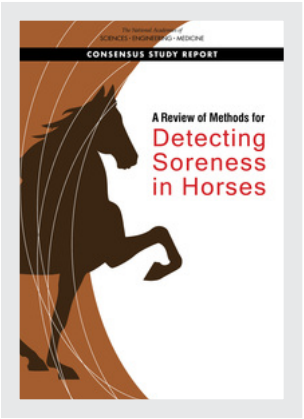

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Committee on a Review of Methods for Detecting Soreness in Horses

Board on Agriculture and Natural Resources

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COMMITTEE ON A REVIEW OF METHODS FOR DETECTING SORENESS IN HORSES

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This Consensus Study Report was reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise. The purpose of this independent review is to provide candid and critical comments that will assist the National Academies of Sciences, Engineering, and Medicine in making each published report as sound as possible and to ensure that it meets the institutional standards for quality, objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process.

We thank the following individuals for their review of this report:

Kent Allen, Virginia Equine Imaging
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Although the reviewers listed above provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations of this report, nor did they see the final draft before its release. The review of this report was overseen by Dr. Brian D. Nielsen, Michigan State University, and Dr. Barbara Schaal (NAS), Washington University in St. Louis. They were responsible for making certain that an independent examination of this report was carried out in accordance with the standards of the National Academies and that all review comments were carefully considered. Responsibility for the final content rests entirely with the authoring committee and the National Academies.

Preface

The Tennessee walking horse (TWH) is an integral part of the American culture of the South, where its origins can be traced to the 18th century. The breed evolved out of necessities for horses used for transportation and utility on the farms and plantations of the southern United States and was known for its stamina, smooth gait, and even disposition. During the last century and today the horse has been used primarily for pleasure and show competition. As the popularity of the TWH grew, so did the desire among owners and trainers to showcase its beauty, quality, and athletic abilities at horse show competitions. Unique and natural to the breed is a smooth four-beat "running walk" gait. In the 1950s the accentuated or exaggerated running walk, known as the "big lick" became popular at high-level competitions. The combination of exaggerated high-action step in front and long stride behind is still considered desirable in today's horse show competitions, and it is often achieved through soring. Soring is the practice of applying a substance or mechanical device to the lower limb of a horse that will create enough pain that the horse will exaggerate its gait to relieve the discomfort. Soring became popular at TWH shows in the mid-20th century, and by 1970 it became enough of a public concern for the welfare of the horse that Congress put into law the Horse Protection Act (HPA). The HPA specifically addresses the practice of soring by prohibiting the showing, exhibition, or sale of TWHs that are found to be sore. Progress has been made, but sadly soring is still being done even after 50 years of HPA enforcement. By all accounts from both the public and equine health and welfare professionals, soring is considered an inhumane practice and must be eliminated.

To the credit of the Tennessee walking horse industry and the U.S. Department of Agriculture (USDA), funding was provided for a National Academies of Sciences, Engineering, and Medicine (the National Academies) committee to conduct a review of the methods for detecting soreness in horses, in hopes of advancing the goal of ultimately eliminating the act of soring in horses and improving the welfare of TWHs.

I want to thank the experienced scientists and clinicians in a variety of equine disciplines who served on the committee for their remarkable dedication to the work involved in preparing this report. Those efforts include hours of literature reviews, multiple committee meetings, working with and learning from numerous presenters who have expertise in various aspects of health and welfare of the horse, and writing working drafts with many edits to make the report readable and of high quality. I also want to thank our wonderful team from the National Academies who worked diligently for many months to keep us on track and gave their total support throughout the entire process. On the committee's behalf, I especially want to thank our study director, Camilla Yandoc Ables, for her assistance through virtually every aspect of the development of this report. Her leadership, knowledge, and determination to assist the committee in every way possible to produce a report that will significantly contribute to the scientific literature for the welfare of these great horses cannot be understated. The committee would also like to thank the rest of the National Academies team, Robin Schoen, Jenna Briscoe, and Sarah Kwon, for their invaluable assistance to the committee. Special thanks to Rachel Reed, representative of the SHOW HIO, for the horse inspection videos; Paul Stromberg and Lynne Cassone for the slides that helped greatly with the review of the scar rule; and the representatives of the study sponsors, Tom Blankenship and Aaron Rhyner, for all the information and assistance they provided to the committee. Last, I want to thank the numerous scientists, equine professionals, individuals previously with the Animal Care Horse Protection Program at USDA's Animal and Plant Health Inspection Service, and members of the public who contributed to the committee's knowledge and understanding of issues important to the study and ultimately to the industry.

Jerry B. Black, *Chair*
Committee on a Review of Methods for Detecting Soreness in Horses

Contents

LIST OF BOXES, FIGURES, AND TABLES

BOXES

FIGURES

TABLES

Summary

The Tennessee walking horse (TWH), a breed that originated in Tennessee more than 100 years ago, is known for its ability to navigate rough terrains with ease, its smooth and easy gaits, and mild and obedient temperament. TWHs are also particularly popular in horse show competitions owing to their unique four-beat running walk and flashy movement. TWH competitions fall into two basic categories: flat-shod and performance. Flat-shod horses wear traditional horseshoes and are judged on brilliance and show presence while still being well mannered, balanced, and manageable. Performance horses are fitted with tall, heavy stacks of pads to accentuate the gait they are best known for, referred to as the "big lick," which draws people to horse shows and is rewarded by horse show judges.

While some trainers of TWHs believe that the big lick can be achieved with hard work, training, and patience, there are also trainers who resort to *soring*, a practice that began in the early 1950s for training TWHs to exaggerate their gait in less time. Soring involves the application of chemical irritants and friction to make the horse's forelegs sore, which causes the horse, when it makes contact with the ground, to flex its forelimbs exaggeratedly and snap them forward—producing the big lick. Because soring gave horses a competitive advantage, the practice became widespread in the 1960s.

Increased public awareness of soring and the resulting backlash prompted the state of Tennessee to enact anti-soring legislation in 1950, which was mostly disregarded by the industry and ultimately not enforced. In 1970 the U.S. Congress declared the practice of soring cruel and inhumane and passed the Horse Protection Act (HPA, 15 U.S.C. §§ 1821-1831), which makes it illegal to exhibit, transport, sell, or auction horses that are known to be sore[1] and authorizes the inspection of horses by U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) personnel. However, with funding limited to about $500,000/year, the ability of APHIS to enforce the HPA nationally was limited. In 1976, Congress amended the HPA which then allowed the Secretary of Agriculture to expand the inspection program. The Secretary subsequently created a program that would permit trained third-party individuals (referred to as designated qualified persons, or DQPs) to conduct horse inspections. The DQP program was established by regulations published in the *Federal Register* in 1979. [2]

APHIS relies on DQPs, horse industry organizations (HIOs), and veterinary medical officers (VMOs, who are APHIS veterinarians) to inspect horses before they are shown, sold, or exhibited in public. A DQP has authority from an HIO[3] to inspect horses or check records for HPA enforcement. After HIOs obtain USDA certification, DQPs are licensed through DQP programs that are administered by HIOs. DQPs are not required to be veterinarians. To ensure that horses are disqualified when soreness is

[1] "The Act states that the term 'sore' when used to describe a horse means that the horse suffers, or can reasonably be expected to suffer, physical pain or distress, inflammation, or lameness when walking, trotting, or otherwise moving as a result of: an irritating or blistering agent applied, internally or externally, by a person to any limb of a horse; any burn, cut, or laceration inflicted by a person on any limb of a horse; any tack, nail, screw, or chemical agent injected by a person into or used by a person on any limb of a horse; or any other substance or device used by a person on any limb of a horse or a practice that a person has engaged in involving a horse." Source: USDA APHIS (2012). (U.S. Department of Agriculture Animal and Plant Health Inspection Service). 2012. Horse Protection Act; requiring horse industry organizations to assess and enforce minimum penalties for violations. *Fed. Reg.* 77: 33607-33619. https://www.federalregister.gov/documents/2012/06/07/2012-13759/horse-protection-act-requiring-horse-industry-organizations-to-assess-and-enforce-minimum-penalties (accessed on October 16, 2019).

[2] APHIS. 2016a. *Horse Protection Act and its administration.* https://www.aphis.usda.gov/aphis/ourfocus/animalwelfare/hpa/ct_hpa_history_and_administration (accessed Feb 13, 2020).

[3] An HIO is an organization engaged in the showing, exhibition, sale, auction, or registration of horses.

A Review of Methods for Detecting Soreness in Horses

detected or when other HPA violations[4] are found and that proper penalties were imposed by the HIO for noncompliance with rules set forth in the HIO rule book,[5] APHIS reviews reports written by show management, HIOs, and DQPs and conducts audits of records maintained by certified DQP programs. VMOs also attend selected horse shows and sales to assess HIOs' inspection procedures and DQPs' performance. VMOs conduct additional unannounced inspections at only very few shows. According to a 2010 audit by the USDA Office of the Inspector General (OIG), in FY 2007, with a $497,000 budget for HPA enforcement, APHIS was able to send VMOs to only 30 (6 percent) of the 463 sanctioned shows throughout the country. The OIG audit also found that the DQP program "was not functioning as intended," noting that DQPs may have conflicts of interest due to their close ties with the industry.

PURPOSE OF THE STUDY AND THE COMMITTEE'S CHARGE

Although VMOs and DQPs use similar methods to inspect horses for soreness, there have been significant disparities between VMO and DQP inspection outcomes. The 2010 USDA OIG audit found that DQPs issue fewer tickets when not being observed by APHIS representatives. There is also a concern within the TWH industry that the determination of soreness is inconsistent between inspectors because the methods themselves may not be reliable. Another focus of debate is the technical merits of the "scar rule" (see Box 1-2 in Chapter 1), which describes lesions on the horse's pastern and fore pastern that suggest a horse has been subjected to soring.

In July 2017, APHIS and the TWH industry jointly requested the National Academies of Sciences, Engineering, and Medicine (NASEM) to oversee an independent study to help ensure that HPA inspection protocols, including protocols for compliance with the scar rule, are based on sound scientific principles that can be applied with consistency and objectivity. The study committee's statement of task is in Box S-1.

To fulfill its charge, the committee reviewed the methods that are currently used by VMOs and DQPs and the methods typically used by equine veterinarians to determine if a horse is experiencing pain. In addition, the committee investigated other methods and technologies that could potentially aid in examining the horse's limbs for soreness. The committee also reviewed the scar rule of HPA to determine if the language of the rule is consistent with current findings relative to dermatopathological changes seen in walking horses examined recently versus when the rule was written over 40 years ago.

FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Horse Inspections by Designated Qualified Persons and Veterinary Medical Officers

Finding 2-1: At shows covered by the Horse Protection Act (HPA), horse inspections are performed by a designated qualified person (DQP) employed by horse industry organizations (HIOs) or, less often, by a USDA veterinary medical officer (VMO) or, in some instances, by both. These individuals have different backgrounds, training, and experience in detecting pain and inflammation in animals. DQPs are not required to have a veterinary degree, and most are not veterinarians. DQPs receive 10 hours of instruction in examining horses from instructors who are not veterinarians. VMOs attended veterinary school for 4 years, and some have private-practice experience prior to being employed by APHIS. Additionally, DQPs are known to have close ties to the industry and may have conflicts of interest (as pointed out in the 2010 OIG audit).

[4] These violations are described in the Horse Protection Regulations in Appendix C of this report.
[5] HIOs are required to submit rule books to APHIS every year.

BOX S-1 Statement of Task

The National Academies of Sciences, Engineering, and Medicine will convene an ad hoc committee of equine veterinarians and experts with relevant experience and appropriate professional certifications or academic degrees to review the scientific and veterinary medical literature on hoof and pastern pain and skin/tissue changes on the pastern of horses and evaluate methods used to identify soreness in horses (as defined in the Horse Protection Act[a] and the implementing regulations) for their scientific validity and reliability. In the course of its study, the committee will:

- examine what is known about the quality and consistency of available methods to identify soreness in horses
- identify potential new and emerging methods, approaches, and technologies for detecting hoof and pastern pain and its causes
- identify research and technology needs to improve the reliability of methods to detect soreness

In a consensus report, the committee will describe its conclusions about the validity and reliability of methods and provide recommendations to improve the efficacy and consistency of approaches to identifying soreness. The report will also review the Horse Protection Act regulations, including the "scar rule" found at 9 C.F.R. § 11.3, and identify changes that would be necessary to implement the findings of the study.

[a]Sore when used to describe a horse means:

(1) An irritating or blistering agent has been applied, internally or externally, by a person to any limb of a horse,
(2) Any burn, cut, or laceration has been inflicted by a person on any limb of a horse,
(3) Any tack, nail, screw, or chemical agent has been injected by a person into or used by a person on any limb of a horse, or
(4) Any other substance or device has been used by a person on any limb of a horse or a person has engaged in a practice involving a horse, and, as a result of such application, infliction, injection, use, or practice, such horse suffers, or can reasonably be expected to suffer, physical pain or distress, inflammation, or lameness when walking, trotting, or otherwise moving, except that such term does not include such an application, infliction, injection, use, or practice in connection with the therapeutic treatment of a horse by or under the supervision of a person licensed to practice veterinary medicine in the State in which such treatment was given.

Finding 2-2: The current horse inspection process for detecting soreness involves observation of the horse's movement and posture and palpation of the limbs, which is the gold standard for detecting local pain and inflammation. These examination methods are known to be valid and reliable when performed by veterinarians who are trained and highly experienced in detecting lameness and pain. They are employed to detect lameness, injury, and pain in all breeds of horses that are used in competitions, shows, recreational riding, work, breeding, and teaching.

Conclusion 2-1: Differences in training and experience account for the discrepancies between VMO and DQP inspection results in past years. This discrepancy will continue to affect inspection outcomes if DQPs are not trained adequately and evaluated for competency by experienced equine veterinarians. Conflicts of interest may also influence decisions of DQPs in finding whether a horse is in compliance with the HPA and in issuing a ticket of violation.

Conclusion 2-2: Physical examination methods are critical in detecting pain when performed by an examiner with sufficient knowledge of normal versus abnormal horse movement and posture and the ways that horses react to palpation if they are in pain. To better detect soreness, it is important that these examinations be done thoroughly using proper techniques and used in conjunction with other diagnostic technologies, tools, and techniques.

A Review of Methods for Detecting Soreness in Horses

Recommendation 2-1: In line with the USDA OIG's recommendation in 2010, the committee strongly recommends that use of DQPs for inspections be discontinued and that only veterinarians, preferably with equine experience, be allowed to examine horses, as is done in other equine competitions.

Recommendation 2-2: If the limited budget for HPA enforcement necessitates continued use of third-party inspectors, they should be veterinarians or equine industry professionals who are screened for potential conflicts of interest and are trained to inspect by APHIS, not by HIOs. This is in line with the rule proposed by APHIS in 2016 and finalized in 2017 but not yet implemented. Training should be done by experienced equine veterinarians, and strict competency evaluations should be conducted to assess the skills and knowledge of trainees before they are given license to inspect horses. Consequences for performing a substandard examination should be strictly enforced, and reports of substandard performance and letters of admonishment should come from APHIS, not HIOs.

Recommendation 2-3: APHIS should adhere to 9 C.F.R. § 11.4(h)(2), which states that reexamination of the horse shall only be granted if the show veterinarian (not the competitor or any other persons) finds sufficient cause.

Methods Used to Detect Soreness

Observation of Horse Movement and Digital Palpation

Finding 2-3: As seen from 61 DQP inspection videos that the committee was allowed to view, inspectors do not carry out a sufficient observation of horse movement. During the visual inspection of the horse's gait, the distance between the two cones is too short and not all horses complete an entire figure 8. The horse takes three or, rarely, four steps around the right cone and may pivot toward the cone on the left. Furthermore, the horse may not complete a sufficient straight-line walk.

Finding 2-4: VMOs are required to perform inspections according to APHIS protocols that are highly prescriptive. Recently APHIS adopted a process wherein a reinspection by a second VMO will automatically occur if the first VMO finds the horse bilaterally sore. This process requires both VMOs to make exactly the same findings before a violation ruling is made.

Finding 2-5: VMOs are required to use the pad of the thumb with only enough pressure to blanch the thumbnail and to follow a specific pattern of applying digital pressure when palpating the horse's limbs during inspection. This prescribed palpation method for VMOs falls short of established protocols for lameness examinations.

Conclusion 2-3: During inspection, ideally a horse should walk around the cones in a figure-8 pattern. Expanding the figure-8 pattern to consist of two adjoining circles, each with a 10-foot radius, would allow for better observation of horse movement. The required straight-line evaluation could be done as the horse is walking to the top of the first circle and then back from the figure 8.

Conclusion 2-4: Prescriptive protocols, if not followed strictly by a VMO, may allow for a possible objection to a VMO's finding by the horse custodian. Moreover, the required inspection by a second VMO may cast doubt on the ability of VMOs to detect pain or other abnormalities and may negatively affect the VMOs' ability to make appropriate judgments.

Conclusion 2-5: The basis of all examinations for pain and lameness is observation and palpation, which are an integral part of determining whether pain is altering gait in a TWH. The strict requirements of following a specified pattern and using only the pad of the thumb with no more pressure than it takes to blanch the thumbnail limit the ability of palpation to detect the presence of limb sensitivity. The

requirement that two VMOs must make exactly the same findings (i.e., sensitive on the lateral pastern but not bulbs of heels or medial pastern) does not consider changes that may occur over time between examinations, how the horse may respond to repeated palpation, or how the presence of foreign substances either parenterally or topically may influence findings over time.

Recommendation 2-4: In digital palpation of distal limbs, the extent of digital pressure need not be prescribed, provided that experienced equine veterinarians are performing the inspections. Use of palpation from the carpus distally to determine the presence or absence of limb sensitivity is well established in other equine competitions. Horses with limb sensitivity in these competitions must be withdrawn for the welfare of the horse and safety of the rider.

Recommendation 2-5: Owing to physiological changes that occur after repeated stimulation of a painful area, inspection protocols should be based on current knowledge of pain perception and should exclude the requirement that horses be repeatedly sore in a specific area to be disqualified.

Testing to Detect Substances that Cause or Mask Soreness

Finding 2-6: Budgetary constraints limit swabbing and testing by APHIS for prohibited substances that cause soreness or that can mask soreness.

Conclusion 2-6: Testing of swabs is an effective method to determine if foreign substances have been applied to the limb of horses to cause soreness or to mask soreness.

Recommendation 2-6: To detect prohibited substances, swabs should be done on a random sampling of horses or on horses that the VMO identifies as suspect from observations made on the grounds of the horse show.

Thermography

Finding 2-7: Thermography, an imaging technique that veterinarians use to detect inflammation and that was used in HPA enforcement in the past, is currently not being used in detecting soreness during horse inspections.

Conclusion 2-7: Thermographic cameras are an objective tool for recognizing alterations in blood flow to the limbs of horses, which is indicative of inflammation. Thermography can be a screening tool in the inspection process and can provide supporting evidence of soreness, which may increase the efficiency and reliability of the inspection process.

Recommendation 2-7: Thermography should be reinstituted in the inspection of TWHs.

Blood Testing to Detect Medications

Finding 2-8: Blood sampling to test for prohibited medications and medications conditionally permitted but given above therapeutic levels is common in equestrian competitions around the world to protect horse welfare and to ensure fairness in competition. Testing is done according to medication rules and guidelines set by a regulatory body based on data on how the use or overuse of these medications can adversely affect the horse or alter its performance. Regulatory bodies, such as the United States Equestrian Federation (USEF) and International Federation for Equestrian Sports require identification of horses by microchip for identity verification, information sharing, and record keeping.

Finding 2-9: Medications given to TWHs are the same as the medications administered to other competition horses and include all of the opioids, sedatives, local anesthetics, and nonsteroidal anti-inflammatory drugs (NSAIDs). These medications (along with their allowable concentrations) have been identified and are tested for by USEF, which has set the standards for medication testing for the entire nonracing equine competition industry in the United States, and other performance horse organizations. Blood testing for medications is not routinely done in TWHs.

Conclusion 2-8: Anti-inflammatory drugs (e.g., NSAIDs), the prevalent type of medication detected in samples from TWHs in 2014, are generally given to horses to treat illness or injury or to alleviate pain in some part of the horse's body. Research indicates that NSAIDs, opioids, and local anesthetics may significantly reduce or abolish a sore horse's response to palpation. Data collected through blood testing to determine the use of NSAIDs, opioids, local anesthetics, or sedatives in TWH competitions could be applied to correlate the use of these drugs in horses that are or are not identified as being sore.

Recommendation 2-8: Serious consideration should be given to testing blood of TWHs, using USEF's rules and guidelines as a model, to detect medications administered to alter TWH response to palpation and for overall protection of TWH welfare and ensuring fair competitions. This would include random selection of horses, identified by microchip, at shows or sales. Championship shows should require testing of winning horses as well as randomly selected competing horses.

Variability of Pain Expression

Finding 3-1: Individual horses differ in perception and expression of pain. These differences are influenced by such factors as distractions and stressors in the immediate environment and the horse's genetics, training history, temperament, and coping style.

Finding 3-2: Research has shown that horses' responses to environmental stressors tend to overshadow their responses to pain. Hence, pain assessment scales used in veterinary research and practice recommend observing the horse in a quiet environment to ensure that the findings are valid and reliable.

Finding 3-3: Observation of 61 inspection videos revealed that some inspections were conducted in relatively quiet locations during a show whereas others were conducted in locations with loud noises and large numbers of people and other horses moving around nearby.

Finding 3-4: The "pain inhibits pain" effect (i.e., conditioned pain modulation) occurs when the pain of interest is inhibited by a pain induced in a different part of the horse's body. During inspection, it is possible that pain in the lower limb and hoof that is being evaluated could be inhibited if the horse also experiences pain because of how it is being restrained by the custodian.

Finding 3-5: Observation of 61 inspection videos revealed numerous incidents of stewarding during the standing inspection that were not dealt with by the inspector. Stewarding may have simply been out of habit or to prevent or control the horse's restless behavior. Examples of stewarding included holding the reins closer than 18 inches from the bit, often just below or on the shank. In some cases, the horse was restrained with constant tension, often with the reins held in an upward direction, or the reins were pulled sharply. These restraint tactics create a distraction during the palpation procedure and can induce pain in the oral cavity, and they violate Horse Protection Regulations.

Conclusion 3-1: Environmental distractions present during horse inspections can result in the inspector reaching inaccurate conclusions regarding soreness. Distractions and stressors can inhibit a horse's sensitivity to and expression of pain, such that detection of soreness would be missed, or a horse's reaction to distractions could be incorrectly attributed to pain. Moreover, when more than one inspector

examines the horse, its behavior may differ between the two inspections if the number and type of distractions and stressors at that location and time also differ.

Conclusion 3-2: Pain or discomfort can be caused by restraint during an inspection. Some restraint methods create acute oral cavity pain that can inhibit limb and hoof pain. How a horse is restrained during an inspection may differ between inspectors and could result in different observations and conclusions about the same horse.

Recommendation 3-1: Designating an inspection area that has as few distractions as possible will reduce the effect of the environment on the horse's response to pain during examination. It is important that inspectors observe the horse's response to the show environment and to restraint before starting the inspection and consider the horse's behavior in the decision-making process.

Recommendation 3-2: To help improve accuracy of soreness detection, the inspector should ensure that custodians are following guidelines that prohibit stewarding while the horse is being inspected and should closely monitor horse custodians for violations.

Behavioral Assessment of Pain

Finding 3-6: DQPs are directed to observe the horse for responses to pain during the inspection process in 9 C.F.R. § 11.21. Some information about behavioral indicators of pain appear in the APHIS training material for DQPs. However, the training material lists "abnormal reactions of the eye, ears, and head in response to palpation." The term "abnormal" is unnecessarily vague, given that specific facial expressions indicative of pain have been described in clinical research literature.

Finding 3-7: Pain can be detected accurately and consistently when it is assessed using physical, physiological, and behavioral parameters that are based on validated clinical scales.

Finding 3-8: Clinical research in horses under veterinary care for laminitis and orthopedic injuries has confirmed that pain assessment using the withdrawal response to palpation is an accurate and reliable method for identifying pain, with very high agreement between raters.

Finding 3-9: Horse Protection Regulations do not include current information about equine pain behavior and its application to clinical practice. Facial grimace scales have long been used in human medicine to assess pain in infants and young children and are currently used in laboratory animal research and veterinary care to assess pain and welfare state.

Finding 3-10: Some horses displayed a facial grimace during standing inspection in the 61 videos provided to the committee. However, the videos also showed that various factors, such as dim lighting, a horse's dark color, and an inspector's body position and direction of gaze while palpating the limb, may prevent a single inspector from simultaneously palpating the forelimb and observing the horse's facial expression.

Conclusion 3-3: A common set of objective criteria grounded in behavioral science, including facial expressions indicative of pain, is lacking from inspector training. Thus, an inspector's interpretation of a horse's behavior is subjective, but it can influence a determination of soreness.

Conclusion 3-4: Research is needed to determine the utility of assessing facial expression of pain in TWHs as part of the inspection procedure before use of facial expressions can be proposed as an additional method for detecting soreness. It is important to know if facial grimace can be reliably identified by different inspectors. It is also important to determine the extent to which the facial

expressions of pain correspond to current evidence of soreness during inspections, such as withdrawal responses to digital palpation and findings of noncompliance with the scar rule criteria.

Conclusion 3-5: One practical limitation to including facial expressions to assess pain during digital palpation is the challenge an inspector might have of simultaneously observing the horse's face and forelimb.

Conclusion 3-6: In clinical research, agreement between raters on horses' responses to digital palpation is consistently high. While agreement may be lower when palpation is carried out in a show environment, differences between inspectors' findings are more likely to result from inadequate training and inconsistent application of technique than from the validity of the pain assessment procedure itself. Another factor might be conflict of interest, which the USDA OIG 2010 audit found was an influence on how DQPs conducted inspections.

