. After leaving the breeding farm, an animal may start out as a race horse, then be sold and retrained as a hunter, jumper, event horse, or equitation horse when his or her racing career is over. He or she may then be sold several times when outgrown by one owner, found to be unsuitable for another's level of experience, or not competitive enough for a third. In mid-life or later, he or she may then be used as a lesson, rental, or camp horse, and finally, when

Table 1
Number of Horses and Participants
by Industry, 1999

Activity	No. of Horses	No. of Participants
Racing	725,000	941,400
Showing	1,974,000	3,607,900
Recreation	2,970,000	4,346,100
Other*	1,262,000	1,607,900
Total	6,931,000	7,062,500**

*Includes farm and ranch work, police work, rodeo, and polo.

**The sum of participants by activity does not equal the total number of participants because individuals could be counted in more than one activity.

Source: American Horse Council

infirm, unrideable, or simply too old to be useful, be sold at auction and sent to slaughter. Relatively few horses die of old age, although some fortunate retirees may be euthanized due to age-related ailments.

At the turn of the millennium, the most pressing welfare issues of the domestic horse surround conditions found in slaughter and transport to slaughter; pari-mutuel racing; the pregnant mare urine (PMU) industry; the competitive and show industry; and in the development of husbandry-related stereotypes. (Urban carriage horses are a highly visible problem in some localities, since they usually are part of a local tourist industry, but they often generate concern out of proportion to their relatively small numbers.)

Slaughter and Transport to Slaughter

Sound, well-behaved, well-trained horses are relatively scarce and can be expensive as a result. There is, however, an oversupply of horses who are lame, suffer from chronic obstructive pulmonary disease or are otherwise infirm, or are unmanageable, unwanted, untrained, or past their useful life.

The fate of most of these “problem” horses is to be slaughtered. Most horses are sold for slaughter for human consumption (primarily outside the United States) rather than for pet food, or are rendered, as they were fifty years ago. They are slaughtered at one of two slaughter plants in the United States, both in Texas. The number of horses being slaughtered is decreasing, as fear of zoonotic diseases and competition from other countries increase (Table 2).

Horses at slaughter are stunned with a captive bolt pistol, then exsanguinated, which should result in a painless death. As with all slaughter procedures, however, much depends upon the competence of the personnel using the equipment provided.

Cruelty can occur if the horse is injured in the handling process, badly frightened, whipped to be persuaded to move, or not properly stunned (Reece, Friend, and Stull 2000). The greater equine suffering occurs not at slaughter but during transport and in the pens used to confine the horses before and after transport. Many slaughter-bound horses begin their journey far from Texas and obviously must be transported long distances as a result. Heat stress is an additional factor in the summer months.

There have been several studies of transport to slaughter under simulated or actual transport conditions. Horses transported for twenty-eight hours in summer can lose 10 percent of their body weight, which results in considerable dehydration (Friend et al. 1998). After transportation for twenty-four hours, 15 percent of the horses (three of twenty) in the Friend et al. study were judged unsuitable for further transport on the basis of weakness or high body temperature. The more crowded the horses, the more likely they are to fall and, once down, to be trampled. In another study horses transported in more crowded (less than 1.3 square meters per horse) conditions had fewer injuries but were more dehydrated and had greater changes in white blood cell counts (Stull 1999). Provision of water in the trailers during rest stops would help the horses compensate for the water they are losing as sweat, but not all horses in the trailers would be willing to move to water since that would involve entering another horse’s personal space (Gibbs and Friend 2000). Double-decker (or possum belly) trucks cause more injuries to horses in the upper levels than do single-deck trucks because the entrances are narrow (Stull and Rodick 2000). The percentage of injured horses was 29 percent for double-decker trailers and 8 percent for single deck trailers. Cortisol, body temperature, and white blood cells were found to be affected by transport. The greatest cause of injury to transported horses, however, was fighting, caused by mixing unfa-

**Table 2
Horses Slaughtered and Processed at Packing Plants in the United States**

Year	Number
1990	345,900
1991	276,700
1992	243,500
1993	169,900
1994	107,000
1995	109,900
1996	105,900
1997	87,200
1998	72,100
1999	62,813
2000	47,134
2001	56,332

The number has dropped substantially in the past ten years.