Recommendation 3-3: Pain assessment using facial expressions is a new area of research, and scientific investigations of these methods have not been performed in TWHs. However, evidence supports the use of facial expressions of pain as supplemental information if video is available to review or if a second inspector is present.

Recommendation 3-4: To improve consistency across inspectors, science-based information about behavioral indicators of pain in horses should be incorporated into inspectors' training.

Recommendation 3-5: Research is needed to study validity and potential utility of using facial grimace for assessing pain in TWHs and to distinguish pain from other sources of distress. To accomplish this, researchers could, under show conditions, apply new clinical pain assessment technologies and score the horse's behavior and facial expressions during the inspection. Facial expressions of pain are expected to correlate with findings from other currently used methods to detect soreness, such as palpation. For this purpose, it is important to capture the horse's head in the inspection videos.

Pain Assessment Using Physiological Parameters

Finding 3-11: Physiological parameters (e.g., heart rate, respiratory rate, body temperature, and blood pressure) have been used extensively to assess pain in horses and humans. They are objective and can be measured easily and repeatably; however, they have low specificity for pain, vary across individuals, and fluctuate between measurements.

Finding 3-12: Most physiological measures do not discriminate between pain and other sources of autonomic arousal. Changes in physiological parameters, while indicative of pain, may also be due to physical exertion, excitement, stress, dehydration, hyperthermia, or certain medications.

Finding 3-13: Ocular thermography has been shown to discriminate between pain and distress in calves undergoing castration. It has also been used to quantify stress in horses during athletic performance and in horses that wear tight nosebands.

Conclusion 3-7: The show environment and other conditions during inspections may cause physiological changes in horses that mirror those seen in pain, thus limiting utility of physiological parameters to help detect if a horse is experiencing soreness.

Conclusion 3-8: Although often included as predictors in composite pain scales to bolster their validity and reliability, physiological parameters are not meant to be used in isolation to detect pain, but instead should be integrated with other measures in a multimodal approach.

Conclusion 3-9: The potential of ocular thermography to help differentiate between pain and stress in TWHs and its utility in detecting soreness warrant further investigation.

Clinical Assessment of Pain

Finding 3-14: Pressure algometry has been used to determine pain thresholds in TWHs that are not sore. A study[6] has shown that TWHs that were not sore responded with a withdrawal reflex only to pressures greater than 10 kg/cm^2 (10 times greater than the pressure needed to blanch the thumbnail, which is what APHIS VMOs are prescribed to apply when palpating horses during inspections at TWH shows).

Finding 3-15: There is a lack of kinetic and kinematic research studies in TWHs that are needed to establish gait characteristics of TWHs that are and are not sore.

Conclusion 3-10: The absence of studies to differentiate pain from stress in TWHs indicates a need for further research.

Conclusion 3-11: Further research is needed on using pressure algometry in TWHs with sore limbs. Kinetic and kinematic research in normal TWHs and those with sore limbs is also needed to establish gait characteristics in this breed.

Recommendation 3-6: The decision to disqualify a horse due to soreness should be driven by an experienced veterinarian, such as a VMO, and should be based on diagnosis of local pain detected on palpation but should also include a more thorough gait or lameness assessment to identify other sources of pain. Signs of pain that should be observed include excessive quietness or restlessness, low head carriage, weight shifting, pointing a front limb or resting a hind limb, standing hunched over or camped out and looking at a painful area, bruxism, sweating, and muscle fasciculations.

Review of the Scar Rule

Finding 4-1: Evaluation of skin samples collected from TWHs that were found to be noncompliant with the scar rule indicated variable (moderate to severe) epidermal hyperplasia (clinically evident thickening and roughness or lichenification) in the form of acanthosis (thickening of the stratum spinosum layer of the epidermis) and variable degrees of hyperkeratosis (thickening of the stratum corneum layer of the epidermis). These skin changes are not incidental or insignificant and do not represent the normal character of the palmar aspect of the horse's pastern. In addition, skin changes seen on the pasterns of TWHs are not observed on those of other breeds of horses, which also train with action devices but usually of lower weight compared to those used on TWHs.

Finding 4-2: The changes of hyperkeratosis and acanthosis, which were prominent in the biopsy specimens, do not normally occur without a previously inflicted injury on the pasterns. These changes are recognized as secondary, chronic lesions, and they do not provide clear evidence of the initial injury to the skin leading to these changes. They are, however, expected to correlate with the grossly detectable lesions of irregular epidermal thickening known as lichenification, a pathologic change most often caused by rubbing, scratching, or some other repeated trauma to the skin.

Conclusion 4-1: The primary injury to the pastern of horses from which skin samples were collected or of any of the TWHs presenting with lichenification of the skin of the palmar aspect of the pastern is not known. It is possible that action devices alone worn by walking horses could have led to the formation of

[6] Haussler, K. K., T. H. Behre, and A. E. Hill. 2008. Mechanical nociceptive thresholds within the pastern region of Tennessee walking horses. *Equine Veterinary Journal* 40(5):455–459.

A Review of Methods for Detecting Soreness in Horses

these lesions; however, this seems highly unlikely if the federal regulation limiting the weight of the action device to 6 ounces was followed.

Conclusion 4-2: More studies are needed to determine if training practices that can cause soreness in TWHs also result in lichenification. A longer-term observation of horses that are subjected to training conditions identical to TWHs training for competition but without use of any chemicals or other agents known to have been used for soring is needed. These studies might elucidate at what point, if at all, during training epidermal hyperplasia and lichenification would develop and what particular training practices would cause these conditions. It is important that observations include periodic biopsy of the palmar aspect of the pastern to check for microscopic changes.

Conclusion 4-3: Studies are also needed to determine if epidermal thickening (hyperplasia) and lichenification are solely caused by the action devices worn by TWHs. This would require observing pasterns of walking horses that were not trained for competition but were made to wear action devices under circumstances identical to TWHs in training for competition.

Finding 4-3: The Horse Protection Regulations and scar rule were written without any microscopic evaluation of skin lesions from horses suspected of being sore. The scar rule language was based on a clinical evaluation of the skin only and has not been reviewed since its inclusion in the regulations.

Conclusion 4-4: The scar rule language is based on the assumption that certain lesions exist microscopically and that those lesions can be detected by gross clinical dermatologic examination and also that the terms used in the scar rule were used appropriately. In addition, it is assumed that the rule can be interpreted and applied in a consistent manner by VMOs and DQPs tasked with examination of horses for scar rule violations. None of these assumptions hold true today, and therefore the rule as written is not enforceable.

Conclusion 4-5: The scar rule language needs to be based on what can accurately be assessed by a gross examination, which ideally would only be performed by an experienced equine practitioner.

Recommendation 4-1: Regardless of why the scar rule was written with limited information and limited expertise in pathological changes in the skin, the committee recommends that the rule be revised. The committee's proposed language is as follows:

> A trained inspector should examine skin of the front limb of the horse from the knee (carpus) to the hoof with particular attention to skin of pastern and fetlock and the coronary band. All areas of skin from carpus to hoof of both limbs should be free of foreign substances such as dyes, hair fillers, ointments, and other substances designed to camouflage scar rule violations during pre- and post-show inspections. Detection of previously approved substances such as lubricants during post-competition inspection does not constitute a violation. There should be no chemical smell emanating from the skin and no substance present that can be rubbed off onto the hands or a cloth. Skin should be haired with no areas of loss of hair, patchy or diffuse. There can be no swelling, redness, excoriation, erosions, ulcers, seeping of fluids, or signs of a response to chronic injury such as epidermal thickening or presence of scales. Photo documentation of lesions, identifying information about the horse, and a date should be provided for any horse determined to be or suspected of being in violation of the scar rule.

1

Introduction

THE TENNESSEE WALKING HORSE

The Tennessee walking horse (TWH), also referred to as Tennessee walker, is a breed of horse that originated in Tennessee more than 100 years ago through a selective breeding process that initially combined the traits of the Narragansett Pacer and Canadian Pacer to produce a horse that could navigate rough terrains with ease (Menard et al., 2010). Later, the Morgan, Standardbred, Thoroughbred, and American Saddlebred were added to the breeding line to improve stamina (Mizell and Robboy, 1980; Menard et al., 2010). The breeding process ultimately produced a horse with smooth and easy gaits and a mild and obedient temperament (Mizell and Robboy, 1980; Kenerson and Moore, 2004; Menard et al., 2010).

Popularity in Horse Show Competitions

TWHs are popular in horse show competitions due to their unique four-beat running walk and flashy movement. A 2004 survey found that there were about 62,000 TWHs in the state of Tennessee, of which 15,500 were used for competition/horse shows, 24,900 were used for pleasure/sport, 14,900 were used for breeding, and 6,700 were used for other purposes such as agricultural work, teaching, and rider training (Kenerson and Moore, 2004). The calculated total annual economic impact from horse shows and events in Tennessee is approximately $45 million (Menard et al., 2010). Horse shows and events not only generate revenue for the state and local economies, they also provide substantial payouts to TWH owners and trainers when their horse wins or performs well in a particular class or division (Mizell and Robboy, 1980). In 2016 the total purse money at the National Tennessee Walking Horse Celebration was over $100,000, with prize money for each class ranging from $750 to $15,000. In 2017 over $15,000 was awarded to the jackpot winner at the International Grand Champion Walking Horse Show, another major TWH competition which is held in Murfreesboro, Tennessee (Medford, 2019).

Achieving the Accentuated Gait (the "Big Lick")

The two basic categories of TWH competitions are *flat-shod* and *performance*. Flat-shod horses wear traditional horseshoes and are judged on brilliance and show presence while still being well mannered, balanced, and manageable.[1] Performance horses are fitted with tall, heavy stacks of pads to accentuate their gait (Tennessee Historical Society, n.d.). Performance horses are known for their accentuated gait, referred to as the big lick, which draws people to horse shows and is rewarded by horse show judges (DeHaven, 1999).

There are trainers of TWHs who believe that the big lick can be achieved with hard work, training, and patience (DeHaven, 1999),[2] but in the early 1950s some TWH owners and trainers began to

[1] https://en.wikipedia.org/wiki/Tennessee_Walking_Horse (accessed November 15, 2019).

[2] There are claims that the big lick can only be achieved if the horses are sored. See interview with former TWH trainer at https://www.humanesociety.org/news/hsus-releases-exclusive-video-interview-convicted-horse-abuser (accessed February 12, 2020).

employ methods, referred to as "soring,"[3] to produce the accentuated gait in less time (Mizell and Robboy, 1980; APHIS, 2012a). Soring involves the application of chemical irritants and friction to make a horse's forelegs sore, so that when the horse makes contact with the ground it flexes its forelimbs exaggeratedly and snaps them forward—producing the big lick. Because soring gave horses a competitive advantage, the practice became widespread in the 1960s (APHIS, 2012a).

Chemicals that are used to make the horse's forelegs sore include mustard oil, croton oil, diesel fuel, gasoline, turpentine, cinnamon oil, kerosene, or corrosive hand cleansers. In training the horse to accentuate its gait, once such a chemical is applied, friction is created on the chemically treated areas by fastening chains to the forelegs. Alternatively, the forelegs can be made sore without the use of irritants through an extensive use of mechanical devices or action devices (DeHaven, 1999). Mechanical devices include performance packages (or stacks, which are multiple pads between hoof and horseshoe) and action devices (bracelet-like chains or rollers placed around the pastern).[4] Trimming the hoof to expose sensitive tissues and tightly nailing on a shoe, inserting a hard object between the pad and the sole to exert pressure on the sensitive tissue (pressure shoeing), and over-tightening metal hoof bands to cause pressure on the hoof capsule have also been done to make a horse accentuate its gait (HSUS, n.d.; APHIS, 2012a).

Methods for Passing Inspections

Trainers and owners who practice soring do so to gain a competitive advantage in the show ring. However, for horses to be allowed to compete, they must first pass inspections designed to detect if horses are sore. Thus trainers and owners of sore horses have devised various methods to pass these inspections, including, for example, applying topical anesthetics to the forelegs to numb them transiently for the inspection. Other methods include training horses to not react to palpation by inflicting pain on other body parts (such as the tongue) and diverting the horse's attention elsewhere to distract it from reacting to palpation. Some trainers apply salicylic acid topically to make a previously inflicted injury or lesions less visible, which causes additional pain, inflammation, and redness. Colored powders, inks, or dyes are then applied to mask the inflammation and redness or impart color to the areas of the skin that have lost hair or pigmentation (DeHaven, 1999).

THE HORSE PROTECTION ACT OF 1970

Increased public awareness of soring and the resulting backlash prompted the state of Tennessee to enact anti-soring legislation in 1950; however, the legislation was mostly disregarded by industry and was ultimately not enforced (DeHaven, 1999). In 1970 the U.S. Congress declared the practice of soring cruel and inhumane and passed the Horse Protection Act (HPA, 15 U.S.C. §§ 1821-1831). The HPA makes it illegal to exhibit, transport, sell, or auction horses that are known to be sore[5] and authorizes the inspection of horses by the U.S. Department of Agriculture Animal and Plant Health Inspection Service (APHIS) personnel. However, with its funding from Congress limited to about $500,000/year, the ability of APHIS to enforce the HPA nationally was limited (DeHaven, 1999). In 1976 an amendment by Congress to the HPA (P.L. 94-360) allowed the Secretary of Agriculture to expand the inspection program (APHIS, 2016a). Following this amendment, the Secretary created a program that would permit trained third-party individuals (referred to as designated qualified persons or DQPs) to conduct horse

[3] According to Mizell and Robboy (1980), the practice of soring dates to the 1930s, though the popularity of its use began to increase in the early 1950s.

[4] See https://en.wikipedia.org/wiki/Soring for information on hoof trimming and pressure shoeing techniques.

[5] "The Act states that the term 'sore' when used to describe a horse means that the horse suffers—or can reasonably be expected to suffer—physical pain or distress, inflammation, or lameness when walking, trotting, or otherwise moving as a result of: an irritating or blistering agent applied, internally or externally, by a person to any limb of a horse; any burn, cut, or laceration inflicted by a person on any limb of a horse; any tack, nail, screw, or chemical agent injected by a person into or used by a person on any limb of a horse; or any other substance or device used by a person on any limb of a horse or a person has engaged in a practice involving a horse" (APHIS, 2012b).

inspections. The DQP program was established by regulations published in the *Federal Register* in 1979 (APHIS, 2016a). Box 1-1 lists other amendments to the HPA along with various other efforts to improve the protection of horses.

BOX 1-1 Horse Protection Efforts in the United States (1970 to 2019)

1970 – Congress enacted the Horse Protection Act (HPA).

1976 – HPA amendments established the Designated Qualified Person (DQP) program (industry self-regulation).

1979 – The DQP program was established by regulations published in the *Federal Register*.

1999 – The U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) Animal Care programs successfully negotiated a cooperative enforcement agreement with the horse industry for horse industry organizations (HIOs) to partner with Animal Care officials in the enforcement of the HPA.

2008 – The American Association of Equine Practitioners (AAEP) followed up on its 2003 policy opposing the soring of horses, releasing a white paper on veterinary recommendations for ending the soring of Tennessee walking horses (AAEP, 2008).

2010 – The USDA Office of Inspector General audited APHIS oversight of the Horse Protection Program and found that self-regulation was inadequate for ensuring that horses are not abused; it advised abolishing the HIO/DQP system (USDA OIG, 2010).

2012 (June) – The American Veterinary Medical Association (AVMA) and AAEP issued a joint statement recommending a ban on action devices and performance packages for TWHs and called for additional funding for the enforcement of the HPA.

2012 (Sept.) – H.R. 6388, the Horse Protection Act Amendments of 2012, was introduced and supported by AVMA and AAEP. This amendment sought to designate additional unlawful acts under the act, to strengthen penalties for violations of the act, and to improve USDA enforcement of the act (U.S. Congress, House, 2012).

2013 (April) – H.R. 1518 and S. 1406, the Prevent All Soring Tactics (PAST) Act of 2013, was introduced and supported by AVMA and AAEP. The Act contains the following specific provisions:

- Defines "action device" to include any boot, collar, chain, roller, or other device that encircles or is placed upon the lower extremity of the leg of a horse.
- Creates a penalty structure that requires horses to be disqualified for increasing periods of time based on the number of violations (from 180 days to 3 years).
- Requires USDA to license, train, assign, and oversee inspectors enforcing the HPA.
- Makes the actual act of soring or directing another person to cause a horse to become sore illegal.
- Prohibits the use of action devices on any limb of Tennessee walking horses, spotted saddle horses, or racking horses at horse shows, exhibitions, sales, or auctions. Also bans weighted shoes, pads, wedges, hoof bands, or other devices that are not strictly protective or therapeutic in nature.
- Increases civil and criminal penalties for violation.
- Allows for permanent disqualification for violators on their third or higher violation (AVMA, 2013).

2016 (July) – APHIS issued a proposed rule that amends the Horse Protection Regulations (APHIS, 2016c); the proposed rule called for APHIS to train and license DQPs to inspect horses at horse shows, exhibitions, sales, and auctions for compliance with the Horse Protection Act. This proposed rule was finalized on January 11, 2017 (APHIS, 2016b) but was withdrawn by USDA under the freeze on pending regulations implemented by the incoming administration. This rule is currently pending.

(Continued)

A Review of Methods for Detecting Soreness in Horses

BOX 1-1 Continued

2017–2018 – H.R.1338, Horse Protection Amendments Act. This bill, which was not supported by AVMA, AAEP, and the American Horse Council (AHC), amends the Horse Protection Act to replace the designated qualified persons program responsible for inspecting horses for soring with a new inspection system. Other provisions include the following:

- The Department of Agriculture must establish a single HIO in order to establish a formal affiliation with the management of each horse sale, horse exhibition, and auction; appoint inspectors to conduct inspections; and otherwise ensure compliance with the Horse Protection Act.
- The commissioners of agriculture for Tennessee and Kentucky must appoint individuals to the HIO. Those individuals must appoint individuals representing the Tennessee walking horse industry.

2019 (July) – H.R. 693, U.S. Senator Joseph D. Tydings Memorial Prevent All Soring Tactics (PAST) Act of 2019, which makes the actual act of soring illegal, was passed in the House (July 25, 2019) and was supported by AVMA and AAEP. For information on the provisions of the PAST Act, see AVMA (2013).

July 29, 2019 (latest action) – PAST Act was received in the Senate, read twice, and referred to the Committee on Commerce, Science, and Transportation (U.S. Congress, House, 2019).

The HPA was enacted specifically to protect the welfare of gaited horses, such as the TWH, by prohibiting the showing, exhibition, or sale of horses that experience soreness or that have been subjected to methods to make them sore. Other horse breeds (i.e., thoroughbreds, Arabians, quarter horses, sport horses, etc.) that compete in sanctioned shows (i.e., shows that are officially recognized by horse show sanctioning organizations, such as the International Federation for Equestrian Sports (FEI) and the U.S. Equestrian Federation (USEF), are tested for drugs and prohibited substances in and out of competition and may be inspected for soundness (fitness to compete) by veterinarians who are hired by the sanctioning organization. Shows that feature TWHs are not sanctioned shows under one umbrella organization; hence the horses are not subject to any exam or testing that is administered by a sanctioning organization.

Enforcement of the Horse Protection Act

The Role of DQPs, HIOs, and VMOs

APHIS relies on DQPs, horse industry organizations (HIOs), and veterinary medical officers (VMOs; APHIS veterinarians) to inspect horses before they are shown, sold, or exhibited in public. A DQP is an individual (usually a farrier, trainer, or an individual with a basic knowledge of horses and the equine industry; see Chapter 2 for DQP qualifications) who has authority from an HIO[6] to determine if horses are sore or to inspect horses or check records for the enforcement of the HPA. DQPs are licensed through DQP programs administered by HIOs after these organizations have obtained USDA certification (see Chapter 2 for more information on USDA certification requirements). A DQP program that does not comply with Horse Protection Regulations will not be certified or will be de-certified by the USDA. Affiliating with a certified HIO and having DQPs at horse shows or sales *is not mandatory*, but show and sale managers opt to have DQPs at their events to reduce their liability under the HPA in case a horse that is sore is shown or sold. Show managers and other responsible personnel who do not affiliate with certified HIOs and have no DQPs at their show or sale are held accountable for any HPA violations observed at their events (APHIS, 2020).

To ensure that horses are disqualified when soreness is detected or when other HPA violations are found and that proper penalties were imposed by the HIO for noncompliance with rules set forth in the

[6] An HIO is an organization that is engaged in the showing, exhibition, sale, auction, or registration of horses.

HIO rule book,[7] APHIS reviews show management, HIO, and DQP reports and conducts audits of records that are maintained by certified DQP programs. In addition, VMOs attend selected horse shows and sales to assess the inspection procedures of the HIOs as well as DQP performance (APHIS, 2018). Owing to budget constraints, VMOs typically only conduct additional unannounced inspections at very few shows (less than 10 percent) annually (AAEP and AVMA, 2015). In fiscal year 2007, with a budget of $497,000 for HPA enforcement, APHIS was able to send VMOs to only 30 (6 percent) of the 463 sanctioned shows throughout the country (USDA OIG, 2010).

While the DQP program has expanded the coverage of HPA enforcement beyond what APHIS alone can cover, a 2010 audit conducted by the USDA Office of Inspector General (OIG) found that the DQP program "was not functioning as intended." The resulting report explains the DQPs' conflict of interest in this way:

> DQPs realize that by ticketing horse exhibitors, or by excluding horses from a show, they are not likely to please their employers—who are interested in putting on a profitable show. DQPs are also likely to be exhibitors themselves, and so while they may be inspecting horses at one show, they could be exhibiting horses at another. If they inspected other exhibitors' horses rigorously, they might find their own horses subjected to much more strenuous inspections at other shows (USDA OIG, 2010).

PURPOSE OF THE STUDY AND THE COMMITTEE'S CHARGE

Horse inspections are performed by VMOs and DQPs using similar methods—that is, visual inspection of the horse's gait, palpation of the horse's front legs to determine soreness, and examination of the skin on the forelimbs for evidence of previously inflicted lesions or prohibited substances that cause or mask soreness. However, even though the two types of inspectors employ the same methods, there have been significant disparities between VMO and DQP inspection outcomes. According to the 2010 OIG audit, DQPs issue fewer tickets when not being observed by APHIS representatives. From 2005 to 2008, DQPs were found to have issued almost half of all their violations at the shows that APHIS attended (USDA OIG, 2010), which represented only 6 percent of all shows monitored by DQPs. Additionally, there is concern within the walking horse industry that the determination of soreness in a horse is inconsistent between inspectors because the methods themselves may not be reliable. Another focus of debate is the technical merits of the "scar rule" (see Box 1-2), which specifies that a horse will be considered to be sore if certain types of lesions are found on the horse's pastern or fore pastern.

BOX 1-2 9 C.F.R. § 11.3 Scar Rule

The scar rule applies to all horses born on or after October 1, 1975. Horses subject to this rule that do not meet the following scar rule criteria shall be considered to be "sore" and are subject to all prohibitions of section 5 of the Act. The scar rule criteria are as follows:

(a) The anterior and anterior-lateral surfaces of the fore pasterns (extensor surface) must be free of bilateral granulomas[a] other bilateral pathological evidence of inflammation, and other bilateral evidence of abuse indicative of soring including, but not limited to, excessive loss of hair.

(b) The posterior surfaces of the pasterns (flexor surface), including the sulcus or "pocket" may show bilateral areas of uniformly thickened epithelial tissue if such areas are free of proliferating granuloma tissue, irritation, moisture, edema, or other evidence of inflammation.

[a] Granuloma is defined as any one of a rather large group of fairly distinctive focal lesions that are formed as a result of inflammatory reactions caused by biological, chemical, or physical agents.

SOURCE: https://www.law.cornell.edu/cfr/text/9/11.3 (accessed November 19, 2019).

[7] HIOs are required to submit a rule book to APHIS every year.

In July 2017, APHIS and the Tennessee walking horse industry jointly requested the National Academies of Sciences, Engineering, and Medicine to oversee an independent study that would help ensure that HPA inspection protocols, including protocols for compliance with the scar rule, are based on sound scientific principles that can be applied with consistency and objectivity. The committee's statement of task is presented in Box 1-3.

COMMITTEE'S APPROACH TO ITS CHARGE

Committee Formation

Individuals appointed to the committee were chosen for their individual expertise and the relevance of their experience and knowledge to the statement of task, not their affiliation with any institution. All committee members volunteer their time to serve on a study. Areas of expertise represented on the committee included equine veterinary medicine, animal behavior, dermatopathology, pain detection technologies, horse show, horse racing, and horse walking experience, farriery, and the HPA. Biographies of the committee members are in Appendix A of this report.

BOX 1-3 Statement of Task

The National Academies of Sciences, Engineering, and Medicine will convene an ad hoc committee of equine veterinarians and experts with relevant experience and appropriate professional certifications or academic degrees to review the scientific and veterinary medical literature on hoof and pastern pain and skin/tissue changes on the pastern of horses and evaluate methods used to identify soreness in horses (as defined in the Horse Protection Act[a] and the implementing regulations) for their scientific validity and reliability. In the course of its study the committee will:

- examine what is known about the quality and consistency of available methods to identify soreness in horses
- identify potential new and emerging methods, approaches, and technologies for detecting hoof and pastern pain and its causes
- identify research and technology needs to improve the reliability of methods to detect soreness.

In a consensus report the committee will describe its conclusions about the validity and reliability of methods and provide recommendations to improve the efficacy and consistency of approaches to identifying soreness. The report will also review the Horse Protection Act regulations, including the "scar rule" found at 9. C.F.R. §11.3 and identify changes that would be necessary to implement the findings of the study.