Source: U.S. Department of Agriculture National Agricultural Statistics Service

miliar horses, who normally establish dominance through physical intimidation in corrals prior to loading (Grandin, McGee, and Lanier 1999). The Grandin, McGee and Lanier study found that 8 percent of horses arriving at a slaughter plant exhibited serious welfare problems. In addition 30 percent had visible bite wounds. Examination of the carcasses revealed bruises on 25 percent of all the slaughtered horses, more than 50 percent of which were kick or bite wounds. Other problems included foot and limb injuries such as fractures, wounds (including infected wounds), and thinness to the point of emaciation. Owner neglect must have been the major cause of the poor body condition of the latter horses.

The federal Commercial Transport of Equines for Slaughter Act, passed in 1996, stipulates that double-deck-

er trailers can no longer be used to transport equines, the ceilings of equine transport trailers must be six feet (three meters) high, and horses must be rested and watered every twenty-eight hours. In 2002 Representative Connie Morella of Maryland introduced H.R. 3781 in Congress; the bill would ban slaughtering of horses for meat. Such a ban could actually increase equine suffering if horses were transported for slaughter to Mexico, where there are fewer animal care laws, or if horses were allowed to starve to death because they could no longer bring a few hundred dollars from slaughter buyers at auction.

Local health codes and lack of land leave those owners who euthanize old or ill horses at home (probably the most humane ending for a horse) few options for body disposal other than commercial renderers. More retirement homes for elderly horses are needed. Care must be taken that horses at these facilities live in compatible groups and have adequate feed available. All too often good intentions may lead to welfare problems when inadequate funds are available and/or the managers of retirement homes are not experienced in equine management.

Racing

Although Standardbreds, Arabians, Quarter horses, and other breeds are raced in the United States, Thoroughbred racing is the best known. More than 54,000 Thoroughbred races were held in 38 states in 2002 (Jockey Club 2003). Racing raises several important welfare issues, including the rate of injury among horses racing or in training; the use of medication (both legal and illegal); the racing of two-year-old horses; insurance claims on ill or suffering horses; and the fate of the overwhelming majority of racehorses who have no monetary value to the breeding industry. The rate of injury during an actual race is relatively low (3.3 per thousand race starts). The rate of fatal injury is 1.4 per thousand starts (Mundy 2000).

Horses may race only seven to twelve times a year but may typically stay in training almost year-round. One way to reduce the number of musculoskeletal injuries in racehorses is to determine the factors associated with injuries. Length of pre-race conditioning is an example. A humeral fracture was found to be most likely to occur when the horse returns to training after a two-month period out of training. Apparently lack of high-speed workouts can lead to disuse osteoporosis (Carrier et al. 1998). Musculoskeletal injuries of all types were found to be more likely to occur when horses are exercised less (Cohen et al. 2000). Nonfatal injuries were most likely to be sesamoid, metacarpal, or carpal fractures (Estberg et al. 1998). Track design is another important potential cause of injury during racing. Increasing the radius of corners, the degree of banking, and the placement of inclines on straight sections will reduce strain on the outside leg and consequently reduce low-grade injuries.

Training methods that reduce the load the horse carries may also reduce injury. Using a treadmill or a swimming pool allows the horse to exercise without carrying a rider, whose weight increases the load on the horse's bones (Evans 2002). There are no statistics concerning injuries during training, but because it is estimated that only 50 percent of Thoroughbred foals actually race, the injury rate must be high. The catastrophic injuries, particularly those in televised races, are most likely to be highly publicized. For example Landseer, a Thoroughbred, sustained a fracture during a Breeders Cup race in October 2002 and was euthanized immediately.

Thoroughbreds "off the track," who are no longer usable or profitable for racing, can usually be sold for riding, either as hunters, three-day eventing prospects, or trail/companion horses. Such animals may excel at the very top of competition. Of the seventy horses identified as starters in the 2002 Rolex Kentucky CCI**** (the highest level of international competi-

tion) three-day event, for example, forty-four were identified as Thoroughbreds, including five of the eventual top ten finishers, although not all necessarily ever had raced (Sorge 2002). Nevertheless many Thoroughbreds do eventually end up at slaughter. McGee, Lanier, and Grandin observed 1,473 horses at auction and 1,348 horses at slaughter plants (2001). They found that Thoroughbred or Thoroughbred type horses constituted about 7 percent of all auction horses and 16 percent of all slaughter horses.

Another problem in racing is age-related. Centuries ago the Jockey Club in Britain declared that all Thoroughbred horses would be given a birth date of January 1 to avoid having to print updated programs during the racing season reflecting the changing ages of horses born through the late spring and summer. This tradition is also followed in the United States. Because horses typically begin race training and competition as two and three year olds—far before they mature physically—this tradition has led to breeding mares to give birth earlier and earlier in the calendar year so that the foal will be as old as possible when he or she races. The motivation in turn has led to great advances in the study of equine reproduction, aimed at bringing mares into breeding condition months before the natural spring season. Mares can be "tricked" into spring-like seasonal readiness by the use of artificial light in their barns, but such interference with the natural cycle can cause problems. Some mares are very dangerous during the transition from the non-breeding to the breeding season, when they come into heat but do not ovulate and, hence, are exposed to high levels of estrogen for long periods. Stallions, although less seasonal than mares, can have problems: they are more apt to exhibit poor libido or to "savagely" (aggressively attack) mares bred in the winter than those bred in the spring.

The horses that suffer the most from this unnatural breeding season, however, are the foals. Foals born in

January or February in the northern half of the United States are subjected to cold barn temperatures, which may slow the development of standing and teat seeking. Horses born in New York are more likely than those in Florida to acquire insufficient maternal antibodies (Leblanc et al. 1992). The primary cause of this failure of passive immunity is probably climatic; the foal is slower to move in the cold. Failure of passive immunity allows the foal to fall victim to infections of the umbilical cord, respiratory tract, etc., because he or she has not yet acquired immunological protection. Inclement weather may keep the mare and foal indoors so that the young horse does not learn to recognize his or her mother in a group and does not get the exercise needed for optimum muscle development. A change in the Thoroughbred industry to "true" birthdays would wreak havoc for a year or two but would be in the best interests of the horse.

Standardbred horses, who raced in harness pulling a lightweight two-wheeled cart called a sulky, are not so easy as Thoroughbreds to retrain for other uses because they trot or pace rather than canter, and their gaits are not comfortable for a rider (although some are bought by those who eschew modern technology, such as the Amish and Mennonites, as driving animals). McGee, Lanier, and Grandin (2001) found that 4 percent of the horses at both auctions and slaughter plants were Standardbreds.

An unpublicized welfare issue involves those horses who are successful at racing and/or breeding and therefore are insured for a large amount of money. Insurance companies may insist that an insured horse who suffers from a permanently painful condition be kept alive to avoid paying the horse's value. Conversely an unsuccessful horse may be worth more dead than alive: a 1994 federal investigation of a scheme to kill horses for insurance money resulted in 23 indictments of riders, trainers, and owners (Englade 1996; *Chronicle of the Horse* 1998).

The Pregnant Mare Urine Industry

The use of horses for production of estrogen came to the attention of the public approximately ten years ago. The resulting criticism of the PMU industry and the industry's response are a good example of humane problem solving.

Equine estrogens were, until recently, almost the only substances available for treatment of the symptoms of menopause and the prevention of osteoporosis in women. Other benefits of this so-called hormone replacement therapy were a reduction in the risks of heart disease and age-related cognitive decline. Pregnant mares produce the most estrogens and produce the most between the third and ninth months of their pregnancies. They are, therefore, the mares used in the PMU industry. They foal and are rebred on pasture during the spring and summer. During the fall and winter, the mares are housed in barns in tie stalls while straddling rubber harnesses suspended from the ceiling that are used to collect urine.