[a]Sore when used to describe a horse means:

(1) An irritating or blistering agent has been applied, internally or externally by a person to any limb of a horse,
(2) Any burn, cut, or laceration has been inflicted by a person on any limb of a horse,
(3) Any tack, nail, screw, or chemical agent has been injected by a person into or used by a person on any limb of a horse, or
(4) Any other substance or device has been used by a person on any limb of a horse or a person has engaged in a practice involving a horse, and, as a result of such application, infliction, injection, use, or practice, such horse suffers, or can reasonably be expected to suffer, physical pain or distress, inflammation, or lameness when walking, trotting, or otherwise moving, except that such term does not include such an application, infliction, injection, use, or practice in connection with the therapeutic treatment of a horse by or under the supervision of a person licensed to practice veterinary medicine in the State in which such treatment was given.

Scope of Review and Guiding Principle

In accordance with the committee's charge, the committee reviewed the methods that are currently used by VMOs and DQPs and methods typically used by equine veterinarians to determine if a horse is experiencing pain and soreness. In addition, the committee investigated other pain assessment methods and technologies that could potentially aid in the examination of a horse's limbs for soreness.

The committee also reviewed the scar rule of the Horse Protection Regulations to determine if the language of the rule is consistent with current findings relative to dermatopathological changes seen in walking horses examined recently versus when the rule was written over 40 years ago.

The committee conducted this study with the protection of the horse's welfare as the guiding principle in all of its discussions and ultimately in the recommendations put forth in the committee's final report. These recommendations are for the consideration of APHIS and other parties responsible for protecting horse welfare through the HPA.

Deliberations and Information-Gathering Activities

To address its charge, the committee deliberated from September 2019 to September 2020, holding five meetings (four were virtual and were held on October 16, 2019, and on January 30, May 7, and June 4 in 2020, while one was an in-person meeting held on February 18–19, 2020 in Washington, D.C.), open sessions (at three of the committee meetings), and the following webinars: Horse Facial Expressions to Assess Pain and Algometry for Assessing Pain in Tennessee Walking Horses (December 2, 2019), Limb Sensitivity Testing and Drug Testing in Tennessee Walking Horses (February 13, 2020), and Equine Pain: Physiology and Assessment and Prohibited Substance Detection and Testing on Tennessee Walking Horses (April 2, 2020). Agendas for the committee meeting open sessions and webinars are included in Appendix B. Video recordings of webinar presentations and the webinar speakers' slides are available at the study website.

Throughout the study, the committee also received input from interested stakeholders and the public via the study website or via e-mail. All submitted comments and documents were added to the study's public access file, which is available on request from the National Academies' Public Access Records Office. Requests can be directed to PARO@nas.edu.

Information from the Study Sponsors

APHIS provided the committee with video recordings of inspections being performed by VMOs and DQPs at horse shows. An HIO also provided the committee with video recordings of inspections being performed by DQPs. As with other materials received from the public, copies of these videos and documents have been deposited in the study's public access file.

Materials Used in the Review of the Scar Rule

Because there are no published studies on TWH tissue biopsies, the committee's review of the scar rule was conducted using an unpublished paper by Stromberg (2017) in which the author evaluated 136 pastern biopsies from 68 TWHs that were disqualified for violations of the scar rule. This paper was provided to the committee by the representative of the Tennessee walking horse industry for its consideration during the review of the scar rule. The two pathologists[8] involved in the evaluation of the pastern biopsies provided 24 pairs out of the 68 pairs for additional review by Dr. Pamela E. Ginn, a member of the study committee and a board-certified veterinary pathologist and a specialist in veterinary dermatopathology.

[8] Dr. Paul Stromberg (Ohio State University College of Veterinary Medicine) and Dr. Lynne Cassone (University of Kentucky Veterinary Diagnostic Laboratory).

A Review of Methods for Detecting Soreness in Horses

ORGANIZATION OF THE REPORT

This report contains four chapters. Chapter 1, this chapter, introduces the study, provides the general background for the study and statement of task for the committee, and explains how the committee addressed its task. Each of the next three chapters addresses a particular item in the statement of task. Chapter 2 focuses on the currently available methods to detect soreness in horses, some of which are currently employed by the APHIS to determine if horses are compliant with the HPA. The chapter includes discussions of these methods, how well they detect soreness, and their reliability. In Chapter 3 the committee addresses its task of identifying potential new and emerging methods, approaches, and technologies for detecting hoof and pastern pain and its causes. The chapter includes a discussion of pain and factors that affect pain perception and the expression of pain as well as a review of pain detection methods and technologies based on horse behavior and physiological parameters and a discussion of their potential use in improving the detection of soreness in horses during inspections for compliance with the HPA. Chapter 4 reviews the scar rule, its limitations, and what changes are currently documented regarding the skin of horses that are suspected of being sore. The basics of dermatologic (skin) examination are discussed in detail, along with a basic overview of pathologic lesions of the skin as they apply to the scar rule. Suggested changes to the language of the scar rule are also included in this chapter.

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2

Methods Used to Identify Soreness in Walking Horses

This chapter focuses on the currently available methods to detect soreness in horses, some of which are currently employed by the U.S. Department of Agriculture's Animal and Plant Health Service (APHIS) to determine compliance with the Horse Protection Act (HPA). These methods, how well they detect soreness, and their reliability are discussed. To provide background to the reader, this chapter begins with a description of the inspection process currently in place to detect if Tennessee walking horses (TWHs) entered in shows experience soreness on their forelimbs (a violation of the HPA), and it continues with a discussion of the qualifications and training of those who inspect the horses. The description of the inspection process is not meant as an analysis of or a commentary on how APHIS enforces the HPA—a task that is outside the committee's purview (see committee's statement of task in Box 1-3, Chapter 1).

The current inspection process of TWHs in competition relies on the observation of horse movement and palpation of limbs, which are performed primarily by inspectors trained and licensed by horse industry organizations (HIOs). These methods, while deemed subjective, are widely and routinely used in veterinary medicine to detect if horses, regardless of breed, are experiencing pain. Objective procedures that may aid the determination of pain or other violations of the Horse Protection Regulations include thermography, radiography, testing of swabs of the distal limbs of TWHs for prohibited substances, and testing of blood samples for the presence of medications that are given to TWHs to alter their response to palpation.

THE INSPECTION PROCESS

APHIS enforces the HPA under Animal Care, the same program through which the Animal Welfare Act (AWA) is administered.[1] At shows and events covered by the HPA, horse inspections are performed by veterinary medical officers (VMOs), who are APHIS employees, or by designated qualified persons (DQPs), who are third-party individuals trained by HIOs, or by both VMOs and DQPs. The inspection process varies depending on who is present and performing inspections at the show or event, but the methods by which DQPs and VMOs detect horses that are sore per the HPA and Horse Protection Regulations (see Appendix C of this report) are basically the same (i.e., visual observation of the horse's gait and palpation).

Horse shows are broken down into categories or classes, with each class showing at a designated time. Horses entered in a particular class are inspected shortly before that class shows. Inspections are performed in a facility with limited access, with the facility divided into two areas. One area is for conducting the actual horse inspection, with access restricted to the DQP, APHIS representatives, and the person handling the horse—referred to as the *custodian* in this report—which could be the trainer, rider, owner, or other responsible party; the second area is the warm-up area where the horse is held after being inspected and prior to showing, with access restricted to a maximum of three persons per horse—typically, the trainer, rider, and owner. The inspection and warm-up area is generally cordoned off to keep unauthorized persons from entering. There are shows in which well-lighted covered barns are used as

[1] See https://www.aphis.usda.gov/aphis/ourfocus/animalwelfare/usda-animal-care-overview (accessed April 2, 2020).

inspection areas, but in shows held in smaller venues, inspections are conducted in graveled parking lots, with no cover and often with bad lighting.

An inspection consisting of gait observation and palpation takes approximately 2-3 minutes per horse. If reinspection or additional procedures are done, the process takes longer. A horse that is found to be sore in either front leg[2] (unilateral soreness) or on both front legs (bilateral soreness) or is noncompliant with scar rule criteria or is in violation of other Horse Protection Regulations (e.g., the 50 percent rule, heel toe, high band, etc.) is disqualified from the entire show.[3] If the DQP inspects the horse and finds a violation, he or she issues a ticket to the custodian of the horse. Cited in the ticket are the custodian and all other persons named in the horse entry form. If a VMO inspects the horse (regardless of whether the DQP previously inspected it or not) and finds a violation, the VMO will create a case packet (i.e., collect information that may eventually be used in a federal case). In recent years, VMOs typically do not create a case packet after the DQP has issued a ticket to the custodian.

After a class shows, the winner of that class would go back to the warm-up area for a post-show inspection by the DQPs. The rest of the horses from that class would be returned to their individual stalls or trailers outside of the controlled area, unless the DQPs or APHIS request that they proceed to the warm-up area. A post-show inspection is done to check if the horse that won was shown while sore; if a VMO is present at that show, the VMO can check the horse after the DQP, but this is not mandatory. As with pre-show inspections, if the DQP finds the horse sore post-show, a ticket is issued; if a VMO finds the horse sore, a case packet is created. The action devices worn by the horse in the class are also examined to ensure they did not strike the coronary band, did not have rough or sharp edges, and weighed less than 6 ounces. Guidelines for the conduct of horse inspections and information on penalties for violations are contained in the Horse Protection Regulations. HIOs may also impose penalties for violations under their own rules (these rules are contained in a rule book that HIOs submit to APHIS every year).

The inspection process is discussed in more detail in the following section. Note that the inspection process will proceed somewhat differently when only a DQP is present (no VMO) versus when there is one VMO or two VMOs (with or without a DQP) present during inspection. The inspection process is not always consistent from year to year and has undergone changes, often due to new policies instituted by the APHIS Animal Care Horse Protection Program leadership.

Inspection Process When Only a DQP Is Present

As mentioned in Chapter 1, a 1976 amendment to the HPA allowed third-party individuals (DQPs) to help with the inspection of horses in order to expand the capacity of APHIS, which, because of budgetary constraints, does not have enough VMOs to inspect all shows or events covered by the HPA. While it is very common to have only DQPs at shows (no VMOs), there are shows that do not have DQPs at all because inspection by a DQP at horse shows is not mandatory. As mentioned in Chapter 1 of this report, show managers use DQPs' services (through an HIO that facilitated the licensing of the DQP; see discussion in Chapter 1) to inspect horses at their events to reduce their liability under the HPA in case a horse that is deemed sore is shown (allowed in the show ring). Conversely, show managers and other responsible personnel that do not affiliate with certified HIOs and have no DQPs at their shows are held accountable for any HPA violations observed during unannounced inspections by APHIS VMOs at their events (APHIS, 2020). The DQP inspection process is illustrated in Figure 2-1a. When a horse is found to be sore on palpation or to be noncompliant with the scar rule criteria or in violation of other Horse Protection Regulations, the DQP has authority to write a ticket (citing the horse custodian or rider, trainer,

[2] Under the HPA, soring includes all limbs or legs of the horse but since soreness is generally observed on the front legs, inspectors typically examine them and not the hind legs.

[3] For equipment or prohibited substance violations, the horse will only be disqualified if the DQP found the violations, not the VMO. If the VMO found these violations, the horse will be allowed to show but the VMO will create a case packet.

A Review of Methods for Detecting Soreness in Horses

and owner for violation) and, on behalf of the show manager, to disqualify the horse from showing. Documentation of the DQP inspection process (which may or may not include video recording) is performed by the HIO employed by the show manager. DQPs sometimes have other DQPs inspect the work and agree on the finding before writing the horse custodian a ticket (A. Rhyner, APHIS, personal communication, May 1, 2020). However, the Horse Protection Regulations do not require multiple DQPs or multiple inspections to disqualify a horse for being sore.

Inspection Process When a DQP and a VMO Are Present

At shows where both a DQP and a VMO are present, the VMO provides oversight of the DQP's inspections to ensure that the DQP is following prescribed procedures. This inspection process is illustrated in Figure 2-1b. If the DQP finds the horse to be in violation of Horse Protection Regulations, the VMO may reinspect the horse with or without a request for a reinspection from the horse custodian. The VMO may also reinspect a horse that the DQP found to be compliant with regulations. During reinspection (i.e., when a VMO reinspects a horse previously seen by a DQP), if the VMO finds a horse to be unilaterally or bilaterally sore or to be noncompliant with the scar rule criteria and returns the horse to the DQP but the DQP does not agree with the VMO's findings, the VMO will alert show management to disqualify the horse (Walking Horse Report, 2020). If a horse is found to be in violation of Horse Protection Regulations by the DQP, the horse custodian and all other persons listed on the horse entry form will get a ticket and the horse is disqualified. However, if the violation is found by the VMO, he or she is authorized to collect information from the individuals responsible for the horse along with any videos, pictures, or radiographs to serve as evidence of an HPA violation and to create a case packet that may be used in a federal case.

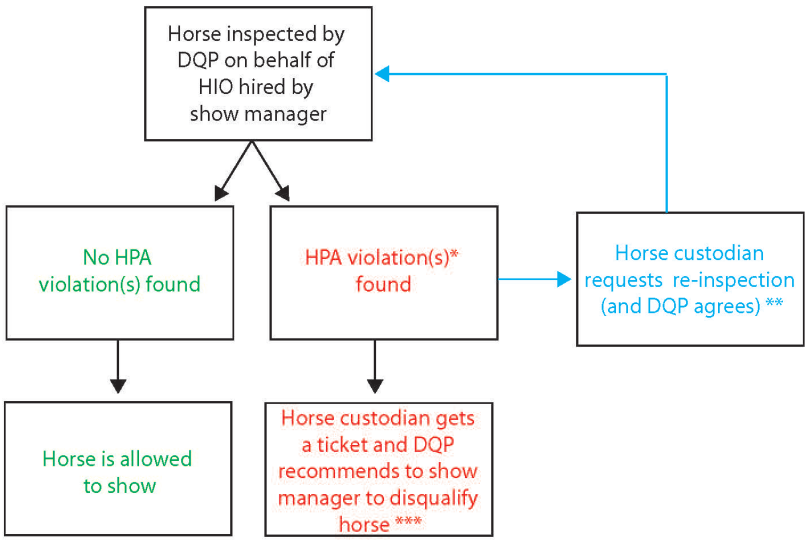


FIGURE 2-1a Horse inspection process when a designated qualified person (DQP) is present at a horse show (no veterinary medical officer). NOTES: *Some of the HPA violations for which a DQP can disqualify a horse from showing are unilateral or bilateral soreness, noncompliance with scar rule criteria, equipment violations (such as high band, off on 50 percent rule, or heel/toe ratio), and detection of prohibited substances on the leg area (e.g., shoe polish to cover up lesions).
**A DQP can decline a horse custodian's request to reinspect because there is no provision in the Horse Protection Regulations that DQPs should reinspect a horse. However, HIOs have been known to ask two DQPs to inspect the same horse and agree on the violations they found before a ruling is made.
***Ticket issued to custodian cites all persons on the horse entry form (this may include the horse custodian, rider, trainer, and owner).

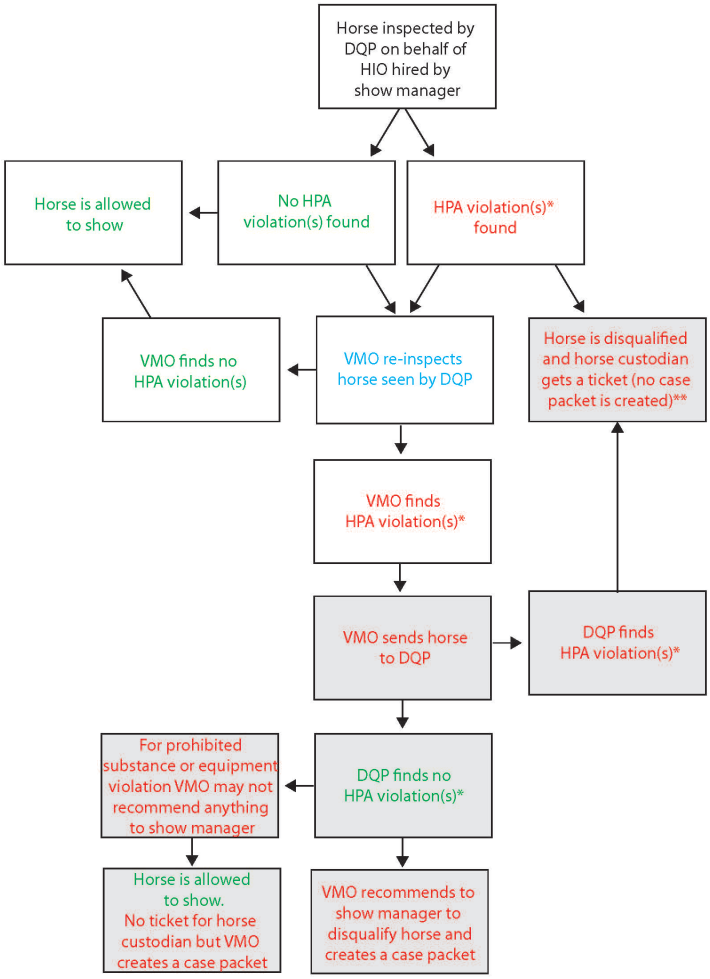


FIGURE 2-1b Horse inspection process when a designated qualified person (DQP) and a veterinary medical officer (VMO) are present at a horse show. NOTE: *Some of the HPA violations for which a DQP can disqualify a horse from showing are unilateral or bilateral soreness, noncompliance with scar rule criteria, equipment violations (such as high band, off on 50 percent rule, or heel/toe ratio), and detection of prohibited substances on the leg area (e.g., shoe polish to cover up lesions)—if found initially by the DQP or if found by the VMO and the DQP concurs that the substance is present.
**Ticket issued to custodian cites all persons on the horse entry form (this may include the horse custodian, rider, trainer, and owner).

Inspection Process When There Is One VMO Present (No DQP)

As mentioned earlier, it is not mandatory for a show manager to hire an HIO that provides the services of a DQP, so there are cases where only a VMO would conduct horse inspections (this is referred to as an unaffiliated show). In this situation the process (illustrated in Figure 2-2) is procedurally similar to the DQP inspection in Figure 2-1a, but in this case the VMO inspects the horse and if he or she finds the horse in violation of HPA regulations, the horse custodian will not get a ticket; instead, the VMO will collect information that may be used in a federal case against the custodian (and all other persons named on the horse entry form). The VMO will reinspect the horse if requested by the horse custodian. (In previous years, the VMO could decline to reinspect if he or she found no sufficient grounds for doing so; this is no longer the practice.)

A Review of Methods for Detecting Soreness in Horses

Inspection Process When There Are Two VMOs Present

The process when there are two VMOs present, which may also involve a DQP, if present (Figure 2-3), is similar to the process when there is a DQP and one VMO present (Figure 2-1b), although it has changed over the years. In previous years, if a VMO found the horse to be sore and there was an objection to the VMO's finding, a reinspection would take place as long as there was sufficient cause (see Horse Protection Regulation 9 C.F.R. §11. 4 (h)(2)). Beginning in 2020, however, if a VMO finds a horse to be bilaterally sore, the second VMO automatically reinspects the horse, whether or not there is a request for it. The findings of the two VMOs must agree in order for the horse to be disqualified. If the two VMOs do not both find the horse to be unilaterally or bilaterally sore, the horse is allowed to show (A. Rhyner, APHIS Horse Protection Program, personal communication, April 20, 2020). If the first VMO finds the horse to be noncompliant with scar rule criteria (which qualifies the horse as sore), a reinspection by the second VMO will take place only if the custodian requests it. The horse will be disqualified if the second VMO concurs with the first VMO's finding. If the custodian does not request a reinspection, the horse is referred to a DQP. If the DQP concurs with the scar rule violation finding, the custodian gets a ticket and the horse is disqualified. If the DQP does not concur with the first VMO's finding, the horse is disqualified and a case packet is created (A. Rhyner, APHIS Horse Protection Program, personal communication, November 14, 2020).

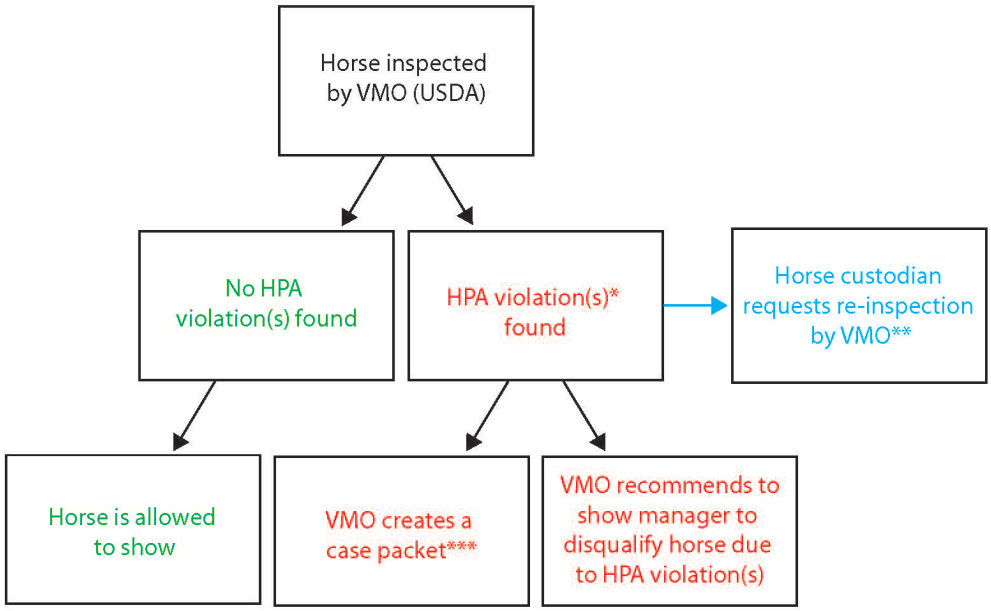


FIGURE 2-2 Horse inspection process when there is one veterinary medical officer (VMO) at a horse show.
NOTES: *HPA violations for which a VMO can disqualify a horse from showing are unilateral or bilateral soreness and noncompliance with scar rule criteria. If the VMO finds equipment violations (such as high band, off on 50 percent rule, or heel/toe ratio) or detects foreign substances on leg area (e.g., shoe polish to cover up lesions), the horse cannot be disqualified unless a DQP concurs with the finding.
**The VMO cannot decline a request to reinspect a horse. If a reinspection is requested, the process restarts from the very beginning (see top of diagram).
***A case packet is created when a VMO collects information that may be used in a federal case against all persons named on the horse entry form (this may include the horse custodian, trainer, rider, and owner).

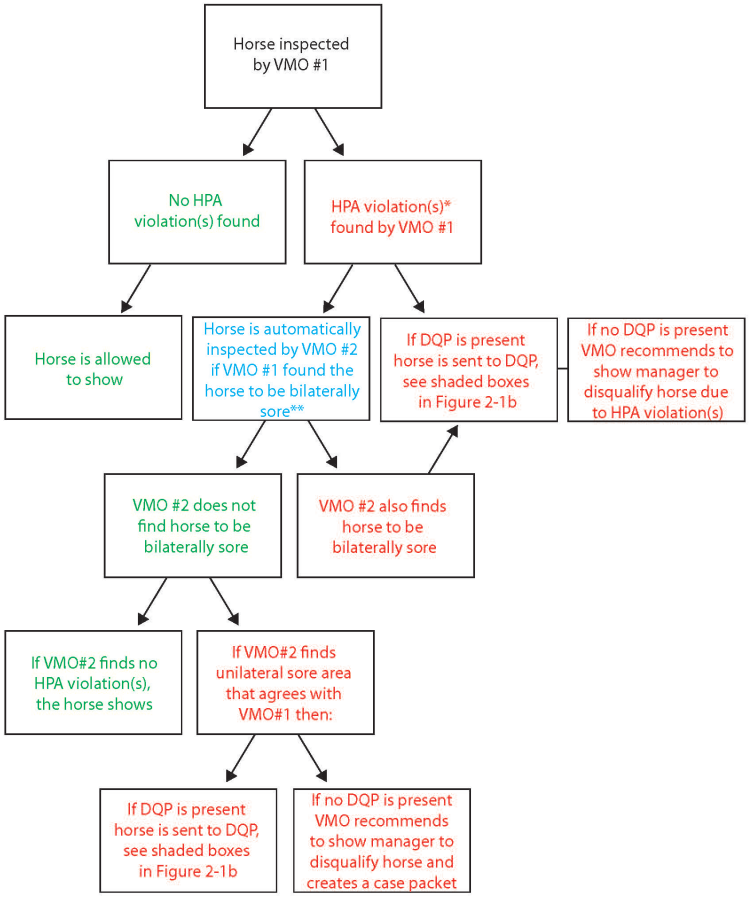


FIGURE 2-3 Horse inspection process when there are two veterinary medical officers (VMOs) at a horse show. NOTES: *HPA violations for which a VMO can disqualify a horse from showing are unilateral or bilateral soreness and noncompliance with scar rule criteria. If a VMO finds equipment violations or detects foreign substances on the leg area (e.g., shoe polish to cover up lesions), the horse cannot be disqualified unless a DQP concurs with the finding. The horse custodian may request that VMO #1 reinspect if he or she finds violations of Horse Protection Regulations other than bilateral soreness. As of 2020, if VMO #1 finds the horse to be bilaterally sore, VMO #2 will reinspect the horse automatically. Automatic reinspection by VMO #2 only occurs when VMO #1 finds the horse to be bilaterally sore; no other violation would trigger automatic reinspection.

HORSE INSPECTORS' QUALIFICATIONS AND TRAINING

Veterinary Medical Officers

All VMOs with the Animal Care program are graduates of American Veterinary Medical Association (AVMA)–accredited veterinary medical schools, with many of them having been private-practice veterinarians before joining the program.[4] Until 2010, Animal Care VMOs (full-time employees) were responsible for the humane treatment of animals covered by the AWA and for inspecting horses for compliance with the HPA. After 2010, with pressure from the TWH industry to have equine veterinarians enforce HPA regulations, APHIS began recruiting equine veterinarians (preferably members of the American Association of Equine Practitioners [AAEP]) whose main responsibility was to inspect horses

[4] See https://www.aphis.usda.gov/aphis/ourfocus/animalwelfare/sa_awa (accessed on April 7, 2020).