Public criticism of the PMU industry focused on the mares' restricted access to water, their lack of exercise during the long months of housing, and the fate of the foals born but not utilized by the PMU industry.

Producers limited the mares' access to water for economic reasons. Because the volume of urine collected from each farm was limited and producers were paid on the basis of grams of estrogen produced, it was in their best economic interest to concentrate the urine. They did so by providing small amounts of water periodically from automatic waterers. Water intake was reduced gradually in the fall, to 3–4 l/100 kg body weight, as compared to 5–6 l/100kg of intake when water is freely available. This degree of water restriction increases osmotic pressure of the plasma and produces clinical signs of dehydration and behavioral signs of increased

motivation for water, but it is not life threatening (Haupt et al. 2001). In response to the negative publicity in the media, however, and criticism by an expert committee invited to tour the farms, the limit on volume of urine collected per farm was eased in 1999. Automatic waterers still are used and controlled, ostensibly to keep the stalls drier and to prevent the mares from dunking their hay into the water. (Hay dunking and playing with an automatic waterer so that the water spills on the floor are annoying behaviors that are tolerated by non-PMU horse owners, but the problem is exacerbated in PMU horses by the close proximity of the hay and water sources.)

In the PMU industry, mares remain in their stalls for days to months at a time because of the inclement weather in north central America during the winter and because of the labor and dangers to the horses involved in removing the harnesses and releasing the horses outside. The issue of lack of exercise has been addressed experimentally by two groups. When released after confinement for two weeks, the industry median time between opportunities for the horse to exercise, mares showed compensatory increases in locomotion in comparison to mares exercised daily. The behaviors in the stalls of exercised and confined mares were similar (Haupt et al. 2001). Physiologically the confined mares were not stressed (Freeman et al. 1999), but in late pregnancy they tended to be more edematous in the legs and abdomen (Haupt et al. 2001). Stereotypic behaviors did not develop in the mares chronically confined in tie stalls, probably because in both studies the horses were provided with free choice hay, which will most closely simulate the natural grazing pattern. Flannigan and Stookey (2002) observed 110 horses on ten PMU farms and found a prevalence of stereotypic behavior of 5 percent, less than that observed by McGreevey et al. (1995a) in box-stalled Thoroughbreds. Although the mares could not lie in lateral recumbency, they could

lie in sternal recumbency (McDonnell et al. 1999). Horses unaccustomed to tie stalls may be reluctant to lie down, but this reluctance is unrelated to the size of the horse: draft horses laid down, but some Thoroughbreds did not (Haupt et al. 2001). Recent studies have shown that horses will work harder for a grain reward than for release from a tie stall and will work as hard for access to another horse as for release from confinement. When tested repeatedly at fifteen-minute intervals after release, horses chose to spend thirty minutes in a paddock with other horses but elected to spend more time if they were confined for more than twenty-four hours (Lee 2000).

The issue that has not been studied is the fate of PMU foals. Originally most of the foals were of draft-breed type, for which there was less of a market, rather than of lighter-build, riding type; they were sold as weanlings and eventually slaughtered for meat after a period in a feedlot. The welfare problems of transport to and handling at slaughterhouses in general have been dealt with, above, but conditions in the feed lots have not been studied. The young horses are not stalled and presumably have plenty of food, but issues of their environment (mud, manure, disease, aggression among the horses, crowding, etc.) have not been addressed. In response to criticism of the PMU industry for producing horses virtually for the meat market, more “light” (as opposed to draft-type) horses now are used for breeding, and some of the resulting foals are being sold as sport or pleasure horses (Freeman 2000). The main problem in selling them is one of timing and location—a large number of foals are available all at one time, which makes them difficult for the existing market to absorb, and they are in North Dakota, Alberta, or Saskatchewan, far from the populous U.S. east and west coasts, where demand would be greater.

Managing the Performance Horse

Horses kept for performance or competition, as well as many companion horses, generally spend a great deal of time intensively housed and managed. The stabled/stalled horse experiences different pressures from those kept less intensively. Although food, water, veterinary care, grooming, and shelter are provided, such conditions deviate considerably from the behavioral patterns of the wild or free-ranging horse. Stereotypic patterns of behavior, such as weaving; cribbing and its associated behavior, wind-sucking; wood-chewing; head-nodding; and stall-walking, are particularly associated with stabling. These sorts of behaviors have been estimated to affect 10 to 40 percent of stabled horses in the United Kingdom (Nicol 1999) and, in general, more of these behaviors are seen in racing Thoroughbreds. Stereotypic behaviors such as these are considered to be abnormal since they represent qualitative and quantitative differences in behavior when compared with the behavior seen among free-living horses. Stereotypes are rarely observed in free-ranging horses, difficult to explain in functional terms, undesirable to horse owners, and considered to be indicative of welfare problems the horse has had or is currently experiencing (Cooper and Mason 1998). The behaviors generally are considered to be “stable vices,” and are viewed as unsoundness, leading to a reduction in a horse’s desirability and value (Haupt 1982; Luescher, McKeown, and Dean 1998).

As more research into the causes of these behaviors is completed, it is becoming clear that the traditional views held about these behaviors are incorrect. When viewed by the layperson, cribbing apparently involves the grasping of a surface (usually horizontal) in the teeth (McGreevy and Nicol 1998a) and the swallowing of air. Cribbing surfaces include hori-

zontal edges of feed and water buckets and wood surfaces such as stall boards and fences (e.g., Winkill et al. 1996). Wind-sucking involves the same contraction of neck muscles and apparent engulfing of air, but without grasping, and often is accompanied by an audible “grunt” (Karlander, Mansson, and Tufvesson 1965; Baker and Kear-Colwell 1974; Kusaari 1983). Traditionally horse owners have believed the horses who crib do so because they are bored and/or hungry. The traditional view is that the horse who is hungry will swallow air while cribbing that will fill his or her stomach. However recent work has demonstrated that horses do not gulp in and swallow air while performing this behavior, as previously believed. When the air movements in the respiratory tracts of wind sucking horses were traced, it became apparent that little or no air is swallowed (McGreevy et al. 1995b).

Recent survey studies have investigated the causes and effects of some commonly observed equine stereotypes (e.g., McGreevy, French, and Nicol 1995; McGreevy et al. 1995a; Luescher et al. 1998; and Redbo et al. 1998). These consistently relate the incidence of stereotypes to a number of management factors, including social isolation and the feeding of concentrates with little access to fiber. Despite the problems inherent in conducting longitudinal studies of the development of stereotypic behavior, the results of work on weaning and on feeding practices following weaning (Nicol 1999) show the importance of feeding fiber and of avoiding high grain diets during early development. Horses have evolved to digest a high fiber diet and to spend up to sixteen hours foraging each day. Intensively managed horses are expected to perform energy-consuming tasks, and they require a controlled diet rich in the nutrients that enable them to do so. Being stabled (stalled) also presents problems in that horses have no control over the timing of their feeding, the type of food, the amount of contact they have with conspecifics or even the amount of

exercise they have. All of these factors lead to problems. The stabled (stalled) horse may be highly motivated to seek social contact or to have access to food, and this can lead to behavioral frustration. Undesirable behavior such as stall-walking and weaving may be the result of the animal attempting to deal with his or her frustration. Providing horses with a high grain diet may ensure that they have enough energy for performance, but a high grain diet has been shown to cause changes in the digestive system (etc.), leading to cribbing (Nicol et al. 2001).