A Review of Methods for Detecting Soreness in Horses

at shows and events and work alongside DQPs whenever possible. These VMOs were considered intermittent VMOs (part-time employees) because they only worked for APHIS during horse shows and events and did not otherwise perform duties related to AWA. However, in recent years horse inspections for HPA enforcement have reverted to being conducted mostly by Animal Care VMOs who are not necessarily equine veterinarians (the primary duty of these VMOs is to inspect for AWA violations; they inspect horses for compliance with Horse Protection Regulations if their schedule permits). At the time of hiring and yearly thereafter, intermittent VMOs and Animal Care VMOs who inspect horses are required to undergo training in Horse Protection Regulations, performance of horse inspections, and how to recognize violations of the HPA.

Designated Qualified Persons

DQPs obtain their licenses after completion of training provided by HIOs. To train DQPs, HIOs must first obtain certification from USDA for their DQP programs.

According to 9 C.F.R. § 11.7 of the Horse Protection Regulations, individuals may qualify as DQPs if (1) they are doctors of veterinary medicine who are accredited in any state by the USDA and who are members of the AAEP, or are large-animal practitioners with substantial equine experience, or are knowledgeable in the area of equine lameness as related to soring; or (2) they are farriers, horse trainers, or other knowledgeable horsemen with experience that would qualify them for positions as HIO stewards or judges and who have been formally trained and licensed as a DQP by HIOs with USDA-certified DQP programs.

To obtain certification for their DQP program, HIOs must provide the following to the USDA:

(1) The criteria to be used in selecting DQP candidates and a list of the minimum qualifications and knowledge each candidate must have in order to be admitted to the DQP program;

(2) A copy of the formal training program (classes and practical training) that each DQP candidate is required to attend before a license can be granted by the HIO. The minimum training requirements are given in 9 C.F.R. § 11.7 of the Horse Protection Regulations (Appendix C of this report); they include:

- Classroom instruction on the anatomy and physiology of the horse's limb (2 hours);
- Horse Protection Regulations (2 hours);
- Soring history and methods for detecting soreness (4 hours);
- Practical instruction in clinics and seminars wherein knowledge gained from the previous classes can be applied (4 hours), including procedures for conducting a thorough and uniform examination of a horse.

Except for the Horse Protection Regulations class, which should be taught by an instructor provided by the USDA (a VMO), all other classes are to be provided by an instructor that the HIO has specified and whose resume has been submitted to the APHIS Animal Care program. The DQP training program should also include instruction on DQP standards of conduct and record keeping and reporting requirements and procedures.

(3) A sample of a written examination that the DQP candidates must pass for completion of the program and the sample answers and scoring thereof, as well as proposed passing and failing standards.

(4) Criteria used to indicate successful completion of the training program, in addition to the written exam.

(5) Criteria and schedule for DQP continuing education, which should be no less than 4 hours per year.

Every year, APHIS conducts a refresher training course for DQPs, but attendance to this course is optional. If a DQP does not attend the APHIS refresher training course, the HIO should provide a refresher course to the DQP to fulfill the requirement for 4 hours of continuing education per year. Throughout the year DQP performance is evaluated by VMOs at selected shows and events.[5] If the DQP's performance at a show is found to be unsatisfactory, APHIS sends a warning letter to the HIO that granted license to the DQP. According to Horse Protection Regulations §11.7 (f) "Each horse industry organization or association having a DQP program certified by the Department shall issue a written warning to any DQP whom it has licensed who violates the rules, regulations, by-laws, or standards of conduct promulgated by such horse industry organization or association pursuant to this section, who fails to follow the procedures set forth in §11.21 of this part, or who otherwise carries out his duties and responsibilities in a less than satisfactory manner, and shall cancel the license of any DQP after a second violation." Any DQP whose license has been cancelled is permanently barred from being a DQP (A. Rhyner, APHIS, personal communication, April 9, 2020). For more information on the certification and licensing of DQPs, see the Horse Protection Regulations in Appendix C of this report.

METHODS CURRENTLY USED TO INSPECT HORSES FOR SORENESS

In accordance with Horse Protection Regulations, a horse is inspected by a DQP or a VMO before a show and, if the horse wins in its class, after the show as well. Section 11.1 of those regulations specifies what methods constitute an inspection:

> Inspection means the examination of any horse and any records pertaining to any horse by use of whatever means are deemed appropriate and necessary for the purpose of determining compliance with the Act and regulations. Such inspection may include, but is not limited to, visual examination of a horse and records, actual physical examination of a horse including touching, rubbing, palpating and observation of vital signs, and the use of any diagnostic device or instrument, and may require the removal of any shoe, pad, action device, or any other equipment, substance or paraphernalia from the horse when deemed necessary by the person conducting such inspection.

Observation of Horse Movement and Appearance

The VMO/DQP inspection process mainly relies on two methods to determine soreness, which are also the methods employed to diagnose lameness in horses. The first method is to observe the horse's movement and appearance. The way that a horse moves and its resting posture may indicate if the horse is experiencing lameness, a condition that often involves the limb and is associated with inflammation caused by trauma (such as by way of soring) or infection (Parks, 2010). Compensatory movements—changes in leg movement or how a foot lands on the ground, head bobbing, and weight redistribution (Kellon, 2017; Smith Thomas, 2019)—may be subtle, but these movements are observable if the whole horse is carefully watched. Observing the horse's posture also helps in determining which limb is sore and the nature of the problem. For example, the rocking back stance is indicative of bilateral forelimb laminitis (Parks, 2010). Observing a horse's gait and posture is a standard of practice among veterinarians and is the first step in deciding if a horse is experiencing soreness or pain (Davis, 2018). To reliably detect lameness by observation, an observer must have knowledge of the anatomy and function (physiology) of the structures of the horse's legs, of the horse's optimal conformation, and of normal gaits (Adams, 2015).

Experienced equine veterinarians have a high degree of agreement when independently examining the same horse for the presence of an abnormal (painful or lame) gait (Keegan et al., 2010).

[5] See https://www.aphis.usda.gov/aphis/ourfocus/animalwelfare/hpa/ct_hpa_inspections_examinations (accessed April 9, 2020).

A Review of Methods for Detecting Soreness in Horses

Any horse that has been observed to have gait or posture abnormalities should be further examined for signs of pain and inflammation.

In 9 C.F.R. § 11.21 of the Horse Protection Regulations, the following instructions are provided for the DQPs:

> (a)(1) During the preshow inspection, the DQP shall direct the custodian of the horse to walk and turn the horse in a manner that allows the DQP to determine whether the horse exhibits signs of soreness. The DQP shall determine whether the horse moves in a free and easy manner and is free of any signs of soreness.

Palpation

Palpation is the process of using one's hands to examine the body (or a part of the body) to detect pain or diagnose a disease. In musculoskeletal evaluation of the horse, palpation is recognized as the gold standard for detecting local pain, local inflammation, and changes in tissue architecture and range of motion in joints and soft tissues (Adams, 2015). Palpation has also been defined as the application of a non-noxious stimulus (such as digital pressure) to an area of the body while observing the horse for responses, such as an effort to withdraw, a change in facial expression, or a movement of whole body (Ross, 2011; Adams, 2015; Davis, 2018). Typically, palpation is repeated several times to make sure the withdrawal response is repeatable and consistent, although prolonged stimulation or pressure on a painful area can elicit some level of analgesia through secretion of local endorphins, gate control (inhibition of presynaptic nociceptive spinal neurons), or hyperstimulation analgesia (activation of descending inhibitory systems) (Melzack, 1975), adding to the complexity of the pain identification. However, Bussieres et al. (2008) found that the pain response to palpation had good to excellent reproducibility across raters. Scores given for the "response to palpation" had high sensitivity and specificity, meaning that they accurately discriminated between horses with and without pain. Adams (2015) discusses in detail how palpation should be done and the factors that help improve lameness diagnosis via palpation, which include the examiner having knowledge of equine anatomy and normal conformation and gaits and being able to recognize lameness.

Palpation has been used as a regulatory measure for detecting hypersensitivity in distal limbs in show jumping horses by International Federation for Equestrian Sports (FEI)–accredited veterinarians since 2010 (this process is discussed in Box 2-1). Limb sensitivity testing is an integral part of FEI's efforts to protect equestrian horse welfare. This examination ensures that only horses fit to compete are allowed to do so.

The Horse Protection Regulations provide instructions for the DQP on how palpation should be done. Section 11.21(a) of the regulations states:

> (2) The DQP shall digitally palpate the front limbs of the horse from knee to hoof, with particular emphasis on the pasterns and fetlocks. The DQP shall examine the posterior surface of the pastern by picking up the foot and examining the posterior (flexor) surface. The DQP shall apply digital pressure to the pocket (sulcus), including the bulbs of the heel, and continue the palpation to the medial and lateral surfaces of the pastern, being careful to observe for responses to pain in the horse. While continuing to hold onto the pastern, the DQP shall extend the foot and leg of the horse to examine the front (extensor) surfaces, including the coronary band. The DQP may examine the rear limbs of all horses inspected after showing and may examine the rear limbs of any horse examined preshow or on the show grounds when he deems it necessary, except that the DQP shall examine the rear limbs of all horses exhibiting lesions on, or unusual movement of, the rear legs. While carrying out the procedures set forth in this paragraph, the DQP shall also inspect the horse to determine whether the provisions of §11.3 of this part are being complied with and particularly whether there is any evidence of inflammation, edema, or proliferating granuloma tissue.

BOX 2-1 International Federation for Equestrian Sports Limb Sensitivity Testing Procedure

The limb sensitivity testing procedure is performed by a team of highly trained and experienced equine veterinarians with a strict system of checks and balances to avoid any misinterpretation of results and conflicts of interest.

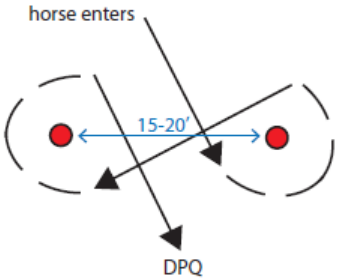
The horse's front limbs are first imaged by thermography by veterinarian 1, then palpated by veterinarian 2. Any horse that is questionable or deemed hypersensitive will be palpated again by veterinarian 1; all palpating is recorded and videoed carefully. Both veterinarians and a member of the ground jury must agree that the horse is sensitive, prior to informing the horse custodian of their findings. (The principal duty of the ground jury is the technical judging of all competitions and the determination of their final results; it is responsible for solving all the problems that could arise during its jurisdiction period[a]). Once a determination of sensitivity has been made, the custodian can choose to withdraw the horse from the competition with no further consequences. If the custodian elects not to withdraw, the veterinary delegate is informed and reviews the video footage and possibly palpates the horse prior to making a final decision. All veterinarians and the ground jury must agree that the horse shows altered sensitivity, although they do not have to agree on precisely where the horse is sensitive; such agreement results in a disqualification and the initiation of a welfare case. The custodian of a horse that is disqualified has no recourse and can be subject to serious penalties depending on what is found as the cause for hypersensitivity (C. Roberts, FEI, Cambridge University, personal communication, February 18, 2020).

[a] https://inside.fei.org/sites/default/files/FEI%20Officials_0.pdf (accessed August 31, 2020).

To understand how the physical examinations are performed by DQPs, the committee requested videos from APHIS and SHOW, Inc. an HIO. The committee viewed 61 videos of horse inspections done during TWH shows, and its observations are in Box 2-2.

BOX 2-2 Committee's Observations Based on Videos of Inspections Performed by Designated Qualified Persons

- After entering the inspection area, the horse is walked on a loose rein and guided toward two separate cones. The horse is supposed to walk around the cones in a figure-8 pattern. As seen from the videos, the distance between the two cones is short, and not all horses actually complete an entire figure 8; instead, the horse is more likely to walk in a pattern similar to the one below, where it takes three or—rarely—four steps around the right cone and then may pivot toward the cone on the left.
- The straight-line walk, which is also a way to observe the horse's movement and is not part of the figure 8 was not seen consistently in the inspection videos.



- Stewarding, pulling on the reins, holding the reins at a length shorter than 18 inches, touching the horse, and the handling of whips, bottles, cigarettes, or other means to gain the attention of the horse are not allowed during the walk or standing inspection (9 C.F.R. § 11.21). However, videos provided by the SHOW HIO showed horse custodians stewarding horses during inspection without getting a warning from the DQP.

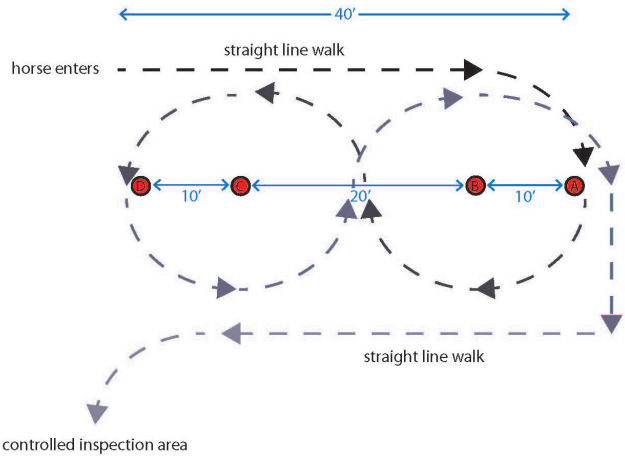
(Continued)

A Review of Methods for Detecting Soreness in Horses

BOX 2-2 Continued

- The amount of digital pressure to apply while palpating the forelimbs is not specified for DQPs. Videos of DQP inspections show a large variation in the technique they use to examine the forelimbs from the carpus to the fetlock—from an absent to a very cursory palpation of limited areas at the palmar surface of the distal limb, with minimal attention given to the dorsal surface of the limb. Some DQPs in the videos from the SHOW HIO appear to have an extremely firm grip on the horse's leg between the carpus and fetlock, which may inhibit the responses of the limb to palpation.
- The process of palpating the limbs and checking for other HPA violations by a DQP is quite fast—palpation usually takes less than a minute per limb. During this examination the DQP is looking for signs of pain indicated by the horse withdrawing or moving the limb three consecutive times at a site of palpation. The DQP also looks for signs of inflammation (loss of hair, redness of skin, edema of the skin, loss of skin integrity) and chronic skin changes indicative of previous skin injury. Some DQPs palpated horses' limbs without ever looking at them.

Based on the committee's examination of U.S. Department of Agriculture training materials and the DQP inspection videos provided by a horse industry organization, it is apparent that many DQPs do not inspect horses according to Horse Protection Regulations and as taught in the annual training sessions provided by the Animal and Plant Health Service. The committee's general observation from the videos is that palpation techniques of DQPs vary greatly from one individual to another. DQPs were observed conducting the physical examinations quickly and in a manner that is not sufficient to detect if a horse is sore, while others were observed gripping the leg too tight, which may inhibit responses to limb palpation. Because DQPs are not performing examinations properly, it is possible that some horses experiencing soreness are not identified during inspections.



One way to improve the observation of a horse's movement in this test would be to expand the figure-8 pattern to consist of two adjoining circles, each with a 10-foot radius (as shown above). The straight-line evaluation could then be done as the horse is walking to the top of the first circle or after it has performed the figure-8 maneuver.

VMOs follow the USDA Standard Operating Procedure for Digital Palpation to Detect Soreness (APHIS Animal Care, 2018). A VMO physical examination of the horse pastern and hoof is similar to an examination by a DQP, but the VMO is required to follow these steps:

> When palpating the posterior pastern use an inverted U pattern and begin on the left side of the pastern at the base of the heel bulb. Palpate up the left side and across to the right and down the inverted U until you reach the right heel bulb. Then smaller concentric inverted U patterns would be used. Then the center of the posterior pastern would be palpated until reaching the area

between the heel bulbs. The anterior pastern would then be palpated in left to right rows starting at the coronary band until reaching the fetlock. All this should be done in 1.5-2.5 minutes in a compliant horse. (APHIS Animal Care, 2018, p. 1-3)

VMOs attend only a very small number of TWH shows compared with DQPs (estimated to be 6 percent of shows attended by DQPs). Originally the duty of the VMOs was to "inspect the inspectors" (DQPs) to ensure that the Horse Protection Regulations were enforced. Currently, VMOs may observe horses on any part of the show grounds, including horses in trailers, in stalls, or in the alleyways, and they may inspect any horse that appears to have abnormal behavior or signs of injury to the lower front or hind limbs. In its 2010 audit report, the USDA Office of the Inspector General noted that VMOs have to perform their duties under a hostile environment—VMOs are often intimidated in order to prevent them from inspecting horses—which necessitates the presence of armed security or police at shows (USDA OIG, 2010). When inspecting horses, VMOs are restricted to more stringent requirements concerning where to stand and must follow a prescribed pattern of palpation and apply a prescribed amount of pressure using the pad of the thumb. The palpation protocol specifically instructs VMOs to "use the flat part of your thumb to apply enough pressure to flatten the flesh of the thumb, thus blanching the thumbnail"—which is an amount of pressure that is well below the threshold to produce a flinch response indicating limb sensitivity in normal TWH limbs (Haussler et al., 2008). These rules were first instituted in late 2016 in response to objections raised by the TWH competitors (owners, trainers, handlers, and attorneys for the TWH industry). VMOs may inspect any horse for what is deemed cause, pre- or post-show, after a DQP has inspected the horse. Additionally, since late 2016, horses found in violation of the HPA have been reinspected by a second VMO, if present. The findings to disqualify a horse must be exactly the same as to the area of apparent pain and the type of response given by the horse as well as findings of skin changes indicative of previous injury (J. Baker, former VMO, USDA Animal Care Horse Protection Program, personal communication, July 27, 2020). Prior to the institution of the required second VMO inspection and prescribed VMO palpation method (in late 2016), the findings of DQPs and VMOs at TWH shows often varied significantly. When the mandatory second VMO inspection was instituted with the requirement that the findings of the two VMOs had to agree exactly, the number of horses found to be unilaterally or bilaterally sore dramatically declined, as indicated by activity reports that were provided to the committee by USDA. The numbers presented below are the sum of bilateral and unilateral findings from the pre-show inspection of padded and flat-shod walking horses that were entered in the 2014, 2015, 2016, 2017, 2018, and 2019 TWH National Celebration.

Inspector/Soreness Finding	2014	2015	2016	2017	2018	2019
VMO bilateral	19	29	35	0	0	0
VMO unilateral	25	35	29	1	0	0
DQP bilateral	3	4	5	6	5	7
DQP unilateral	14	10	12	21	10	20

During diagnostic lameness examinations, once an abnormal, painful, or inflamed structure is identified, further diagnostic methods that provide objective data are used to make a definitive diagnosis (Turner, 2015; Davis, 2018). Some of these diagnostic tools can be used to provide evidence of soreness during horse inspections and are discussed in another section of this chapter.

Finding 2-1: At shows covered by the Horse Protection Act (HPA), horse inspections are performed by a designated qualified person (DQP) employed by horse industry organizations (HIOs) or, less often, by a USDA veterinary medical officer (VMO) or, in some instances, by both. These individuals have different backgrounds, training, and experience in detecting pain and inflammation in animals. DQPs are not required to have a veterinary degree, and most are not veterinarians. DQPs receive 10 hours of instruction in examining horses from instructors who are not veterinarians. VMOs attended veterinary schools for 4

A Review of Methods for Detecting Soreness in Horses

years and some have private-practice experience prior to being employed by APHIS. Additionally, DQPs are known to have close ties to the industry and may have conflicts of interest (as pointed out in the 2010 OIG audit).

Finding 2-2: The current horse inspection process for detecting soreness involves observation of the horse's movement and posture and palpation of the limbs, which is the gold standard for detecting local pain and inflammation. These examination methods are known to be valid and reliable when performed by veterinarians who are trained and highly experienced in detecting lameness and pain. They are employed to detect lameness, injury, and pain in all breeds of horses that are used in competitions, shows, recreational riding, work, breeding, and teaching.

Finding 2-3: As seen from 61 DQP inspection videos that the committee was allowed to view, inspectors do not carry out a sufficient observation of horse movement. During the visual inspection of the horse's gait, the distance between the two cones is too short and not all horses complete an entire figure 8. The horse takes three or, rarely, four steps around the right cone and may pivot toward the cone on the left. Furthermore, the horse may not complete a sufficient straight-line walk.

Finding 2-4: VMOs are required to perform inspections according to APHIS protocols that are highly prescriptive. Recently APHIS adopted a process wherein a reinspection by a second VMO will automatically occur if the first VMO finds the horse bilaterally sore. This process requires both VMOs to make exactly the same findings before a violation ruling is made.

Finding 2-5: VMOs are required to use the pad of the thumb with only enough pressure to blanch the thumbnail and to follow a specific pattern of applying digital pressure when palpating the horses' limbs during inspection. This prescribed palpation method for VMOs falls short of established protocols for lameness examinations.

Conclusion 2-1: Differences in training and experience account for the discrepancies between VMO and DQP inspection results in past years. This discrepancy will continue to affect inspection outcomes if DQPs are not trained adequately and evaluated for competency by experienced equine veterinarians. Conflicts of interest may also influence decisions of DQPs in finding whether a horse is in compliance with the HPA and in issuing a ticket of violation.

Conclusion 2-2: Physical examination methods are critical in detecting pain when performed by an examiner with sufficient knowledge of normal versus abnormal horse movement and posture and the ways that horses react to palpation if they are in pain. To better detect soreness it is important that these examinations be done thoroughly using proper techniques and used in conjunction with other diagnostic technologies, tools, and techniques.

Conclusion 2-3: During inspection, ideally a horse should walk around the cones in a figure-8 pattern. Expanding the figure-8 pattern to consist of two adjoining circles, each with a 10-foot radius, would allow for better observation of horse movement. The required straight-line evaluation could be done as the horse is walking to the top of the first circle and then back from the figure 8.

Conclusion 2-4: Prescriptive protocols, if not followed strictly by a VMO, may allow for a possible objection to a VMO's finding by the horse custodian. Moreover, the required inspection by a second VMO may cast doubt on the ability of VMOs to detect pain or other abnormalities and may negatively affect the VMO's ability to make appropriate judgments.

Conclusion 2-5: The basis of all examinations for pain and lameness is observation and palpation, which are an integral part of determining whether pain is altering gait in a TWH. The strict requirements of

following a specified pattern and using only the pad of the thumb with no more pressure than it takes to blanch the thumbnail limit the ability of palpation to detect the presence of limb sensitivity. The requirement that two VMOs must make exactly the same findings (i.e., sensitive on the lateral pastern but not bulbs of heels or medial pastern) does not consider changes that may occur over time between examinations, how the horse may respond to repeated palpation, or how the presence of foreign substances either parenterally or topically may influence findings over time.

Gas Chromatography–Mass Spectrometry to Detect Prohibited Substances that Mask Soreness

At events covered by the HPA, horses presented at the inspection area must not have any prohibited substances on their limbs. Lubricants (glycerol, petrolatum, and mineral oil) may be applied only after a horse has been inspected by a DQP or VMO and only if these lubricants are supplied and controlled by the event management (9 C.F.R. § 11.2). However, as mentioned in the previous chapter, some horse trainers apply other substances (e.g., copper naphthenate[6] or diesel fuel) to the horse's lower legs to make them sore. Trainers may also apply numbing agents (lidocaine, benzocaine, etc.) to mask soreness, or substances (e.g., shoe polish) to hide lesions that are evidence of a previous injury so that the horse can pass inspection. Some of these substances may rub off on inspectors' hands, while other are not visible. In 2004, APHIS began using gas chromatography–mass spectrometry (GC–MS) as an additional tool in a pilot program to gather information on prohibited substances that have been applied topically on horses' limbs (Melissa Radel, APHIS, personal communication, April 3, 2020).

GC–MS is an analytical method that involves the use of a gas chromatograph coupled to a mass spectrometer, by which complex drugs or chemicals may be separated, identified, and quantified.[7] GC–MS has been in use for many years and is considered the "gold standard" for the detection of drugs, medications, or environmental contaminants and for use in forensic investigations (Hites, 2016; Lynch, 2017). The introduction of GC–MS in the late 1960s was one of the most significant advances in the testing for drugs used in horse racing (Kim and Yoon, 1996). At present, GC–MS confirmation of drug identification is required by many regulatory bodies in horse racing (Wu, 1995) and other equestrian sports, such as the U.S. Equestrian Federation (USEF) and the FEI. With GC–MS confirmation, drug identification is able stand up to scrutiny in court (Stanley and Kollias-Baker, 1997).

GC–MS identifies and quantifies whatever substances are found. For many drugs, particularly those that mask pain, horse organizations have a zero-tolerance policy (no amount of drug allowed), which has been put under question because of the possibility of contamination and the ability of GC–MS to detect down to the picogram level (1 picogram is 0.000000000001 gram) (Hersh, 2010). For medications that are frequently used to legitimately treat disease in horses, acceptable limits may be established.

USDA APHIS Protocol for Detecting Prohibited Substances that Mask Soreness

According to the Horse Protection Regulations (9 C.F.R. § 11.2(c) *Substances*), "all substances are prohibited on the extremities above the hoof of any Tennessee Walking Horse or racking horse while being shown, exhibited, or offered for sale at any horse show, horse exhibition, or horse sale or auction, except lubricants such as glycerine, petrolatum, and mineral oil, or mixtures thereof." To determine the presence of prohibited substances (such as topical anesthetics and any other substance that is not glycerine, petrolatum, or mineral oil), a USDA Animal Care inspector or technician obtains swabs at the request of a VMO (DQPs do not take swabs) from the surface of the pastern of the horse prior to inspection/palpation. TWH industry personnel have raised the objection that prohibited substances found on a horse's leg(s) were from environmental contamination. Thus, to rule out any environmental contamination swabs are also taken from the surrounding air. Additionally, the majority of the substances

[6] Commonly used treatment for thrush in horses and ponies.

[7] See https://www.bristol.ac.uk/chemistry/facilities/nerc-lsmsf/techniques/gcms (accessed May 23, 2020).

found in the past 2 years were topical anesthetics, substances not found in the environment. All swabs (three samples: a blank/control and swabs from both the left and right forelegs of the horse) are placed immediately into sealed evidence bags and sent directly to an APHIS-accredited laboratory for testing using GC–MS. One person conducts all tasks involved in the sampling for prohibited substances, from the preparation of collection tubes to the actual swabbing and packaging for shipment to the laboratory. However, because of budgetary constraints, swabbing/testing cannot be done on all of the horses and shows that VMOs inspect. APHIS follows a risk-based approach in which VMOs only take swabs at shows where prohibited substances are more likely to be detected (shows with padded horses). In 2018, 144 out of 194 (74.23 percent) padded horses tested positive for prohibited substances, while 28 out of 66 (42.42 percent) flat-shod horses tested positive. In 2019, 84 out of 111 (75.68 percent) padded horses tested positive, while only 3 out of 23 (13.04 percent) of flat-shod horses tested positive (Radel, 2020).

Because results from swab tests are not obtained on the same day (they are received by USDA days after the show has taken place), they do not factor into the decision to allow the horse to show or to disqualify the horse. Results from prohibited substances testing provide information on what types of prohibited substances are being detected on horses, the compliance rate for padded horses compared with flat-shod horses, and the compliance rates according to the type of shows and geographic location. Depending on the type of substances detected (i.e., numbing agents), the results may be used to build a federal case against the horse custodian (Melissa Radel, APHIS, personal communication, April 3, 2020). APHIS posts data from prohibited substance tests on its Horse Protection Program website. Prior to 2017, lab results only indicated which prohibited substances were detected, but concentrations were not determined. In fiscal years 2018 and 2019 the prohibited substance testing results included the concentrations of the detected substances if they were on the APHIS target substances list. If the detected substances were not on the target list, only their presence was indicated, not the concentration (Radel, 2020).

Finding 2-6: Budgetary constraints limit swabbing and testing by APHIS for prohibited substances that cause soreness or that can mask soreness.

Conclusion 2-6: Testing of swabs is an effective method to determine if prohibited substances have been applied to the limb of horses to cause soreness or to mask soreness.

METHODS FOR DETECTING SORENESS NOT CURRENTLY USED IN HORSE INSPECTIONS FOR HPA ENFORCEMENT

Thermography (Thermal Imaging)

Thermography is a noncontacting, noninvasive method of detecting heat emitted from the body or from a part of the body and representing the heat as a pictorial display, called a thermogram. This method involves the use of an infrared camera. Thermography measures infrared radiation emitted from a body (or a particular body part) which then can be directly converted to temperature measurements (see Figures 2-4 and 2-5). The heat detected is directly related to the presence of blood vessels near the skin; warmer temperatures are indicative of increased circulation or a change in blood flow—conditions that are correlated with injury or inflammation (soreness) or lameness (Robson, n.d.; Veterinärmedizinische Universität Wien, 2013; Turner, 2015).

Thermography can help locate an area that is inflamed, but it does not characterize the etiology of inflammation. It is commonly used in equine medicine (in conjunction with other diagnostic methods) to help with the proper diagnosis and treatment of back injuries and lameness (Turner, 1999, 2015). In clinical cases thermography has been found to successfully detect a number of equine inflammatory conditions including laminitis, arthritis of the femoropatellar joint, and tendonitis (Purohit and McCoy, 1980). At FEI-sanctioned show jumping events, limb sensitivity examinations employ thermography to determine abnormalities in the heat patterns on a horse's skin (FEI, n.d.).

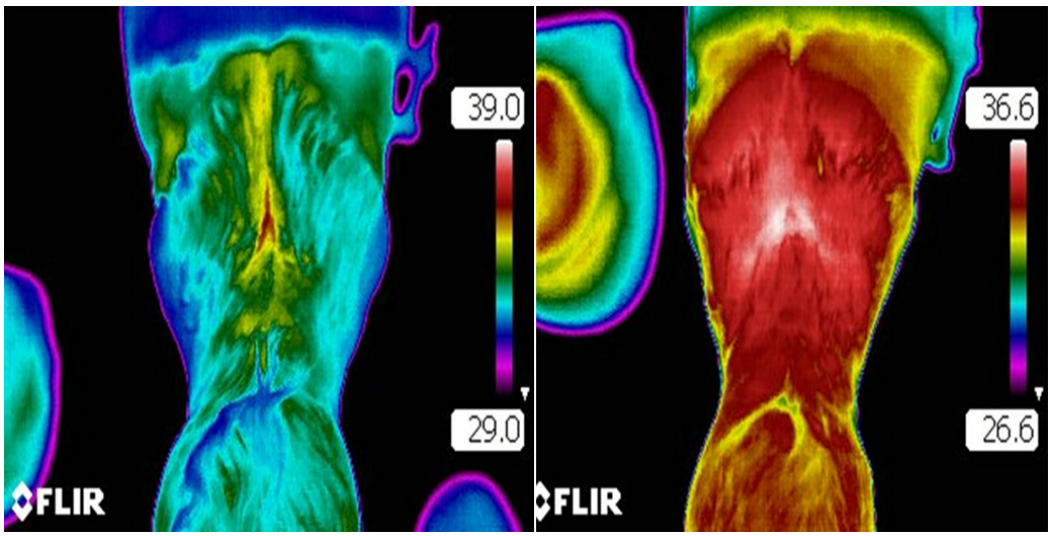


FIGURE 2-4 Thermographic images of horse palmar pastern. Warmer temperatures are indicated by white and red. As the temperature decreases, the colors transition to blue and purple, as indicated on the temperature chart. Higher skin temperatures are correlated with inflammation. The image on the left shows a normal palmar thermogram; the warmest area is in the "pocket" and down through the cleft to central sulcus. The image on the right is not a normal thermogram; it shows a significant increase in thermal emissions over the palmar pastern and vertical striations. This pattern has only been seen in association with a horse that is sore with dermal changes. SOURCE: T. A. Turner, D.V.M.

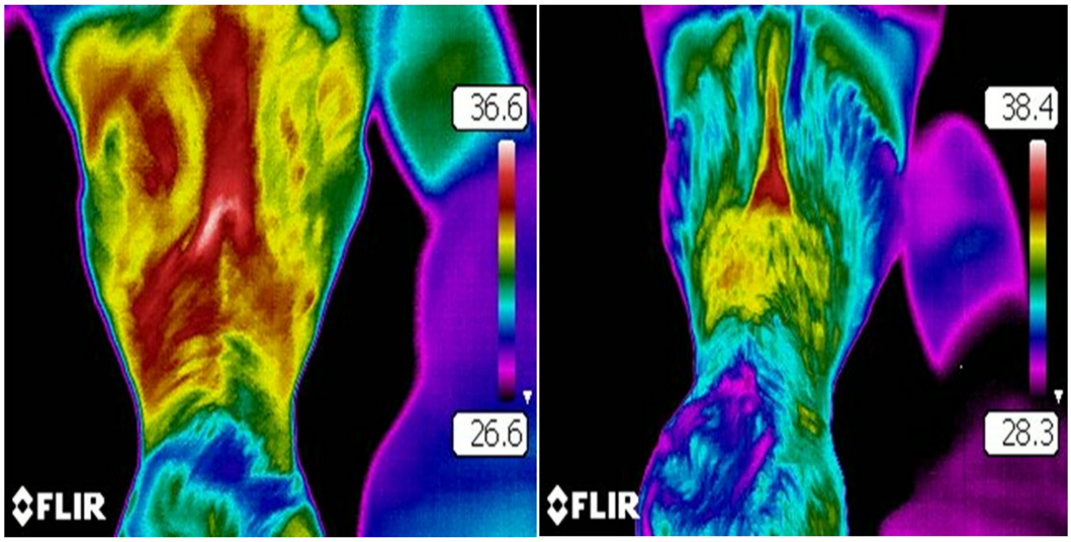


FIGURE 2-5 Thermographic images of the fore pasterns of two different horses. These thermal images are not normal and are suspicious because of the asymmetry of the pattern. SOURCE: T. A. Turner, D.V.M.

Thermographic measurements are highly accurate and repeatable (Turner, 2011) when taken under optimal conditions (listed in the American Academy of Thermology Veterinary Guidelines for Infrared Thermography; AAT, 2019). While no more complicated than other imaging techniques (Lesté-Lasserre, 2013), thermography is sensitive to environmental factors such as sunshine, ambient temperature, and drafts and to the presence of haircoat, topical moisture, and topical liniments (AAT, 2019). One study found that airflow can cause the temperature of horses' forelimbs to decrease, which necessitates taking measurements in a draft-free environment in order to avoid false-negative or false-positive diagnoses (Westermann et al., 2013b). However, measurements are not affected by the position

of the infrared camera, as shown by a study by Westermann et al. (2013a) in which they found that changes in the camera angle (up to 20°) or a 0.5-m increase in camera distance from the forelimb did not affect thermographic measurements. In fact, when used by trained individuals who understand and know how to compensate for such "artifacts," thermography is a highly useful tool under competition conditions (Turner et al., 2001).

Past Use of Thermography for HPA Enforcement

Thermography was originally used by USDA in 1978 as additional basis for enforcement of the HPA, which at that time mainly relied on palpation as the method for detecting soreness. The decision to use thermography was based on research performed by Nelson and Osheim (1975), which showed thermography to be an accurate and objective diagnostic tool.[8] After the use of thermography became standard protocol[9] for Federal Veterinary Service employees (the equivalent of VMOs today), two issues were identified that resulted in a change in the Horse Protection Regulations. Specifically, it was noted that certain preparations used by the industry for the lubrication of action devices could block infrared emissions; as a result, the rule was established that only glycerin, petroleum, or mineral oil could be used and only after the inspection process (APHIS, 1978). In addition, while examining young horses (2-year-olds) thermographically, a high incidence of tendonitis was observed. This was attributed to the weight of the shoe and pads and to the length of time these horses worked. Subsequently, regulations were added to the HPA that limited the workouts and performances of 2-year-old horses.

During the 1990s the use of thermography to help with HPA enforcement ceased. This was due to the cost and complexity of the equipment, as the machines were cumbersome, required special training, and were not easy to use or get to the horse shows. Another reason was that industry was not in favor of thermography because it added to the time of the inspection, and custodians wanted to get their horses warmed up and in the ring (R. DeHaven, former APHIS administrator, personal communication, August 3, 2020).

In 2008, thermography was reintroduced into the show inspection process and became part of the USDA protocol when inspecting horses for compliance with the HPA. Technology had improved markedly, with the equipment being less expensive, more durable, and easier to use. The standard operating procedure for thermography[10] was as follows: Thermography screening inspections were to be used to screen horses prior to palpations by DQPs or VMOs. The screening would consist of three images of the limb from the carpus (knee) distally; front (dorsal), left side (lateral LF and medial RF), and right side (medial LF and lateral RF); and then two close-up images, one of each palmar surface of the front pasterns. These inspections also were to be used to gather data to analyze thermography image results in comparison with soring. The USDA Horse Protection regional or national coordinator requested VMOs who attended competitions, exhibits, or sales to perform thermography screening inspections. The custodians of horses that displayed abnormal images had the option to take the horse back to the barn or to proceed forward through inspections. Foreign substance sampling might be conducted after the thermography screening inspection if image patterns indicate that a foreign substance might have been applied to the horse's legs. Thermography was last used at the 2016 TWH National Celebration.

During the time thermography was used—between 2009 and 2016—thermal patterns were detected that were consistent with and subsequently shown to be indicative of foreign substances applied to the legs. Patterns were also found that were determined to be consistent with chronic inflammatory conditions of the pastern as well as patterns to be expected after the application of desensitizing agents.

[8] Kimberly Copher Back, HPA Docket No. 08-0007 (U.S.D.A. May 12, 2009) (Decision and Order), https://oalj.oha.usda.gov/sites/default/files/090512_HPA-08-0007_DO.pdf (accessed June 19, 2020).

[9] Thermography was typically used on horses that exhibited pain reaction during digital palpation (R. DeHaven, former APHIS administrator, personal communication, August 3, 2020).

[10] USDA APHIS Thermography Standard Operating Procedure. Unpublished. March 25, 2011.

Finding 2-7: Thermography, an imaging technique that veterinarians use to detect inflammation and that was used in HPA enforcement in the past, is currently not being used in detecting soreness during horse inspections.

Conclusion 2-7: Thermographic cameras are an objective tool for recognizing alterations in blood flow to the limbs of horses, which is indicative of inflammation. Thermography can be a screening tool in the inspection process and can provide supporting evidence of soreness, which may increase the efficiency and reliability of the inspection process.

Radiology/Radiography

Radiology is the use of x-rays and other high-energy radiation for the diagnosis and treatment of disease (radiography is the type of technology used to produce images). Radiologic techniques are used to produce images (called radiographs) to help evaluate an anatomic structure during pre-purchase or lameness examinations. Radiographs are useful in determining damage or changes to bony tissues but provide limited information on soft tissues, such as tendons or ligaments. They require interpretation by an experienced and knowledgeable veterinarian (AAEP, 2020) and are often used in conjunction with clinical examination. Because radiographs are two-dimensional, taking multiple views of the area of interest is required to allow for sufficient examination of changes in the structure of the bone or soft tissues (Turner, 2015; Oke, 2019). Plain film radiography, the standard system for many years, has now been replaced by computed radiography and digital radiography systems (Turner, 2015). Currently available portable radiologic machines allow radiographs to be easily viewed on laptops, and they are reasonably priced.

Digital radiography was introduced into the horse inspection process during the 2009 show season. It was used to examine the hoof packages for the use of illegal weights, nails, packing, or other devices prohibited by the HPA (see Figures 2-5 to 2-9). The digital radiography standard operating procedure is as follows: Radiography may be used to further evaluate a horse for soring after palpations by DQPs or VMOs. These inspections will also be used to gather data to analyze digital radiography image results comparing compliant and noncompliant horses. The USDA Horse Protection regional or national coordinator requests VMOs who may attend competitions and exhibits to work with veterinary consultants to include digital radiography in the inspection process when needed. The procedure requires digital radiography equipment (plate and x-ray generator), safety lead gowns and gloves, and a computer with imaging analysis software and the ability to calibrate images. Four radiographic images are made, two of each front foot. The images should include a horizontal dorsal palmar and a lateral-to-medial projection of each front foot with the x-ray beam centered on the shoe (APHIS Animal Care, 2018).

Data collected from various radiographs show that some horses have had evidence of excessive trimming of the sole and excessive dressing of the dorsal hoof capsule as well as the presence of laminitis or other hoof abnormalities that would cause pain to the horse. As a result of this information, regulations were instituted specifying that a horse having greater than 5 degrees of rotation is to be considered evidence of soring (Stick et al., 1982).

Testing of Blood Samples for the Presence of Prohibited Medications

Blood testing is most commonly done in the horse racing and nonracing performance horse industries to test for the presence of medications that are given to horses to enhance the horses' performance (e.g., analgesics, steroids, or bronchodilators), to calm or improve the performance of excitable horses (e.g., sedatives, tranquilizers), or to make it difficult to detect the presence of illegal drugs (e.g., diuretics) (Slifer, 2018). Annually, the racing industry spends about $11 million on sample collection and about $26.5 million on testing (Jockey Club, 2014). Blood testing is performed according to medication rules and guidelines set by the regulatory body (i.e., state or sanctioning organization) that contracts with the testing laboratory (S. Stanley, University of Kentucky, personal communication,

A Review of Methods for Detecting Soreness in Horses

February 18, 2020). The USEF has established a protocol for testing and a policy on prohibited drugs and permitted medications, including concentrations allowed for permitted medications. For verification of horse identity, record keeping, and exchange of information, racehorses and other horses that compete in FEI or USEF/U.S. Hunter Jumper Association (USHJA)–sanctioned events are required to be identified by microchip.[11] APHIS does not perform blood testing as part of HPA enforcement.

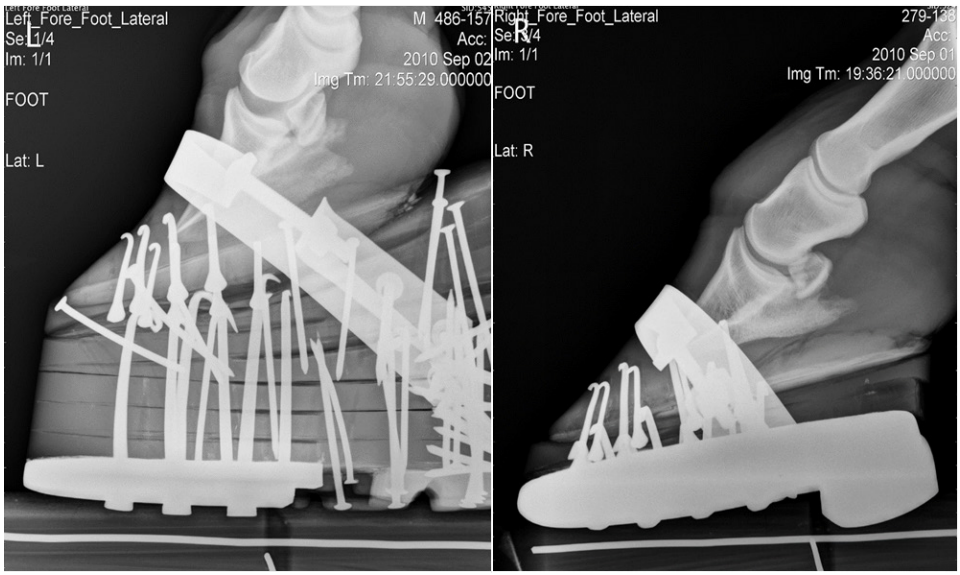


FIGURE 2-6 Radiographs showing hoof wall width and sole depth. Although the Horse Protection Regulations do not currently specify acceptable ranges for these measurements, many feet that were radiographed showed measurements that were significantly outside of normal measurements. The image on the right shows an excessively thin hoof wall.

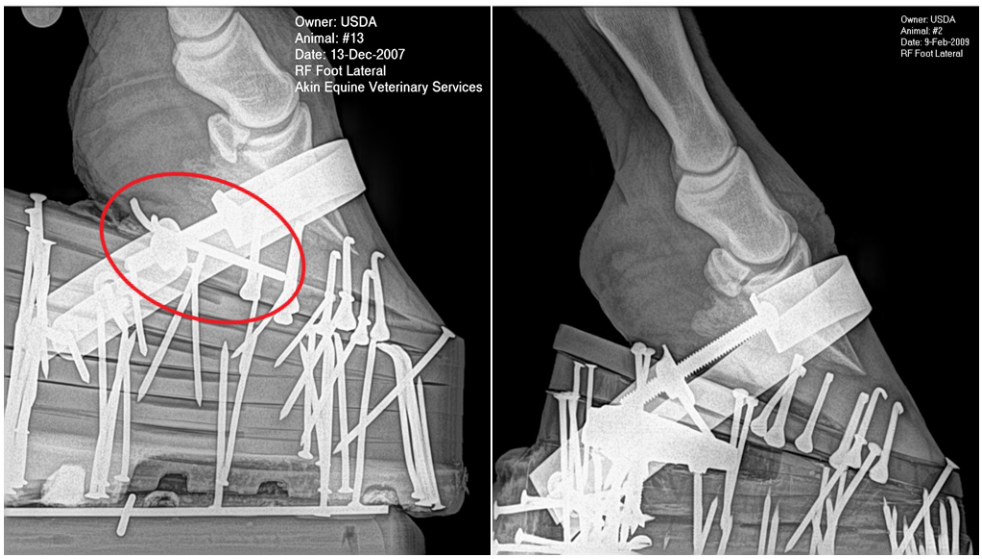


FIGURE 2-7 Radiographs of illegal substances inside hoof packages: of a Chadwick spring (left, encircled), which constitutes an illegal substance between sole and pad; (right) an illegal weight inside the package.

[11] See https://inside.fei.org/fei/your-role/veterinarians/passports/microchips; https://www.usef.org/learning-center/videos/horse-microchipping (accessed November 12, 2020).

FIGURE 2-8 Radiograph showing a rotation of >5 degrees.

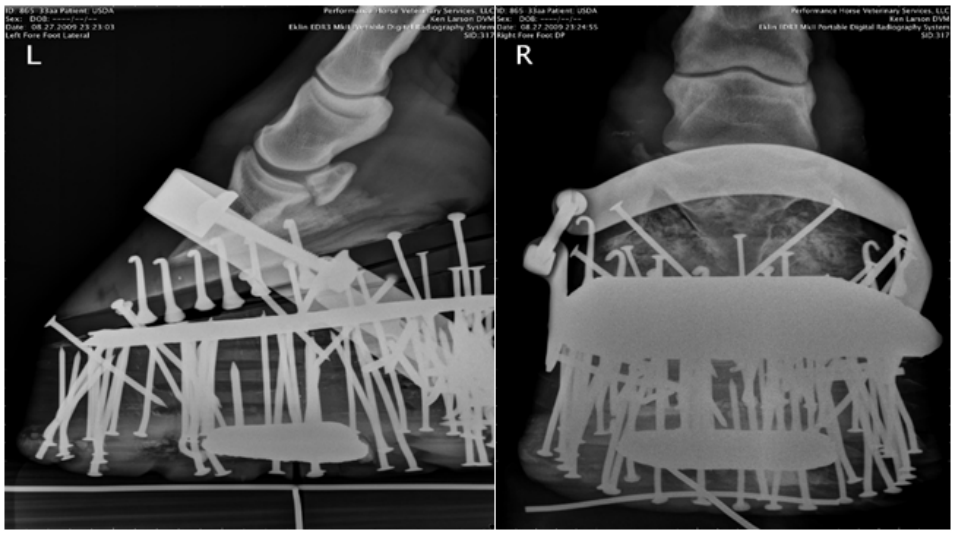


FIGURE 2-9 Radiographs of (left) a lateral view of an illegal metal pad and a legal weight on the sole of the package and and(right) a dorsal palmar view of an illegal metal pad and a legal weight on the sole of the package.

In 2014 the Tennessee Walking Horse National Celebration sought the creation of a veterinary advisory committee (VAC) that would provide oversight for the collection and testing of blood samples taken from TWHs entered during the 2014, 2015, and 2016 National Celebration. Blood testing was done by accredited laboratories (LGC Sciences, Inc. in 2014; University of California, Davis, in 2015 and 2016) to determine compliance with the medication withdrawal guidelines set by the VAC (S. Stanley, University of Kentucky, personal communication, February 18, 2020). The laboratories were asked to test blood samples for the presence of prohibited substances and drugs that were identified by the VAC. These substances fell under the following general categories: nonsteroidal anti-inflammatory drugs (NSAIDs), sedatives, corticosteroids, non-androgenic reproductive hormones, immunostimulants, electrolytes, vitamins and minerals, and intra-articular injections.

A Review of Methods for Detecting Soreness in Horses

The method for detecting the presence of prohibited substances employed standard equipment and technologies that are used to test blood samples from racehorses (i.e., liquid chromatography–mass spectrometry). In all of the 3 years that blood testing was done, the samples tested all came from winners from each of the classes of the National Celebration (Stromberg, 2017). Test results were sent by the laboratories to the VAC. According to one of the documents provided by the TWH industry representative,[12] the number of samples taken in 2014, 2015, and 2016 were 407, 88, and 84, respectively. Of these samples 230, 88, and 26 were selected for testing. The numbers of samples that tested positive for prohibited medications were 51 out of 230 in 2014, 0 out of 88 in 2015, and 17 (9 were from pleasure horses) out of 26 in 2016. In 2014 the medications most prevalent in the samples were methylprednisolone, a steroid primarily used for treating joint and soft tissue inflammation (26 samples); triamcinolone acetonide, a corticosteroid for treating skin and joint conditions (14 samples); and diclofenac, an NSAID (12 samples). Some samples were found to contain at least two anti-inflammatory medications. The results of the testing in 2015 indicated that all samples were in compliance with the VAC's medication withdrawal guidelines. In 2016 some samples were found to be noncompliant with withdrawal guidelines for some compounds, namely romifidine, a sedative; phenylbutazone, an NSAID; and stanozonol, a synthetic steroid with anabolic and androgenic properties (S. Stanley, University of Kentucky, personal communication, February 18, 2020).

To the committee's knowledge, blood testing was done only in these 3 years (2014, 2015, and 2016) at the National Celebration, and the blood samples that were tested came from winners, that is, horses that would not have been allowed to compete if they were found to be sore or to be in violation of other Horse Protection Regulations. This puts into question the usefulness of blood testing in determining if a horse was experiencing soreness when it was entered into a show. Most therapeutic drugs, such as those detected in the blood samples from 2014 National Celebration winners, are generally administered to horses for their overall well-being (Slifer, 2018), so it cannot be assumed that these were given to horses specifically to alleviate pain or inflammation of the limbs. However, NSAIDs, opioids, and local anesthetics may abolish a sore horse's response to palpation by decreasing mechanical nociceptive thresholds to palpation (Schatzmann et al., 1990; Dönselmann et al., 2017; Söbbeler and Kästner, 2018; Echelmeyer et al., 2019). Topically applied pain blocking chemicals (e.g., lidocaine or benzocaine) are less likely to enter the bloodstream and the window of their detection is small and depends on how frequently they were applied, the quantity applied, and how much time has elapsed before testing was performed (S. Stanley, University of Kentucky, personal communication, February 18, 2020). Topically applied pain blocking chemicals can be detected by swab testing technology, which is currently being employed by APHIS to check for the presence of prohibited substances on horse limbs (see USDA APHIS Protocol for Detecting Prohibited Substances that Mask Soreness section in this chapter).

Finding 2-8: Blood sampling to test for prohibited medications and medications conditionally permitted but given above therapeutic levels is common in equestrian competitions around the world to protect horse welfare and to ensure fairness in competition. Testing is done according to medication rules and guidelines set by a regulatory body based on data on how the use or overuse of these medications can adversely affect the horse or alter its performance. Regulatory bodies, such as the United States Equestrian Federation (USEF) and International Federation for Equestrian Sports require identification of horses by microchip for identity verification, information sharing, and record keeping.