Various studies have been carried out to determine the effectiveness of the current and new methods for dealing with stereotypic behavior. Many stables used for housing racehorses are fitted with weaving bars, or grills, that are supposed to stop (or block) a horse from being able to perform the behavior. Weaving grills (McBride and Cuddeford 2001), anti-cribbing devices (such as collars) (McGreevy and Nicol 1998a), and pharmacological intervention (Dodman et al. 1987) all have been shown to be of little value in permanently stopping the behaviors. Recent studies also have measured the horses' physiological distress responses, such as heart rate and adreno-cortical activity (Broom and Johnson 1983), to test if there are any underlying effects on horse welfare of treatment for stereotypic behavior (Lebelt, Zanella, and Unshelm 1998; McGreevy and Nicol 1998b; McBride and Cuddeford 2001). Generally these studies have found that preventative measures alone cause more problems for the horses, probably because they treat the symptoms rather than the underlying cause of the behavior. The horses appear to be more stressed when prevented from performing the behavior, indicating a compromise of horse welfare. A number of alternative, less invasive approaches have been studied. These include foraging devices designed to allow the horse to "trickle-feed" and "work" for food (e.g., Winkill et al. 1996; Henderson and Waran 2001); feed additives such as fiber and anti-acids (Johnson et al.

1998; Nicol et al. 2001); increased social contact (Cooper, McDonald, and Mills 2000); and even mirrors in the stable (Mills and Davenport in press; McAfee, Mills, and Cooper 2002). Initial results from such studies are encouraging, and further work is required in this area.

Restriction of normal social behavior and the feeding of a low fiber, high grain diet are the two main factors consistently related to the performance of stereotypic behavior in horses. Horses used for performance purposes should be prevented from developing such undesirable behaviors by ensuring that management and housing are considered from the horse's perspective. Horses are social grazing animals. They have physical and behavioral needs (see Cooper and McGreevy 2002) that can be met under conditions of domestication through such measures as feeding high fiber diets, allowing social contact, changing early weaning and feeding practices, giving the animals greater control of their environment, removing restrictions on highly motivated behavior, and understanding the degree to which the horses have had to adapt in order to serve human needs.

Performance-enhancing and Conformation-enhancing Techniques

There are three types of horses: those who labor symbiotically with farmers or ranchers to plow, to handle livestock, or to pull loads; those who live as companion animals and who may or may not have to carry a rider for a few hours a week; and performance horses. Performance horses have a very different relationship with their owners from that of pleasure or companion horses. Although the owner of a performance horse may like or even love the horse, his or her main goal is to

win in competitions. The competition may be conformation, high jumping, barrel racing, or dressage, but in all cases if the horse does not win, an effort will be made to improve performance. Sometimes these efforts involve more training, but at other times the welfare of the horse can be compromised. This is probably more likely to happen when the person who owns the horse and who expects the horse to win is not the same as the trainer or manager whose livelihood depends on satisfying the goals of the owner.

Hoof and Pastern Manipulation

Allowing the horse's hooves to grow to a length incompatible with normal gait in order to obtain an exaggerated gait in the show ring, myectomy (cutting the muscles of the tail), and tail setting harnesses on "gaited" horses such as American Saddlebreds are examples of the at least mildly uncomfortable methods used to improve a horse's performance. If despite these interventions the horse's performance does not improve, he or she is sold as the first step in the descent to auction and perhaps the slaughterhouse.

More invasive are such practices as "soring," in which a caustic compound is applied to the pasterns (above the hooves) of Tennessee Walking horses, then chains linked around the pasterns so that resulting wounds will be abraded as the animal moves. The pain encourages the animals to lift their forelegs high and carry their weight back on their hind quarters in an exaggerated gait, or "lick," an action admired by judges. The Horse Protection Act passed in 1970 prohibits soring, but there is insufficient funding to allow veterinary inspectors to ensure compliance. Lay inspectors are used, but they usually are affiliated with the industry in some way (DeHaven 2000). One suggestion to improve compliance has been to hire veterinarians who are not equine practitioners but who could, after a training course, examine horses at

shows in their immediate area. This would eliminate the need for—and possible conflict of interest by—lay examiners.

Other issues of horse welfare seem to be purely cosmetic but are rooted in competitive advantage. These are exemplified by the treatment of the tails of show horses.