Finding 2-9: Medications given to TWHs are the same as medications administered to other competition horses and include all of the opioids, sedatives, local anesthetics, and nonsteroidal anti-inflammatory drugs (NSAIDs). These medications (along with their allowable concentrations) have been identified and are tested for by USEF, which has set the standards for medication testing for the entire nonracing equine

[12] The 2014, 2015, and 2016 blood testing reports and the summary report are available upon request to the Public Access Records Office of the National Academies of Sciences, Engineering, and Medicine.

competition industry in the United States, and other performance horse organizations. Blood testing is not routinely done in TWHs.

Conclusion 2-8: Anti-inflammatory drugs (e.g., NSAIDs), the prevalent type of medication detected in samples from TWHs in 2014, are generally given to horses to treat illness or injury or to alleviate pain in some part of the horse's body. Research indicates that NSAIDs, as well as opioids and local anesthetics, may significantly reduce or abolish a horse's response to palpation. Data collected through blood testing to determine presence of NSAIDs, opioids, local anesthetics or sedatives in TWH competitions could be applied to correlate the use of these drugs in horses that are or are not identified as being sore to determine if medications are being used to hinder the detection of soreness via palpation during pre-show inspections.

RECOMMENDATIONS

Recommendation 2-1: In line with the USDA OIG's recommendation in 2010, the committee strongly recommends that use of DQPs for inspections be discontinued and that only veterinarians, preferably with equine experience, be allowed to examine horses, as is done in other equine competitions.

Recommendation 2-2: If the limited budget for HPA enforcement necessitates continued use of third-party inspectors, the committee recommends that they should be veterinarians or equine industry professionals who are screened for potential conflicts of interest and that they be trained to inspect by APHIS, not by HIOs. This is in line with the rule proposed by APHIS in 2016 that was finalized in 2017 but not yet implemented. Training should be done by experienced equine veterinarians, and strict competency evaluations should be conducted to assess the skills and knowledge of trainees before they are given license to inspect horses. Consequences for performing a substandard examination should be strictly enforced and reports of substandard performance and letters of admonishment should come from the APHIS, not HIOs.

Recommendation 2-3: APHIS should adhere to the Horse Protection Regulation 9 C.F.R. § 11.4 (h)(2), which states that the reexamination of the horse shall only be granted if the show veterinarian (not the competitor or any other persons) finds sufficient cause.

Recommendation 2-4: In digital palpation of distal limbs, the extent of digital pressure need not be prescribed, provided that experienced equine veterinarians are performing the inspections. Use of palpation from the carpus distally to determine the presence or absence of limb sensitivity is well established in other equine competitions. Horses with limb sensitivity in these competitions must be withdrawn for the welfare of the horse and safety of the rider.

Recommendation 2-5: Owing to physiological changes that occur after repeated stimulation of a painful area, inspection protocols should be based on current knowledge of pain perception and should exclude the requirement that horses must be repeatedly sore in a specific area to be disqualified.

Recommendation 2-6: To detect prohibited substances, swabs should be done on a random sampling of horses or on horses that the VMO identifies as suspect from observations made on the grounds of the horse show.

Recommendation 2-7: Thermography should be reinstituted in the inspection of TWHs.

Recommendation 2-8: Serious consideration should be given to testing blood of TWHs, using USEF's rules and guidelines as a model, to detect medications administered to alter TWH response to palpation and for overall protection of TWH welfare and ensuring fair competitions. This would include random

selection of horses, which are identified by microchip, at shows or sales. Championship shows should require the testing of winning horses as well as randomly selected competing horses.

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3

New and Emerging Methods, Approaches, and Technologies for Detecting Pain and Its Causes

This chapter addresses the committee's task to identify potential new and emerging methods, approaches, and technologies for detecting hoof and pastern pain and its causes (see Chapter 1, Box 1-3 for the full statement of task). This chapter begins with a discussion of factors that affect pain perception and the expression of pain. This is followed by a review of pain detection methods and technologies based on horse behavior and physiological parameters and a discussion of how these methods could be used to improve the detection of soreness in horses during inspections for compliance with the Horse Protection Act (HPA).

Detection of pain in horses is complex and requires adequate training and experience. A thorough clinical exam is the foundation of veterinary diagnosis, and its value for grading pain and lameness is supported by an abundance of scientific evidence. Palpation of the painful area remains the gold standard for detecting soreness, though behavioral changes and facial expressions can also help identify a painful individual. Human health care practitioners commonly use grimace scales as an adjunctive method to grade pain, and their use in horses is promising. Thus far most of the research has looked at facial expressions in horses with or without clinical pain under controlled conditions. The standardized protocol used during show inspections of the Tennessee walking horse (TWH) offers a unique opportunity to study whether the facial grimace could be adopted as a noninvasive low-cost method to improve detection of soreness.

INTRODUCTION

Pain is a vital sensory modality that detects certain types of threats to homeostasis—the tendency of the body's various systems to remain at equilibrium and maintain optimal functioning. Behavioral reactions to pain act to defend the animal against potential injury and include efforts to escape from, cope with, avoid, or remove the source of pain. The sensation of a harmful chemical, mechanical, or thermal stimulus activates peripheral pain receptors, called nociceptors. The neural signal is transmitted to the dorsal horn of the spinal cord, where the primary afferent nerve axon signals neurons in the spinal cord, initiating a withdrawal reflex; the signal is also passed along to the brain, which leads to the actual perception of pain.

Pain perception in horses can be influenced by extraneous factors in the environment as well as by horses' individual differences in pain sensitivity, coping style, and history. For example, compared with sensitive horses (i.e., active coping style), stoic horses (i.e., passive coping style) tend to demonstrate less behavioral change with pain (Ijichi et al., 2014). This may be an important factor to consider when assessing pain in TWHs, which have been bred for the qualities of docility and stoicism. Furthermore, individual differences among horses in sensitivity to pain, personality, and training history might cause some sore horses to display pain behaviors while others under the same conditions might not. Furthermore, extraneous factors such as stress and distractions—as would be present at a horse show—can help explain why the same horse may respond differently to pain from one moment to the next.

Context and Environment

Situational factors can facilitate or inhibit pain expression and thus contribute to scoring and decision errors during an evaluation for pain. The modulation of pain behavior by environmental stressors, distractions, other sources of pain and habituation is discussed below.

Stressors

Pain and stress are closely related but operationally distinct constructs. Pain is one type of stress that threatens homeostasis, but not every stressor is painful. Behavioral responses to pain may be similar to and confounded with responses to other causes of distress (Rietmann et al., 2004). To accurately assess pain and avoid confounding pain and stress responses, pain assessment procedures are typically conducted in an environment with as few extraneous stressors as possible. For example, in scoring a horse's facial expression of pain using the Horse Grimace Scale (HGS), Dalla Costa et al. (2014), who developed the scale, recommend that the horse should be observed in a quiet location without outside interference from observers. To increase the accuracy of the score, the authors also suggest videotaping and repeating observations, particularly if the goal is to monitor changes in pain state, such as following surgery (see discussion of the HGS in the section on Behavioral Assessment of Pain).

The effect of stress on pain sensitivity is complex and depends on the type of stressor, on its duration and intensity, and on individual differences in the stress response. Research in horses suggests that pain thresholds increase when stressors are present in the environment, thereby inhibiting pain expression. This phenomenon is called stress-induced analgesia or hypoalgesia and is considered typical in prey animals. Even a mild stressor has been shown to suppress pain behavior in horses. In one study, horses moved and paced more when in a stressful situation (social isolation) and were less active in response to mild somatic pain (a neck skin pinch). Horses were restless in the combined stressor–pain condition, indicating that stressors can moderate pain behavior (Reid et al., 2017). In another study, the mere presence of a person was enough to inhibit pain. Horses in a hospital with orthopedic pain showed significantly fewer discomfort behaviors when a caretaker was present than when the horse was alone (Torcivia and McDonnell, 2020). Discretely observing the horse in a quiet environment—for example, by using video—is the ideal standard, but it is not possible in the context of an inspection during a horse show. It is important to consider, however, that even mild signs suggesting pain observed in an environment with distractions should be taken seriously, since the threshold for pain perception and expression may be markedly increased.

Responses to stress and pain can be inextricably confounded in some cases. Studies of pain in the ridden horse recognize that distress behaviors can be caused by either pain—for example, from a tight noseband or an ill-fitting saddle—or by anxiety from environmental stressors (Dyson et al., 2018; Gleerup et al., 2018). To accurately identify pain, the assessment protocol should minimize environmental stressors and discriminate between responses caused by pain and those caused by stress.

Discriminant validation conducted on several human behavioral and facial expression pain scales has confirmed that stress and pain are distinct. In one study the Wong-Baker Scale featuring simple cartoon pain faces accurately discriminated between self-reports of pain and fear in young children (Garra et al., 2013). In another study, behavioral responses for five commonly used neonatal behavioral pain scales were found to discriminate between a painful experience (heel lance) and a stressful experience (nappy change), whereas physiological measures such as heart rate, blood pressure, and respiration rate measures did not accurately discriminate between the pain and stress (Kappesser et al., 2019). Distinguishing between behavioral expression of pain and stress is a relatively unexplored area of research in horses. In one pilot study (Dalla Costa et al., 2017) researchers scored facial expressions of horses in four potentially distressing situations using the HGS, which was designed to grade pain. Only horses that were startled by an umbrella opening (the fear condition) trended to score higher on two of six

facial indicators, "ears held stiffly backward" and "prominent chewing muscles." On the basis of these findings the researchers concluded that the assessment tool was a specific indicator of pain. Further discriminant validation research of this sort is needed to distinguish pain from other sources of stress in horses.

Distractions

Horses are inspected for violations of the Horse Protection Regulations at show grounds which have a wide range of environmental distractions, including other horses, exhibitors and spectators, and noises. To reduce distractions, 9 C.F. R. § 11.5(a)(2) states that:

> The management of any horse show, horse exhibition, or horse sale or auction shall, without fee, charge, assessment, or other compensation, provide APHIS representatives with an adequate, safe, and accessible area for the visual inspection and observation of horses while such horses are competitively or otherwise performing at any horse show or horse exhibition, or while such horses are being sold or auctioned or offered for sale or auction at any horse sale or horse auction.

Section 11.6 describes the inspection space and facility requirements and states:

> The management of every horse show, horse exhibition, or horse sale or auction, containing Tennessee Walking Horses or racking horses, shall provide, without fee, sufficient space and facilities for APHIS representatives to carry out their duties under the Act and regulations at every horse show, horse exhibition, or horse sale or auction, containing Tennessee Walking Horses or racking horses, whether or not management has received prior notification or otherwise knows that such show may be inspected by APHIS. The management of every horse show, horse exhibition, horse sale or auction which does not contain Tennessee Walking Horses or racking horses shall provide, without fee, such sufficient space and facilities when requested to do so by APHIS representatives. With respect to such space and facilities, it shall be the responsibility of management to provide at least the following:
>
> (a) Sufficient space in a convenient location to the horse show, horse exhibition, or horse sale or auction arena, acceptable to the APHIS Show Veterinarian, in which horses may be physically, thermographically, or otherwise inspected.
>
> (b) Protection from the elements of nature, such as rain, snow, sleet, hail, windstorm, etc., if required by the APHIS Show Veterinarian.
>
> (c) A means to control crowds or onlookers in order that APHIS personnel may carry out their duties without interference and with a reasonable measure of safety, if requested by the APHIS Show Veterinarian.
>
> (d) An accessible, reliable, and convenient 110-volt electrical power source, if electrical service is available at the show, exhibition, or sale or auction site and is requested by the APHIS Show Veterinarian.
>
> (e) An appropriate area adjacent to the inspection area for designated horses to wait for inspection, and an area to be used for detention of horses.

Section 11.21(a)(4) also discourages handlers from distracting the horse, and states that:

> The DQP shall instruct the custodian of the horse to control it by holding the reins approximately 18 inches from the bit shank. The DQP shall not be required to examine a horse if it is presented in a manner that might cause the horse not to react to a DQP's

examination, or if whips, cigarette smoke, or other actions or paraphernalia are used to distract a horse during examination.

Distractions created by horse custodians can contribute to unexplained variance in pain assessment during an inspection and across inspectors. The committee's observation of 61 inspection videos revealed that many exhibitors adhered to Horse Protection Regulations when holding a horse for inspection, but others did not. Horse custodians inadvertently or intentionally held reins closer than 18 inches from the bit shank, touched the horse or the bit, held the reins taut (in some cases above the level of the horse's mouth), jiggled or jerked on the reins, and stood in front of the horse in a dominant stance. The custodian may have been trying to control or correct an unruly horse, but these distractions can draw the horse's attention away from the digital palpation; a shift in attention has been shown to suppress pain expression (Hoegh et al., 2019; Torcivia and McDonnell, 2020).

Conditioned Pain Modulation

Pain inhibits pain. Conditioned pain modulation (CPM) occurs when two painful stimuli are presented together, either simultaneously or sequentially. The pain of interest is in one location, but the response to that pain is inhibited by pain induced in a different location (Kennedy et al., 2016). Both distraction and CPM suppress pain, but they appear to work by two independent mechanisms (Hoegh et al., 2019). In humans, CPM is known to inhibit the withdrawal reflex at the level of spinal activity via "differential recruitment of the muscles involved in the protective behavior" (Jure et al., 2019, p. 259). To the committee's knowledge CPM has not been studied in horses, although in humans it is a hypothesized mechanism for exercise-induced analgesia, a phenomenon whereby pain is inhibited by vigorous exercise (Lima et al., 2017). One study with endurance horses confirmed that lower limb pain was less immediately after competition than it was before competition (Schambourg and Taylor, 2020).

Through CPM, a horse's withdrawal response to the digital palpation of a painful pastern could be inhibited by pain in a different location. When a horse is held for inspection, pain in the oral cavity will evoke an evasive response. The biomechanics of forces created by movement of the bit, tension in the reins, or the reins raised sharply can cause pain. A shank bit is used on most competition horses undergoing inspection. As a result of lever action, any force applied by movement of the reins will be amplified. When the reins are lifted upward, the direction of bit rotation is opposite to their direction during riding, putting pressure on sensorily naïve tissue. To relieve pain in the oral cavity, a horse is likely to raise the head and neck and brace backward (O. Doherty, International Association of Equitation Science Council, personal communication, April 20, 2020). In its review of 61 inspection videos, the committee observed some horses reacting this way during digital palpation, creating uncertainty about the source: Was it a reaction to the palpation of a painful pastern, to pain in the oral cavity, or to some other stressor?

Habituation and Peripheral Sensitization

Reflex strength can be reduced by repeated stimulation through the process of habituation and is a potential source of variability in responses to digital palpation during inspections. Any initial responses to a stimulus, such as pressure, applied to a nonpainful area are expected to habituate and therefore to decrease with repeated stimulation. Responses to pressure applied to a painful area, however, are not expected to habituate. Information about response habituation could be incorporated into the inspection training in order to reduce the misattribution of potentially stressful, but nonpainful, handling procedures as a pain response.

Peripheral sensitization can result in the expansion of pain response to mechanical stimuli, such as digital palpation, to an area of uninjured tissue adjacent to the source of injury (Woolf, 1989). Nociceptors generally have high thresholds that are only activated by intense stimuli, but tissue injury and

peripheral sensitization result in a decreased pain threshold. Thus, digital palpation of a painful area of the pastern could elicit a withdrawal response over a broad area.

Individual Differences

Horses differ in their sensitivity and response to pain due to differences in genetics, personality, past experiences, and training history. Individual differences result in variations between horses and can help explain why some sored horses, as determined by physical evidence such as a violation of the scar rule or inflammation that is apparent with thermography, may not display pain behaviors. Individual differences in sensitivity, coping style, and training history and their potential effect on pain behavior are described below.

Pain Sensitivity

Some individuals are inherently more responsive to pain induced by a stimulus than others because of genetically based differences in nociceptor sensitivity and activity. Previous painful insults can also have long-lasting effects on nociceptor sensitivity. Research on the development of chronic pain has provided information about the neuroplasticity of pain. For example, repeated injury can exacerbate a painful stimulus and experience through an increase in the number and activity of pain receptors (Woolf, 1989). This can lead to hyperalgesic priming, which is an increased sensitivity to subthreshold stimuli, and in extreme cases to allodynia, where pain is caused by a stimulus that does not normally elicit pain, such as the light touch of clothes on sunburned skin (Latremoliere and Woolf, 2009).

Coping Style

Coping style refers to an individual's manner of responding to perceived danger, a stressful situation, or an environmental challenge, and, like other dimensions of personality, coping style is stable across situations and time (Coppens et al., 2010; Ijichi et al., 2014). Coping style is modeled as a continuum, with proactive and reactive types as anchors (Koolhaas et al., 1999; Koolhaas and Van Reenen, 2016). Proactive individuals have an active coping style, exerting control to remove themselves from the situation (flight) or to remove the source of danger (fight). Reactive individuals tend to be passive, responding to stressors by freezing and emotional blunting (lack of emotional expression) (Koolhaas et al., 1999). Individual differences in coping style can muddle the link between the intensity of a painful stimulus and the observed pain response (Squibb et al., 2018).

Coping style has been linked to personality (Koolhaas and Van Reenen, 2016). Bold personality types tend to have a proactive coping style and shy personality types to have a reactive coping style. Breed differences in personality, notably anxiousness and excitability, have been reported in horses (Lloyd et al., 2008). Although personality has not been systematically studied in the TWH, the breed is characterized as having a "gentle disposition" and a "calm, docile temperament" (TWHBEA, 2020), traits consistent with a shy personality and reactive coping style. Despite their quiet, compliant demeanor, individuals with a reactive coping style have a more pronounced physiological response to stressors (Coppens et al., 2010), raising welfare concerns.

Training History

Compliance during a stressful or painful handling experience is not always a reliable indicator of a horse's underlying affect, physiological state, or level of physical discomfort but may instead reflect its training history. In one study, compliance, as measured by latency to cross a tarp or walk through streamers, did not correlate with physiological indicators of stress, including heart rate variability, infrared eye temperature, and core body temperature (Squibb et al., 2018). The researchers hypothesized that compliance (such as standing still and following) in trained horses may depend more on previously

A Review of Methods for Detecting Soreness in Horses

learned cues than on the horse's level of distress and that these previously learned cues could "overshadow inherent emotional responses" (Squibb et al., 2018, p. 37).

For practical and safety reasons, horses are generally trained to defer to a handler rather than to react to events in the environment. When training involves the application of pressure through a lead rope or rein, the horse seeks to escape from the discomfort, and behavior such as halting is reinforced by the release of pressure (McGreevy and McLean, 2009).

Horses quickly learn to anticipate and respond to cues that predict pain or pressure. Pressure applied to the bit can cause oral pain that may overshadow the limb withdrawal response during palpation of the pastern. Through associative learning, cues that predict bit pressure or pain, such as a movement of the hand, reins, or halter, can also come to overshadow pain responses to palpation, possibly through an extension of CPM (Kennedy et al., 2016).

The intensity and urgency of coping with a stressor can be mitigated in the presence of a calm, competent handler (Ijichi et al., 2018). Having some degree of control over pain and stressors can also mitigate many of their negative effects. Sustained tension on the reins during training or inspections, however, causes acute uncontrollable and inescapable pain, and learned helplessness may result (Hall et al., 2008). Research has not been done with horses, but seminal work with dogs (Seligman and Maier, 1967; Maier and Seligman, 1976) and rats (Seligman and Beagley, 1975) provides a model for learned helplessness, indicating that it is an outcome of uncontrollable stress and pain; in this research dogs exposed to inescapable shock became apathetic and, in subsequent trials, made no effort to escape from pain, and the effect persisted over time (Seligman et al., 1975). Learned helplessness resulting from aversive training methods has been suggested in horses, a species that displays a surprising level of compliance under stressful and painful conditions (Waran et al., 2002).

VARIABILITY OF PAIN EXPRESSION

To accurately determine the amount of pain an individual is experiencing requires having both reliable assessment methods and an agreement among raters about how to implement those methods. For most pain assessment scales, reliability, validity, and inter-rater agreement are known and published, having been calculated as part of the scale development and validation process. For example, as mentioned above (see section on Nociceptive Withdrawal Reflex) scores on the Composite Pain Scale (CPS) item "Response to palpation of the painful area" had good to excellent agreement between raters as calculated by Cohen's kappa statistic (κ) (Bussieres et al., 2008), which is a widely accepted measure for determining inter-rater reliability. An assessment method with low inter-rater reliability is generally not used in practice.

The validity of a behavioral assessment procedure is called into question when there are scoring discrepancies among raters. Low agreement can occur when one or some combination of the following occurs: (1) the assessment method is unreliable; (2) extraneous factors create inconsistencies in the behavior being scored; and (3) raters apply the method differently or inconsistently, often due to inadequate training or conflict of interest.

The reliability of a behavioral scale can be compromised if it is used in a new context, if it is used by an untrained individual, or if it is applied inconsistently. When a scale is developed in one context but applied in a different context, its validity and reliability may differ from the published values, and additional research must typically be carried out in the new context. For example, the CPS (Bussieres et al., 2008) was developed in horses with induced orthopedic pain and then validated later for use in horses with laminitis (van Loon and Van Dierendonck, 2019). In addition, clinical scales are expected to be used by a large number of raters; inter-rater agreement, and thus the validity of the assessment method, is ensured through standardized training and consistent application across raters. Uncontrolled extraneous factors can also introduce error into the assessment. Some behaviors are robust against, and others more easily modulated by, extraneous variables. Pain behavior can be inhibited or facilitated by extraneous variables. Factors that influence variability in the expression of pain are discussed below.

As Sator-Katzenschlager (2014) wrote, "The amount of pain perceived … is assumed to be directly proportional to the extent of injury" (p. 699). Pain perception, however, is subjective and does not necessarily correlate with the degree of injury. In addition, responses may depend on the severity of pain. While veterinarians generally agree in their assessments of severe pain, their assessments tend to differ for moderate and chronic pain (Price et al., 2002; Rietmann et al., 2004).

Finding 3-1: Individual horses differ in perception and expression of pain. These differences are influenced by such factors as distractions and stressors in the immediate environment and the horse's genetics, training history, temperament, and coping style.

Finding 3-2: Research has shown that horses' responses to environmental stressors tend to overshadow their responses to pain. Hence, pain assessment scales used in veterinary research and practice recommend observing the horse in a quiet environment to ensure that the findings are valid and reliable.

Finding 3-3: Observation of 61 inspection videos revealed that some inspections were conducted in relatively quiet locations during a show whereas others were conducted in locations with loud noises and with large numbers of people and other horses moving around nearby.

Finding 3-4: The "pain inhibits pain" effect (i.e., conditioned pain modulation) occurs when the pain of interest is inhibited by a pain induced in a different part of the horse's body. During inspection, it is possible that pain in the lower limb and hoof that is being evaluated could be inhibited if the horse also experiences pain because of how it is being restrained by the custodian.

Finding 3-5: Observation of 61 inspection videos revealed numerous incidents of stewarding during the standing inspection that were not dealt with by the inspector. Stewarding may have simply been out of habit or to prevent or control the horse's restless behavior. Examples of stewarding included holding the reins closer than 18 inches from the bit, often just below or on the shank. In some cases, the horse was restrained with constant tension, often with the reins held in an upward direction, or the reins were pulled sharply. These restraint tactics create a distraction during the palpation procedure and can induce pain in the oral cavity, and they violate Horse Protection Regulations.

Conclusion 3-1: Environmental distractions present during horse inspections can result in the inspector reaching inaccurate conclusions regarding soreness. Distractions and stressors can inhibit a horse's sensitivity to and expression of pain, such that detection of soreness would be missed, or a horse's reaction to distractions could be incorrectly attributed to pain. Moreover, when more than one inspector examines the horse, its behavior may differ between the two inspections if the number and type of distractions and stressors at that location and time also differ.

Conclusion 3-2: Pain or discomfort can be caused by restraint during an inspection. Some restraint methods create acute oral cavity pain that can inhibit limb and hoof pain. How a horse is restrained during an inspection may differ between inspectors and potentially result in different observations and conclusions about the same horse.

BEHAVIORAL ASSESSMENT OF PAIN

The goal of inspections is, as described in Chapter 1 of this report, to examine a horse to determine compliance with or violation of the HPA. Designated qualified persons (DQPs) and, less often, veterinary medical officers (VMOs) examine horses entered in show classes for lower limb pain, scars and lesions, and prohibited substances that contribute to or mask soreness. The Horse Protection Regulations allow for the use of visual methods to determine whether a horse is in violation or is compliant (9 C.F.R. § 11.21) and further states that the inspector should "observe for responses to pain in

A Review of Methods for Detecting Soreness in Horses

the horse" (9 C.F.R. § 11.21(a)(2); see Chapter 2). However, the Horse Protection Regulations do not specifically mention examining behaviors that can be indicative of pain, nor is behavior included as a category on official inspection forms used by DQPs and VMOs.

A horse's behavior can inform an assessment of physical pain and distress. A valid pain assessment method should produce a consistent response that corresponds to the level of perceived pain. Pain perception, however, involves a subjective element that does not always correlate perfectly with the degree of physical insult (Reid et al., 2018).

Most objective clinical pain scales include a behavioral component. Being able to recognize a patient's pain experience aids in making decisions about diagnosis and appropriate palliative care. In nonverbal humans and animals, for whom self-report measures are not reliable or possible, grading pain relies heavily on observing behavior. To accurately judge an animal's pain state requires being familiar with the species and the individual, using a reliable assessment method, and controlling factors that contribute to variation in the perception and expression of pain. This section presents clinical scales for evaluating orthopedic pain and laminitis in horses that include behavioral indicators, and it reviews the factors that can facilitate or inhibit pain expression.

Pain Sensation, Perception, and Expression

As noted above, pain is a vital sensory modality that detects certain types of threats to homeostasis. Initial behavioral responses to acute pain are mediated by descending motor pathways. The nociceptive withdrawal reflex (NWR) is a relatively simple flexor reflex produced entirely by neural pathways that lie within the spinal cord. A familiar example of the NWR is the automatic withdrawal of a hand after touching a hot stove burner.

Pain signals are further transmitted to the brain via ascending afferent neurons in the spinal cord. Pain perception occurs in the brain, bringing pain into conscious awareness, localizing the pain, and adding an emotional component. Pain perception is complex and is modulated by an individual's past experiences and coping style. An individual's *perception* of pain is the amount of pain an individual subjectively experiences at a given moment, which does not always correspond with the absolute magnitude of the stimulus causing the pain. Behaviors that reflect a horse's perceived level of pain include facial expressions and voluntary motor behaviors, such as posture, pawing, and head movements.

Pain Behavior Scales

The choice of an assessment tool for diagnosing and grading physical pain in horses depends on the source of pain (e.g., visceral, orthopedic, traumatic)[1] and the intended use of the assessment. Pain scales intended for research or inpatient hospital use tend to be time-consuming to complete and complicated to score and often require extensive training. In the case of some tools, repeated observations (e.g., baseline measures) are also needed before a determination about the animal's pain state can be made, limiting the tools' clinical application (de Grauw and van Loon, 2016). Pain assessment conducted in the field tends to employ scales that are simpler, take less time to complete and score, and yield rapid results. These features facilitate diagnosis and treatment in real-life conditions and when time is limited.

The development of clinical scales for assessing pain in animals lags behind, but parallels, the development of these scales in humans. Pain assessment in infants (Riddell et al., 2013) is particularly relevant. As is the case with infant pain scales, equine pain scales generally include physiological (e.g., heart rate, blood pressure, respiration rate) and behavioral (e.g., facial expression, posture, discrete behaviors) indicators.

The equine pain scales presented in this chapter meet the following criteria: (1) The scale was developed or validated, or both, in horses with orthopedic pain or laminitis—two types of clinical pain

[1] For a comprehensive review of pain assessment tools organized by type of pain (nonspecific pain, abdominal pain, and limb and foot pain) see Ashley et al. (2005).

that are most similar to the pain a sore horse might experience; (2) the scale includes at least some behavioral indicators of pain that could be freely expressed by a horse during a show inspection; other behaviors, such as lying down, might also be included on a scale but are not relevant to the show context; and finally (3) the scale has been validated to some extent for specificity, sensitivity, and/or inter-rater reliability. When considering scale validation, the committee was mindful that most equine scales have been developed for clinical application. In this context, false negative results, meaning that the assessment method does not detect some individuals that do have pain, create a serious treatment and welfare concern. In the context of HPA horse inspections, however, false positive results raise an equally serious concern because they can potentially result in a reported soring violation when there was none, with unwarranted penalties for the exhibitor.

BEHAVIORAL INDICATORS OF PAIN

Nociceptive Withdrawal Reflex

NWR is a behavioral response to palpation of a painful area (see Chapter 2 for a discussion of palpation). Limb withdrawal responses to palpation are graded as positive if the horse displays the NWR or if the horse avoids the pressure by lifting its foot, attempting to paw the ground or stamp, flexing the limb, or attempting to walk off (Luna et al., 2015).

Research provides evidence that the limb withdrawal response to mechanical stimulation is an accurate and valid method for assessing pain. In a study by Luna et al. (2015), nociceptive thresholds to mechanical, thermal, and electrical stimuli were measured in eight horses. The stimuli were applied to the thorax and lower limb, and thresholds were scored by multiple raters at two time points separated by months. The researchers found that a mechanical stimulus applied to the hoof had the highest inter-observer agreement (100 percent), sensitivity (100 percent), and specificity (94–97 percent), and they concluded that the stimuli "were easy to apply, aversive responses were consistent and easy to interpret, and all tests were reliable, sensitive and specific" (Luna et al., 2015, p. 613).

The limb withdrawal response is included as an item on the CPS (see Table 3-1), which was developed in horses with induced orthopedic pain (Bussieres et al., 2008). Horses showing little or no response to palpation were rated as having little or no pain, and those resisting palpation or showing a violent reaction were rated as having more severe pain. This item has been found to have good to excellent reproducibility across raters. Scores for the "response to palpation" item also had high sensitivity and specificity, meaning that the item accurately discriminated between horses with and without pain.

The NWR is reliably elicited by palpation of a painful forelimb pastern. As a relatively simple and invariant behavior, this flexor reflex is readily identified by different inspectors. Although horses can be trained not to respond to pain and being in an unfamiliar environment can dampen the pain response, the NWR is less affected than other behavioral indicators of pain by training, extraneous environmental factors, and individual differences. For these reasons, palpation of the potentially painful pastern is an indispensable element of the HPA inspection protocol for detecting pain in sored horses.

Weight Off-Loading and Lameness

Force applied to a painful limb will cause a horse to shift weight away from the pain, causing it to adopt an abnormal limb position and head and neck movement, which results in lameness, defined as an abnormal stride during locomotion. Observation for lameness is included in the inspection procedures detailed in Chapter 2 (section on Observation of Horse Movement and Appearance). In addition, reluctance to lead, gait abnormalities or problems with locomotion, shifting weight to the rear legs, and stepping forward with the rear limbs while the front limbs remain lightly planted are aspects of lameness and weight off-loading that are included on a list of indicators of pain in the Animal Care, Horse

A Review of Methods for Detecting Soreness in Horses

Protection Program DQP training material from the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS).[2]

Behavioral scales developed for horses with laminitis and orthopedic pain typically include items describing abnormal posture, weight bearing, and movement. Behavioral indicators of discomfort are described and illustrated in a recently developed ethogram using horses with orthopedic pain in a hospital (Torcivia and McDonnell, 2020). Another clinical scale, the Obel Method (Meier et al., 2019), originally developed in 1948 (Obel, 1948), is widely used for grading discomfort and lameness associated with laminitis (Table 3-2). In an evaluation procedure that is similar to that used with the Obel scale, DQP and VMO inspectors evaluate a horse's gait while it is walking on a straight line and turning in accordance with 9 C.F.R. § 11.21 9(a)(1). Recognizing gait abnormalities depends on having a standard for comparison, but there are no available gait analyses performed in padded or flat-shod competition horses that have never been subjected to the practice of soring; it would be valuable if such analyses could be carried out in future research (see Chapter 2 section on Observation of Horse Movement and Appearance).

TABLE 3-1 Score Sheet for the EQUUS-COMPASS Composite Pain Scale

Data	Categories	Score
Physiological data		
Heart rate	24–44 beats/min	0
	45–52 beats/min	1
	53–60 beats/min	2
	>60 beats/min	3
Respiratory rate	8–13 breaths/min	0
	14–16 breaths/min	1
	17–18 breaths/min	2
	>18 breaths/min	3
Rectal temperature	36.9–38.5°C	0
	36.4–36.9°C or 38.5–39.0°C	1
	35.9–36.4°C or 39.0–39.5°C	2
	35.4–35.9°C or 39.5–40.0°C	3
Digestive sounds	Normal motility	0
	Decreased motility	1
	No motility	2
	Hypermotility or steelband	3
Behavior Posture (weight distribution, comfort)	Stands quietly, normal walk	0
	Occasional weight shift, slight muscle tremors	1
	Non-weight bearing, abnormal weight distribution	2
	Analgesic posture (attempts to urinate), prostration, muscle tremors	3
Appetite	Eats hay readily	0
	Hesitates to eat hay	1
	Shows little interest in hay, eats very little hay in mouth but does not chew or swallow	2
	Neither shows interest in nor eats hay	3
Sweating	No signs of sweating	0
	Warm or damp to touch, no sweat or wet spots visible	1
	Wet spots visible, no droplets or streams	2
	Excessive sweating, may include streams or droplets	3

(Continued)

[2] This document was provided by APHIS to the committee. A copy can be requested from the Public Access Records Office of the National Academies of Sciences, Engineering, and Medicine.

TABLE 3-1 Continued

Data	Categories	Score
Kicking at abdomen	Quietly standing, no kicking	0
	Occasional kicking at abdomen (1–2 times/5 min)	1
	Frequent kicking at abdomen (3–4 times/5 min)	2
	Excessive kicking at abdomen (>5 times/5 min), intermittent attempt to lie down and roll	3
Pawing at floor (pointing, hanging limbs)	Quietly standing, does not paw at floor	0
	Occasional pawing at floor (1–2 times/5 min)	1
	Frequent pawing at floor (3–4 times/5 min)	2
	Excessive pawing at floor (>5 times/5 min)	3
Head movements	No evidence of discomfort, head straight ahead for the most part	0
	Intermittent head movements laterally/vertically, occasional looking at flank (1–2 times/5 min), lip curling (1–2 times/5 min)	1
	Intermittent and rapid head movements latterly/vertically, frequent looking at flank (3–4 times/5 min), lip curling (3–4 times/5 in)	2
	Continuous head movements, excessively looking at flank (>5 times/5 min), lip curling (>5 times/5 min)	3
Appearance (reluctance to move, restlessness, agitation, and anxiety)	Bright, no reluctance to move	0
	Bright and alert, occasional head movements, no reluctance to move	1
	Restlessness, pricked up ears, abnormal facial expressions, dilated pupils	2
	Excited, continuous body movements, abnormal facial expressions	3
Response to treatment Interactive behavior	Pays attention to people	0
	Exaggerated response to auditory stimulus	1
	Excessive-to-aggressive response to auditory stimulus	2
	Stupor, prostration, no response to auditory stimulus	3
Response to palpation of the painful area	No reaction to palpation	0
	Mild reaction to palpation	1
	Resistance to palpation	2
	Violent reaction to palpation	3
Total		39

SOURCE: Adapted by van Loon and Van Dierendonck (2019) from Bussieres et al. (2008).

TABLE 3-2 Obel Laminitis Grades for Rating a Horse's Withdrawal from Pressure/Palpation of Localized Area

Grade	Behavioral Description
Normal	Horse appears sound
Obel grade I	At rest, the horse shifts its weight between the forelimbs; the horse is sound at the walk, but the gait is stilted at the trot in a straight line and on turning
Obel grade II	The gait is stilted at the walk and the horse turns with great difficulty, but one forelimb can be lifted
Obel grade III	The horse is reluctant to walk, and one forelimb can only be lifted with great difficulty
Obel grade IV	Horses express marked reluctance or absolute refusal to move

SOURCE: Adapted from Meier et al. (2019).

A Review of Methods for Detecting Soreness in Horses

Facial Grimace

In humans, pain scales based on facial expressions offer objective, quick, and simple tools for use in clinical practice. As they are used in human medicine, facial expressions reliably convey information about a patient's perceived pain and its severity, and both facial expressions and limb withdrawal are commonly used to grade pain in children and infants for whom verbal self-report is unreliable or impossible (Garra et al., 2013).

The way that pain is expressed in the face has features that are similar in a number of mammals and is referred to as a "facial grimace" or "pain face." Grimace scales have been developed and validated to assess pain in animals that are used in laboratory research, including mice (Langford et al., 2010), rats (Sotocinal et al., 2011), and rabbits (Keating et al., 2012). The APHIS Animal Care, Horse Protection Program training material for designated qualified persons includes "abnormal reactions of the eye, ears, and head in response to palpation" in a list of pain indicators, but no further information is provided. In the past decade several scales have been developed that describe facial features indicative of pain in horses (Dalla Costa et al., 2014; Gleerup et al., 2015; van Loon and Van Dierendonck, 2015). These scales have not been psychometrically compared with one another in a systematic way, but all describe a similar facial expression indicative of pain.

A horse in pain shows distinctive and likely involuntary facial expressions (Dalla Costa et al., 2014; Gleerup et al., 2015; Wathan et al., 2015). In the upper half of the face the horse's ears rotate backward to focus caudally with increased distance between them. Tension is apparent in the muscles above the eye with a pronounced zygomatic process, and the horse has a withdrawn gaze and a reduced blink rate. In the lower half of the face the horse's nostrils are dilated, the muzzle is tense with pursed lips, and the chewing muscles along the cheeks are tense. The overall appearance is a flattened facial profile (Table 3-3; Figures 3-1 and 3-2).

The HGS (Figure 3-1) was developed for use in research and clinical practice using a sample of horses that were undergoing routine castration (Dalla Costa et al., 2014), and the scale was later validated on horses diagnosed with acute laminitis (Dalla Costa et al., 2016) and with dental pain (Coneglian et al., 2020). The equine pain face (Gleerup et al., 2018; shown in Figure 3-2) and the Equine Utrecht University Scale for Facial Assessment of Pain (EQUUS-FAP; van Loon and Van Dierendonck, 2015; Table 3-4) also describe grimace-like facial expressions in horses with pain. The equine pain face was developed by comparing facial action units (FAUs) of horses in a control condition and two pain-induction conditions: a chemical burn caused by the topical application of capsaicin on the antebrachium, and ischemic pain caused by a blood pressure cuff. The EQUUS-FAP was developed (van Loon and Van Dierendonck, 2015) and validated (Van Dierendonck and van Loon, 2016) in horses diagnosed with acute colic, and follow-up studies further validated its application to horses with facial pain (van Loon and Van Dierendonck, 2017) and orthopedic pain (van Loon and Van Dierendonck, 2019). In its review of 61 HPA-compliant and noncompliant inspection videos, the committee found that many horses displayed a facial grimace during digital palpation (Figure 3-3), indicating that the palpation was painful. Facial expressions consistent with pain were often observed concurrently with changes in the horses' posture and focus, including reduced movement of head and neck; ventral positioning of the head, with head positioned forward or turned slightly away from the inspector; and an inward focus of attention.

TABLE 3-3 Facial Features of Horses in Pain

	Pain Expression	
Facial Features	Gleerup et al. (2015)	Dalla Costa et al. (2014)
Ears	Asymmetrical/low ears	Ears stiffly backwards+
Eye	Angled eye Withdrawn and tense stare	Tension above the eye area and orbital tightening
Nostrils	Square-like	Strained
Muzzle	Tension of the muzzle	Strained mouth and pronounced chin
Mimic/chewing muscles	Tension of the mimic muscles	Tension of the chewing muscles

FIGURE 3-1 Horse Grimace Scale. Score is the sum of six features, rated as not present (0), moderately present (1), or obviously present (2). Higher scores indicate higher levels of pain. SOURCE: Dalla Costa et al. (2014).

Scoring the HGS, equine pain face, and EQUUS-FAP scales to grade pain requires some training but is sufficiently simple and quick for the scales to be used in clinical practice. Items for both the HGS (Figure 3-1) and EQUUS-FAP (Table 3-4) scoresheets are assigned a value 0, 1, or 2. Higher values indicate greater pain characterized by increasing tension and internal focus/withdrawal. The EQUUS-FAP scale includes additional facial behavior categories, such as yawning and teeth grinding. Training and use of these objective scales can potentially improve accuracy of pain diagnosis and grading. In one study, dental pain was rated on a scale ranging from 0 (no pain) to 3 (severe pain) from photographs (Coneglian

A Review of Methods for Detecting Soreness in Horses

et al., 2020). The research found high agreement among veterinarians who were trained to use the HGS and poor agreement among equine veterinarians who evaluated pain subjectively based on experience.

Mobile apps are currently available for scoring facial expression and other behavioral indicators of pain in horses. The Equine Pain and Welfare App (EPWA) was developed by researchers and veterinarians at Utrecht University in the Netherlands for Android and Apple operating systems. The measurement of pain using facial expressions is based on the EQUUS-FAP scale (van Loon and van Dierendonk, 2015). The Horse Grimace Scale HGS app, developed by AWIN WP4 for Android operating systems, includes an informational video, a training session on how to use the HGS (Della Costa et al., 2014), and a session for scoring horses. The apps offer a convenient, simple, and accurate way to clinically assess behavioral indicators of pain.

Biomedical research has applied computer technology to identify and integrate FAUs that correspond to a level of perceived pain. EquiFACs (Equine Facial Action Coding System) is an emerging method modeled after a human facial action coding system (Ekman and Friesen, 1978). Using technology, the movement and position of facial muscles are categorized and functionally linked to equine affective states (Wathan et al., 2015). A study using this system found the FAU scores of the equine grimace, as coded by the HGS, correlated with the pain state of the animal (Dalla Costa et al., 2018).

Other Behavioral Indicators of Pain

Behavioral responses to pain involve characteristic postures and movements that act to alleviate pain. These behaviors are included in the CPS (Table 3-1). The CPS assessment tool was initially developed on a sample of horses with induced synovitis pain in the tarsocrural joint of the hock (Bussieres et al., 2008) and later clinically validated in horses presenting with acute orthopedic pain (van Loon and Van Dierendonck, 2019).

The CPS is a multifactorial scale that includes physiological measures, spontaneous behaviors, and evoked responses to stimuli (Table 3-1). Each of the 13 items is assigned a score from 0 to 3, giving a total pain score ranging from 0 (no signs of pain) to 39 (maximal pain score). During scale development in horses with orthopedic pain, researchers compared the CPS scores of each horse with and without anesthesia. Posture was found to have the greatest diagnostic sensitivity and specificity for pain, and the authors recommended it be included in a composite pain scale. The descriptions of postures indicative of orthopedic pain were "non-weight bearing positions and abnormal weight distribution" and "analgesic posture, prostration, muscle tremors." Pawing the ground was also strongly associated with pain state, but its utility in HPA inspections may be limited because horses are often unable to paw or prevented from pawing the ground. The CPS item "interactive behavior" had high specificity but low sensitivity for pain, and "head movement" had low specificity. Consequently, the authors suggested that these items should not be included in a composite pain scale.

While spontaneous pain behaviors are prominently represented in the CPS, the scale also includes two "response to treatment" items—"interactive behavior" and "palpation of the painful area." These items are of particular interest because of their direct relevance to the inspection procedure. "Response to palpation of the painful area" was previously discussed (see Nociceptive Withdrawal Reflex. above). "Interactive behavior" refers to a horse's attention and behavior toward the environment. The CPS grades a horse that pays attention to people or shows an "exaggerated response to an auditory stimulus" as having little or no pain. Interestingly, the scale grades both a horse that overreacts to or shows an aggressive response to an auditory stimulus and a horse that does not respond to an auditory stimulus and appears to be in a "stupor" as experiencing a high degree of pain. This may be explained by the fact that an individual horse's personality is linked to its expression of pain, which adds to the complexity of pain assessment (Ijichi et al., 2014).

The pros and cons of behavioral assessment scales discussed in this section are summarized in Table 3-5.

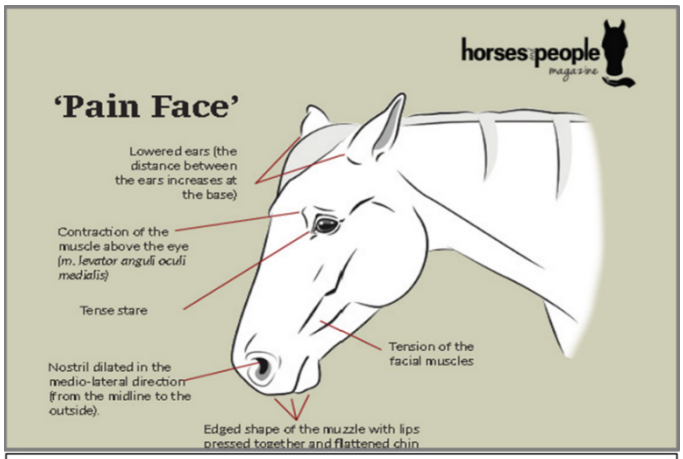

FIGURE 3-2 "Pain face" diagram for clinical use. SOURCE: Gleerup et al. (2015).

TABLE 3-4 Score Sheet for the Equine Utrecht University Scale for Facial Assessment of Pain (EQUUS-FAP) Scale

Data	Categories	Score
Head	Normal head movement; interested in environment	0
	Less movement than normal	1
	No Movement	2
Eyelids	Opened eyelids; sclera can be seen in case of eye/head movement	0
	More opened than normal or tightening of eyelids. An edge of the sclera can be seen for 50% of the time	1
	Obviously more opened eyes or obvious tightening of eyelids. Sclera can be seen more than 50% of the time	2
Focus	Focused on environment	0
	Less focused on environment	1
	Not focused on environment	2
Nostrils	Relaxed	0
	A bit more opened than normal	1
	Obviously more opened than normal; nostril flaring and possibly audible breathing	2
Corners mouth/lips	Relaxed	0
	Lifted a bit	1
	Obviously lifted	2
Muscle tone head	No fasciculations	0
	Mild fasciculations	1
	Obvious fasciculations	2
Flehmen and/or yawn	Absent	0
	Present	2

(Continued)

A Review of Methods for Detecting Soreness in Horses

TABLE 3-4 Continued

Data	Categories	Score
Teeth grinding and/or moaning	Absent	0
	Present	2
Ears	Position: Orientation toward sound; clear response with both ears or ear closest to source	0
	Delayed or reduced response to sound	1
	Position: backwards or no response to sound	2
Total		18

SOURCE: van Loon and Van Dierendonck (2017, supplementary table S1).

FIGURE 3-3 Photographs captured from videotaped standing inspections by designated qualified persons before (left) and during (right) palpation. Single images are less reliable than video clips and are presented here with the sole purpose of illustrating facial grimace expressions observed in horses in the inspection context. The upper images are of the same horse. Top and bottom left: Examples of alert facial expressions immediately before palpation consistent with no pain. Features include normal movement of the head with a focus on the environment, eyes open with relaxed upper lid, nostrils relaxed, facial muscles and mouth relaxed, and ears forward or directed toward sounds in the environment. Top and bottom right: Examples of facial expressions during palpation consistent with a pain grimace. Features include little or no movement of the head, eyes widely open with contraction of the muscles above the eye and tense stare, sclera often visible (not shown), muscle tension in the face and neck, nostrils open and flared, mouth pursed, and ears held backward with little or no response to sounds in the environment (van Loon and Van Dierendonck, 2018). SOURCE: Photos are from videos received from APHIS. Top photos from DQP Inspection 2 (left photo, time stamp 0:29; right photo, time stamp 1:48). Bottom left photo from DQP Inspection 14 (time stamp 0:19); and bottom right photo from DQP Inspection 5 (time stamp 0:25). Copies of videos may be requested from the Public Access Records Office of the National Academies.

TABLE 3-5 Behavioral Assessment Scales Basis, Pros, and Cons

Scale (author)	Assessment Basis	Pros	Cons
Composite Pain Scale (Bussieres et al., 2008). Digital palpation is included as one item on the scale.	Identification of flexor reflex (nociceptive withdrawal reflex [NWR]) during digital palpation.	NWR is reliably elicited by palpation of a painful forelimb pastern. The flexor reflex is readily identified with good to excellent reproducibility across raters. Digital palpation had high sensitivity and specificity, such that scores accurately discriminated between horses with and without pain. Compared with other behavioral indicators of pain, the NWR is less affected by training, extraneous environmental factors, and individual differences across horses.	
Obel method (Obel, 1948)	Abnormal posture, weight bearing, and movement.	Commonly used in clinical practice to grade discomfort and lameness associated with laminitis. Easy to score with five grade classifications.	Training is required to recognize and grade gait abnormalities. Accurately scoring gait abnormalities depends on having a standard for comparison, but normal gait analyses in padded or flat-shod TWH competition horses that have never been sored is not available.
Facial expressions of pain	Features of the upper and lower halves of the face, called facial action units.	Facial indicators of pain are reliably expressed and distinctive; they are involuntary and similar across horses.	Scoring facial expressions requires training and can be time-consuming, requiring several minutes of continuous observation, repeated observations, videotaping, or multiple still images. Facial expressions due to pain may be confused with expressions caused by other stressors. Environmental distractions and actions of handlers can interfere with pain expression.
Horse Grimace Scale (HGS) (Dalla Costa et al., 2014, 2016)	Horses in veterinary care for routine castration, laminitis, and dental pain.	Test is simple to score with six facial features graded on a 3-point scale. Most of the six facial features showed good inter-rater reliability. In horses with laminitis, HGS scores were correlated with Obel method pain grade.	Time-consuming scoring procedure that involved videotaping stabled horses and selecting still images from videotapes. Sensitivity and specificity are not known.

(Continued)

A Review of Methods for Detecting Soreness in Horses

TABLE 3-5 Continued

Scale (author)	Assessment Basis	Pros	Cons
Equine pain face (Gleerup et al., 2018)	Burning pain induced with a chemical substance and mechanical pain induced with a tourniquet.	Experimental study with healthy horses, comparing facial expressions in the same horse with and without pain. Easy to score, recording the presence of each of six facial expressions associated with pain. Presence of a human observer did not influence the horses' facial expressions of pain.	Inter-rater reliability, sensitivity, and specificity are not known. The type and location of the induced pain are different than pain experienced by horses that have been sored.
Equine Utrecht University Scale for Facial Assessment of Pain (EQUUS-FAP) (van Loon and Van Dierendonck, 2015, 2017, 2019; Van Dierendonck and van Loon, 2016)	Horses in veterinary care with colic, facial pain, and orthopedic surgery/trauma.	Validated for several clinical populations. High inter-rater reliability, sensitivity, and specificity. An app for android and OIS operating systems is available to simplify training and scoring.	Scoring requires training. A score for each of nine items is assigned based on specific descriptions. To grade facial expressions of pain, horses are observed continuously for 2 minutes.

Finding 3-6: DQPs are directed to observe the horse for responses to pain during the inspection process in 9 C.F.R. § 11.21. Some information about behavioral indicators of pain appear in the APHIS training material for DQPs. However, the training material lists "abnormal reactions of the eye, ears, and head in response to palpation." The term "abnormal" is unnecessarily vague, given that specific facial expressions indicative of pain have been described in clinical research literature.