Tail Docking

The original purpose of tail docking, or amputation, may have been to prevent tangling of the tail of a driving horse with the reins, especially if the driver was standing on the ground rather than high above the wagon or carriage. Long tails would interfere with the driver's ability to control the horse while plowing. Another reason for tail docking is convenience of harnessing, since a docked tail does not have to be threaded through the crupper or breeching. Because very few horses are used for plowing in the United States, the only reason for docking today is cosmetic. It is practiced with Hackneys and draft horses. In addition to the immediate pain of docking, horses with shortened tails suffer because they cannot defend themselves from flies. Docked horses also cannot effectively signal aggressiveness by lashing their tails from side to side, or signal exuberance by raising the tail.

Other Tail Manipulations

The tail also is important in showing two different types of performance horses—Arabians and Western pleasure horses (the latter of whom typically are Quarter horses or color-breed horses).

Arabians are judged for their alertness and spirit. An aroused horse, especially a playful one, will carry his or her tail high. Exhibitors may try to mimic that natural high tail carriage by gingering their horses. Gingering involves placing ointment with a high concentration of ginger into the horse's rectum and anus. The horse raises his or her tail in response to the irritation of the chemical. The

process is not only uncomfortable for the horse but also unethical from a competitive standpoint. Although evidence of gingering can be detected by thermograph, the testing technique is too sensitive to use in the field (Turner and Scoggins 1985).

The optimal tail carriage for Western pleasure horses is just the opposite of that of Arabians. The ideal Western pleasure horse is relaxed and submissive to the rider's riding aids (legs, seat, hands, and voice), a state expressed through a flaccid tail. Such a look has been so well rewarded by judges of Western pleasure classes that to achieve it, if not the reality of voluntary submission, unethical exhibitors have enervated the tail by cutting the nerves or have used local anesthesia to temporarily prevent tail lashing. (The latter is often a sign of resistance to the rider's aids and thus a disobedience to be penalized.) Evidence of these practices can be detected electromyographically (Coulter and Luttgén 1994). Other practices to induce calmness are working the horse to near-exhaustion before an event or administering a small dose of a tranquilizer such as acepromazine to chemically calm the animal.

Pleasure Horses

Pleasure horse owners have the closest bonds with their horses. They are most likely to affect their horses' welfare negatively through ignorance of basic horsemanship or an inability to support the horses financially.

An ignorant owner may overfeed a horse, let a horse eat poisonous lawn clippings, or overwork a horse who is out of condition—just a few of the myriad mistakes that can have disastrous consequences to a horse's well-being.

Many young horse owners can barely afford to feed a horse, so that any veterinary care, even preventative, is out of the question. (They may be unaware of the true cost of horse ownership over and above that of the animal's feed. A joint survey by the American Veterinary Medical Association,

American Animal Hospital Association, and Association of American Veterinary Medical Colleges [Brown and Silverman 1999] found that horse owners reported they would pay an average of \$1,827 for a 75 percent chance of curing their horse of an ailment and \$828 for a 10 percent chance. They further reported that they would pay an average of \$165 per month to keep their horse healthy.)

Other horse owners may experience a reversal of fortune or circumstance yet be reluctant to part with a horse due to personal attachment or unwillingness to sell at a loss. The horse's care may suffer as a result.

Carriage Horses

Approximately one thousand to two thousand horses are used to pull carriages in various North American cities (Merriam 2000). The most urgent problem for these horses is heat stress: carriage rides typically are purchased by tourists, and tourists travel during the summer months when temperatures are high. In southern regions, hours of operation should be limited to cooler times of the day and evening. Horses should have access to water every two hours. Walking or, worse yet, trotting on a paved surface, possibly up and down hills, increases the chance of horses developing lameness. Carriage drivers may be ignorant of basic horse health and therefore may not notice lameness, dehydration, signs of colic, or other health or welfare issues. Carriage horses should be examined every few weeks by a veterinarian.

Some horses may suffer from long-term exposure to air pollution, particularly if they are driven in high traffic areas. Use in high traffic areas also can increase the number of horse-automobile collisions. Carriage horses should have their work hours regulated and their living quarters kept clean, well bedded, and ventilated.

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