Finding 3-7: Pain can be detected accurately and consistently when it is assessed using physical, physiological, and behavioral parameters that are based on validated clinical scales.

Finding 3-8: Clinical research in horses under veterinary care for laminitis and orthopedic injuries has confirmed that pain assessment using the withdrawal response to palpation is an accurate and reliable method for identifying pain, with very high agreement between raters.

Finding 3-9: Horse Protection Regulations do not include current information about equine pain behavior and its application to clinical practice. Facial grimace scales have long been used in human medicine to assess pain in infants and young children and are currently used in laboratory animal research and veterinary care to assess pain and welfare state.

Finding 3-10: Some horses displayed a facial grimace during standing inspection in the 61 videos provided to the committee. However, the videos also showed that various factors, such as dim lighting, a horse's dark color, and an inspector's body position and direction of gaze while palpating the limb, may prevent a single inspector from simultaneously palpating the forelimb and observing the horse's facial expression.

Conclusion 3-3: A common set of objective criteria grounded in behavioral science, including facial expressions indicative of pain, is lacking from inspector training. Thus, an inspector's interpretation of a horse's behavior is subjective, but it can influence a determination of soreness.

Conclusion 3-4: Research is needed to determine the utility of assessing facial expression of pain in TWHs as part of the inspection procedure before use of facial expressions can be proposed as an additional method for detecting soreness. It is important to know if facial grimace can be reliably

identified by different inspectors. It is also important to determine the extent to which the facial expressions of pain correspond to current evidence of soreness during inspections, such as withdrawal responses to digital palpation and findings of noncompliance with the scar rule criteria.

Conclusion 3-5: One practical limitation to including facial expressions to assess pain during digital palpation is the challenge an inspector might have of simultaneously observing the horse's face and forelimb.

Conclusion 3-6: In clinical research, agreement between raters on horses' responses to digital palpation is consistently high. While agreement may be lower when palpation is carried out in a horse show environment, differences between inspectors' findings are more likely to result from inadequate training and inconsistent application of technique than from the validity of the pain assessment procedure itself. Another factor might be conflict of interest, which the USDA OIG 2010 audit found was an influence on how DQPs conducted inspections.

PHYSIOLOGICAL ASSESSMENT OF PAIN

Physiological measurements have been used extensively in assessing pain in horses and humans, both in clinical practice and in applied research. The factors that are measured include, but are not limited to, heart rate and heart rate variability, respiratory rate, body temperature, ocular temperature, blood pressure, and various endogenous substances such as beta-endorphins, cortisol, serotonin, dopamine, substance P, and oxytocin. This section includes a discussion of physiological parameters that are used to assess or indicate pain as well as of the biomarkers and noninvasive techniques that have been explored for their utility in pain and stress assessment. To the committee's knowledge, these parameters are not currently included in the TWH inspection process and may warrant further investigation for such a purpose.

Physiological Parameters as Indicators of Pain and Stress

The advantages of physiological values over other methods to assess pain are that they are objective, are noninvasive, and can be measured relatively easily and repeatably. Heart rate, respiratory rate, and temperature are routinely measured during a physical exam; endogenous substances can be measured from blood samples. Heart rate variability, ocular temperature, and blood pressure measurements require specialized equipment and are therefore not routinely measured during a physical exam, but they are frequently included as part of research on the physiology of pain and stress. The major disadvantages of these measurements are: (1) they have been shown to have low specificity for pain (Rietmann et al., 2004), (2) baseline measures may vary across individuals, and (3) they fluctuate greatly from measurement to measurement. The results of a laboratory analysis of blood, for example, can depend on the precise timing of the draw; this is the case for cortisol, for instance, which has a diurnal pattern. Furthermore, because blood samples are analyzed in independent labs, the results are not available immediately, and performing the test is an added expense. Finally, endocrine levels do not reliably or only weakly correlate with other measures of pain (Rietmann et al., 2004).

Most physiological measures do not discriminate between pain and other sources of autonomic arousal—in particular, stress. Stress responses and pain responses are both characterized by elevated heart rate, blood pressure, respiration, and body temperature (Rietmann et al., 2004) and by elevated ocular temperature. Moreover, physiological measures fail to distinguish or discriminate between arousal elicited by stimuli with negative valence and those with positive valence. For example, heart rate will increase with pain but also with exercise, excitement, stress, dehydration, hyperthermia, and certain medications. Thus, the horse show environment includes many triggers leading to physiological changes that mirror those seen in pain.

A Review of Methods for Detecting Soreness in Horses

Biomarkers

Substance P (SP) is a neuropeptide active in pain perception that is actively being investigated as a potential biomarker for pain in animals, and recent research suggests that SP may increase in proportion to the amount of perceived distress. For example, in one study calves undergoing routine castration without the use of local anesthesia, had 30 percent higher serum SP levels than calves undergoing sham castration, while there was no difference in serum cortisol levels between the two groups. Serum SP and cortisol levels are used as a biomarker for the stress response (Coetzee et al., 2008). Interestingly, vocalization by calves during the procedure was significantly correlated with levels of SP but not with cortisol levels. In another study, serum SP was found to be higher in dogs with fractures or medial patella luxation than in healthy controls that underwent the same clinical procedures (Yoon et al., 2019). Furthermore, SP levels were significantly higher in those dogs with a fracture than in dogs with patella luxation, suggesting that SP may be sensitive to levels of perceived pain.

Noninvasive Techniques for Pain Assessment

Objective physiological assessment measures are commonly recorded in standardized pain assessment scales, such as the Composite Pain Scale for horses (Bussieres et al., 2008) (Table 3-1). However, physiological parameters alone have generally been found not to be valid for diagnosing orthopedic pain (Raekallio et al., 1997). For example, increases in noninvasive blood pressure (NIBP) are thought to be significantly correlated with behavioral pain scores, but NIBP recorded in standing horses tends to underestimate blood pressure, and the precision and accuracy of the NIBP measures are low, putting into question the utility of NIBP as a physiological indicator of pain in horses (Heliczer et al., 2016).

Another attractive noninvasive technique for measuring stress and pain is ocular infrared thermography, which measures temperature changes on the surface of the eye. Findings from a research study in calves (Coetzee et al., 2008) suggest that ocular thermography has the potential to discriminate between pain and distress. Calves undergoing castration showed increased eye temperature with stress and decreased eye temperature with pain. In horses, ocular thermography has been used to quantify stress during athletic performance and with the use of tight nosebands (Fenner et al., 2016; Cravana et al., 2017). However, the committee is not aware of any studies specifically differentiating pain from stress in horses, and this may warrant further research in TWHs.

A recent study explored the effect of stacked wedge pads and chains applied to the forefeet of TWHs on behavioral and biochemical indicators of pain. This study was conducted on 20 sedentary TWHs (10 horses shod with stacks and chains, 10 control horses that were flat shod) at the flat walk on a walker for a 5-day period, with the testing done after only a 5-day acclimation period (Everett et al., 2018). Considering the facts that none of these horses were actually sored and that the conditions of the study did not replicate the conditions under which the horses are shown (ridden running walk, with shoes and chains applied for an extended period of time (months to years), it is not too surprising that no significant changes were found in any of the biochemical parameters evaluated (fibrinogen, SP, plasma cortisol).

Physiological predictors are often included in composite pain scales to bolster their validity and reliability; however, as previously mentioned, physiological parameters should not be used in isolation to detect pain. Instead, they should be integrated in a multimodal approach that includes observational and objective measures, visual inspection for signs of trauma and an antalgic stance, changes in facial expressions captured in composite pain scales (see section on Behavioral Assessment of Pain), palpation of limbs and other potential sensitive areas, and gait evaluation (see Chapter 2).

Finding 3-11: Physiological parameters (e.g., heart rate, respiratory rate, body temperature, and blood pressure) have been used extensively to assess pain in horses and humans. They are objective and can be

measured easily and repeatably; however, they have low specificity for pain, vary across individuals, and fluctuate between measurements.

Finding 3-12: Most physiological measures do not discriminate between pain and other sources of autonomic arousal. Changes in physiological parameters, while indicative of pain, may also be due to physical exertion, excitement, stress, dehydration, hyperthermia, or certain medications.

Finding 3-13: Ocular thermography has been shown to discriminate between pain and distress in calves undergoing castration. It has also been used to quantify stress in horses during athletic performance and in horses that wear tight nosebands.

Conclusion 3-7: The show environment and other conditions during inspections may cause physiological changes in horses that mirror those seen in pain, thus limiting utility of physiological parameters to help detect if a horse is experiencing soreness.

Conclusion 3-8: Although often included as predictors in composite pain scales to bolster their validity and reliability, physiological parameters are not meant to be used in isolation to detect pain, but instead should be integrated with other measures in a multimodal approach.

Conclusion 3-9: The potential of ocular thermography to help differentiate between pain and stress in TWHs and its utility in detecting soreness warrant further investigation.

CLINICAL ASSESSMENT OF PAIN

Pain recognition in horses is complex and typically involves a multimodal approach including observational and objective measures, visual inspection for signs of trauma and an antalgic stance, changes in facial expressions captured in composite pain scales (see section on Behavioral Assessment of Pain in this chapter), physiological parameters (see section on Physiological Assessment of Pain in this chapter), and palpation of limbs and other potential sensitive areas and gait evaluation (see Chapter 2). Identifying pain in horses is not intuitive, particularly for those unfamiliar with normal breed-specific or individual behaviors (Taylor et al., 2002).

Horses notoriously hide pain well so as to mask weakness, as is the case with other prey animals as well. From an evolutionary standpoint, prey cannot afford to show potential predators that they are injured, as they are likely to draw attention to themselves and hence be attacked (Seksel, 2007; Allweiler, 2020). This tendency can make it difficult to reliably detect pain in horses. Complicating the issue even further is the existence of individual differences in pain tolerance, which have been demonstrated in people and animals and which play an important role in the identification and management of pain. For example, the TWH, praised for its stoic and docile nature, may have a higher pain tolerance than other horses (although that does not make it any less necessary that the horses get treated for whatever underlying conditions led to the pain). The result is that the identification and diagnosis of pain in horses—and in TWHs in particular—is challenging and, as pointed out in Chapter 2, requires extensive training, ideally by experienced equine veterinarians.

In determining the musculoskeletal health of horses—which is a major component of athletic soundness at a competition—it is crucial that one observe the horses' pain behavior at rest and during exercise and also palpate for pain (Tabor et al., 2020). These actions are the basis for horse inspections at all official international equestrian competitions and are strictly regulated by the international equestrian governing body, the International Federation for Equestrian Sports (FEI). The FEI enforces the Code of Conduct for the Welfare of the Horse which is to "acknowledge and accept that at all times the welfare of the horse must be paramount. The welfare of the horse must never be subordinated to competitive or commercial influences" (FEI, 2020). The FEI Limb Sensitivity Testing Procedure is discussed in Box 2-2 in Chapter 2.

A Review of Methods for Detecting Soreness in Horses

Visual Inspection for Signs of Pain

It is important to remember that general pain behavior in the horse is influenced by temperament, age, sex, breed, and environment (de Grauw and van Loon, 2016). The fact that environment influences pain behavior makes remote observation via video recordings ideal, but this is not possible at horse shows. Interactions with handlers, spectators, and other horses and simply being in the foreign environment of an equestrian competition will all alter a horse's behavior and potentially mask signs of pain. A visual inspection for signs of pain should include an assessment of general demeanor and posture. Signs of pain are nonspecific and may include (but are not limited to) excessive quietness or restlessness, low head carriage, weight shifting, pointing a front limb or resting a hind limb, standing hunched over or camped out, and looking at a painful area. Other signs may include bruxism (grinding of teeth), sweating, and muscle fasciculations or brief spontaneous muscle contractions (Dalla Costa et al., 2014; Gleerup et al., 2015). A horse sore in front will rarely rest a hind limb but will instead bear more weight on its hindquarters to relieve pain. Unwillingness to bear weight on a hind limb is indicative of lameness, while resting a hind limb may be attributed to other causes.

At all FEI-sanctioned events, regulatory veterinarians perform a clinical examination to assess each horse's fitness and aptitude to compete without pain. This is determined by careful clinical observation, which may include measuring heart rate, respiratory rate, and temperature as well as the palpation of any areas considered injured or painful, based on the possible presence of swelling, redness, loss of hair/skin, or the presence of blood; palpation for hyper- and hyposensitivity of the limbs; evaluation of pain in the feet using hoof testers; passive flexion of the distal limb joints to assess the range of motion of the joint(s); and walking and trotting the horse in a straight line or a circle.

Pressure Algometry

Pressure algometry, a technique that involves administering consistent pressure to an area, is used in scientific experiments to increase the consistency and repeatability of pressure applied during palpation and has been proposed for testing horses at competitions for either hypo- or hypersensitivity. Pressure algometry has already been used to determine mechanical nociceptive thresholds (MNTs) in horses (Haussler and Erb, 2006; Haussler et al., 2008; Love et al., 2011; Schambourg and Taylor, 2020). The MNT is defined as the pressure it takes to elicit a withdrawal response by an individual. The higher it is, the more pressure the individual can tolerate at a specific site before showing a reaction. To prove repeatability, pressure is applied three consecutive times (Haussler and Erb, 2006). However, as pointed out in Chapter 2, prolonged stimulation or pressure on a painful area can produce analgesia through the secretion of local endorphins, gate control (inhibition of presynaptic nociceptive spinal neurons), and hyperstimulation analgesia (activation of descending inhibitory systems) (Melzack, 1975), which complicates pain identification. A recent study used pressure algometry to determine MNTs in pasterns of TWHs that were not sore (Haussler et al., 2008). This study found that TWHs that were not sore responded with a withdrawal reflex only to pressures greater than 10 kg/cm^2 (this is 10 times greater than the pressure needed to blanch the thumbnail, which is the pressure that APHIS VMOs are told to apply when palpating horses during inspections at TWH shows). This investigation also revealed that anxious TWHs did not have different mechanical nociceptive thresholds than calmer ones, which is an important factor when considering palpation at show grounds, which are foreign environments that could conceivably cause a horse to be more nervous than usual. This suggests that TWHs that were not sore, tolerate a high level of pressure in their pastern region prior to responding, regardless of whether they are nervous, and that, in particular, they tolerate a much higher pressure than would be produced with palpation using a thumb. Similar work has not been done in sore TWHs, but it would be expected that MNTs in sore TWHs would be well below 10 kg/cm^2, which could be used as an objective cutoff during inspections should pressure algometers be used. However, recently the direct digital palpation of epaxial muscles of horses by three experienced individuals was deemed superior to palpation with an algometer

in terms of the repeatability of the painful response (Merrifield-Jones et al., 2019). Once again this shows the importance of familiarity and training for an adequate interpretation of the results of palpation.

Gait Analysis—Kinematics, Kinetics

Another key factor in determining a horse's fitness to compete safely is the confirmation of the absence of lameness, or pain causing an irregular gait (Adams, 2015). In most official equestrian competitions, including racing, this is done by careful inspection of the horse at trot in a straight line, on a loose lead, and in hand and by observing for asymmetric head, limb, and pelvic movements. Veterinarians use subjective lameness grades, most commonly the five-point American Association of Equine Practitioners (AAEP) lameness scale, to grade the lameness. Any horse showing consistent lameness at the trot (grade 3 AAEP lameness) is excluded from competition. However, bilateral lameness may confound the ability to detect asymmetry, and therefore in the research and clinical setting, more sophisticated biomechanical analysis is used predominately in order to increase the sensitivity of the detection of lameness. The added challenge in assessing TWHs for lameness is that they are gaited, and usually do not trot, which requires additional expertise to visually evaluate their gait for lameness.

Kinetic analysis (related to forces acting on the body) combined with kinematic analysis (related to the movement of the body) is considered the gold standard approach to lameness diagnosis. Various commercial systems combining inertial sensors, high-speed video analysis, accelerometers, and in-ground force plates measuring ground reaction forces have been developed to aid gait analysis in sport horses at various gaits (walk, trot, canter, gallop) and movements (jumping, piaffe, passage) (Roepstorff et al., 2009; Rhodin et al., 2017;Hardeman et al., 2019). However, to the committee's knowledge, only few kinematic (Nicodemus et al., 2002) and no kinetic studies have been conducted in TWHs and information about such studies and the characteristic gait of the TWH is lacking in the scientific literature. Additionally, TWHs are only assessed briefly for irregular gait at the flat walk and not at the running walk, which decreases the ability to detect lameness in this breed.

Finding 3-14: Pressure algometry has been used to determine pain thresholds in TWHs that are not sore. A study[3] has shown that TWHs that were not sore responded with a withdrawal reflex only to pressures greater than 10 kg/cm^2 (10 times greater than the pressure needed to blanch the thumbnail, which is what APHIS VMOs are prescribed to apply when palpating horses during inspections at TWH shows).

Finding 3-15: There is a lack of kinetic and kinematic research studies in TWHs that are needed to establish gait characteristics of TWHs that are and are not sore.

Conclusion 3-10: The absence of studies to differentiate pain from stress in TWHs indicates a need for further research.

Conclusion 3-11: Further research is needed on using pressure algometry in TWHs with sore limbs. Kinetic and kinematic research in normal TWHs and those with sore limbs is also needed to establish gait characteristics in this breed.

RECOMMENDATIONS

Recommendation 3-1: Designating an inspection area that has as few distractions as possible will reduce the effect of the environment on the horse's response to pain during examination. It is important that inspectors observe the horse's response to the show environment and to restraint before starting the inspection and consider the horse's behavior in the decision-making process.

[3] Haussler, K. K., T. H. Behre, and A. E. Hill. 2008. Mechanical nociceptive thresholds within the pastern region of Tennessee walking horses. *Equine Veterinary Journal* 40(5):455–459.

Recommendation 3-2: To help improve accuracy of soreness detection, the horse inspector should ensure that custodians are following guidelines that prohibit stewarding while the horse is being inspected, and should closely monitor horse custodians for violations.

Recommendation 3-3: Pain assessment using facial expressions is a new area of research, and scientific investigations of these methods have not been performed in TWHs. However, evidence supports the use of facial expressions of pain as supplemental information, if video is available to review or if a second inspector is present.

Recommendation 3-4: To improve consistency across inspectors, science-based information about behavioral and facial indicators of pain in horses should be incorporated into inspectors' training.

Recommendation 3-5: Research is needed to study validity and potential utility of using facial grimace for assessing pain in TWHs and to distinguish pain from other sources of distress. To accomplish this, researchers could, under show conditions, apply new clinical pain assessment technologies and score the horse's behavior and facial expressions during the inspection. Facial expressions of pain are expected to correlate with findings from other currently used methods to detect soreness, such as palpation. For this purpose, it is important to capture the horse's head in the inspection videos.

Recommendation 3-6: The decision to disqualify a horse due to soreness should be driven by an experienced veterinarian, such as a VMO, and should be based on diagnosis of local pain detected on palpation but should also include a more thorough gait or lameness assessment to identify other sources of pain. Signs of pain that should be observed include excessive quietness or restlessness, low head carriage, weight shifting, pointing a front limb or resting a hind limb, standing hunched over or camped out and looking at a painful area, bruxism, sweating, and muscle fasciculations.

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4

Review of the Scar Rule for Determining Compliance with the Horse Protection Act

This chapter reviews the scar rule, its limitations, and what changes are currently documented regarding the skin of Tennessee walking horses (TWHs) that are suspected of being sore. The chapter focuses on the evaluation of changes in the skin of the forelimb of TWHs as part of the inspection process for ensuring compliance with the "scar rule" as defined in the Horse Protection Regulations. Evaluation of these changes is an essential component of the inspection process for detection of soreness in TWHs. Particular emphasis is placed on the accuracy and specificity of the language of the scar rule in light of changes that have occurred in the TWH industry since the scar rule was included in the Horse Protection Regulations. A suggestion for updating the language of the scar rule to accurately reflect the character of soring lesions is presented. Accurate recognition and documentation of the skin abnormalities found in TWHs determined to be in violation of the scar rule is essential for training inspectors to recognize these changes and for ensuring compliance with Horse Protection Regulations. An overview of the microscopic anatomy of the skin and a review of both the current clinical abnormalities and histological (microscopic changes) of sore horses is presented and a correlation of the two is made.

THE HORSE PROTECTION ACT AND APPLICATION OF THE SCAR RULE

As discussed in Chapter 2, the Horse Protection Regulations outline the process for the examination of the forelimb of a horse before it is allowed to show and after winning in its class (post-show). The inspection of horses for HPA compliance includes a dermatologic examination of the forelimbs from below the carpus, with particular attention paid to the skin of the pastern and the coronary band. The following sections describe the specific requirements in Title 9 of the *Code of Federal Regulations* for these examinations:

> **§ 11.21(a)(2):** The DQP [designated qualified person] should digitally palpate the front limbs from the knee (carpus) to the hoof with particular attention to the pastern and the fetlock. They should pick up and examine the posterior surface of the pastern and apply digital pressure to the pocket (sulcus), including the bulbs of the heel, and continue to the medial and lateral surfaces of the pastern. They should extend the foot and leg to examine [the] anterior surface including the coronary band. They may examine the rear legs after showing or any horse exhibiting lesions on or unusual movement of the rear legs. They should also inspect to determine whether the horse is scar rule compliant.
>
> **§ 11.3 Scar Rule**:[1] The scar rule applies to all horses born on or after October 1, 1975. Horses subject to this rule that do not meet the following scar rule criteria shall be considered to be "sore" and are subject to all prohibitions of section 5 of the Act. The scar rule criteria are as follows:

[1] See https://www.law.cornell.edu/cfr/text/9/11.3 (accessed on November 19, 2019).

(a) The anterior and anterior-lateral surfaces of the fore pasterns (extensor surface) must be free of bilateral granulomas,[2] other bilateral pathological evidence of inflammation, and other bilateral evidence of abuse indicative of soring including, but not limited to, excessive loss of hair.

(b) The posterior surfaces of the pasterns (flexor surface), including the sulcus or "pocket" may show bilateral areas of uniformly thickened epithelial tissue if such areas are free of proliferating granuloma tissue, irritation, moisture, edema, or other evidence of inflammation.

CLINICAL DERMATOLOGIC EXAMINATION, MICROSCOPIC ANATOMY OF THE SKIN, AND PERTINENT DEFINITIONS

The dermatologic examination that is performed at the point of inspection to assess whether there is a scar rule violation is limited to the detection of gross lesions of the skin. The term "gross" refers to the clinical appearance of the skin to include what can be detected with a visual inspection by naked eye and abnormalities that can be detected by palpation and sometimes smell.

The abnormal findings documented from a dermatological examination of the skin all fall into the broad category of "lesions." A lesion is defined as any abnormality in a tissue or organ caused by trauma or disease. As shown in Figure 4-1, many exogenous and endogenous factors can affect the integrity of the skin.

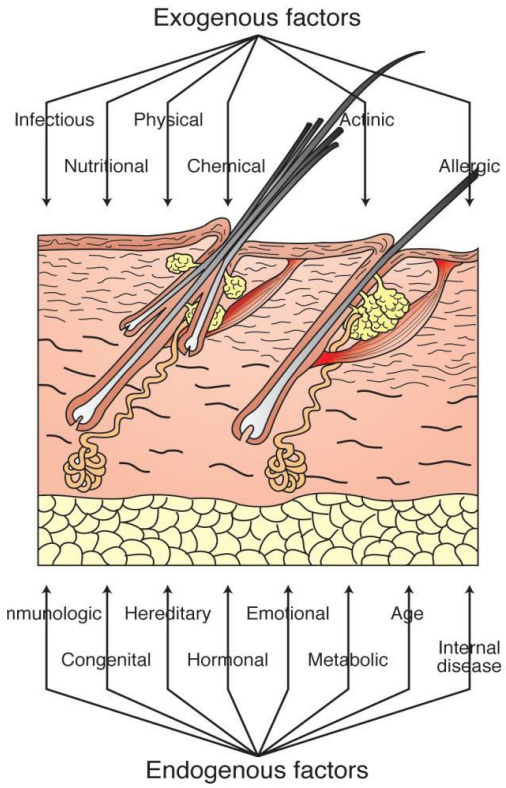

FIGURE 4-1 Diagram of the skin illustrating the types of endogenous and exogenous factors that can affect the integrity of the skin. SOURCE: Hargis and Ginn (2011).

[2] *Granuloma* is defined as any one of a rather large group of fairly distinctive focal lesions that are formed as a result of inflammatory reactions caused by biological, chemical, or physical agents. (44 FR 25179, Apr. 27, 1979, as amended at 53 FR 14782, Apr. 26, 1988, 53 FR 28373, July 28, 1988.)

The skin has three main layers, as illustrated in Figure 4-2. Gross lesions of the skin are categorized as *primary*, indicating a change in a tissue that represents the effects of the original injury or disease as it first occurred. Primary lesions are the most useful lesions in determining the etiology or cause of an injury or disease. Examples of primary injuries of the skin include vesicles (blister), papules, nodules, or lacerations. *Secondary* lesions of the skin, on the other hand, reflect changes in the tissue that occurred over a period of time after the initial injury (Figure 4-3). Primary lesions often change in characteristic ways over time, making it possible for an experienced examiner to devise a differential list of types of initial injuries or diseases that could have produced the secondary lesion. Primary lesions are most often acute and transient, whereas secondary lesions are chronic and more persistent unless the initiating causes can be identified and removed. Figure 4-4 shows a primary (acute) lesion evolving into a secondary (chronic) lesion, which is what happens if a laceration or cut is not properly sutured or bandaged. This leads to the tissue being unable to reform in its original form, resulting in the formation of the chronic and end stage of a scar. Similarly, an injury leading to a vesicle or blister over time can lead to the secondary more chronic lesion of an erosion or ulcer. In some instances, deep ulcers can also lead to scar formation over time.

A more detailed and definitive evaluation of the lesions of the skin requires the microscopic evaluation of tissue biopsies taken from the lesions. Again, primary lesions are the most useful in determining the cause of the lesions, so primary lesions are the lesion of choice for histopathological evaluation.

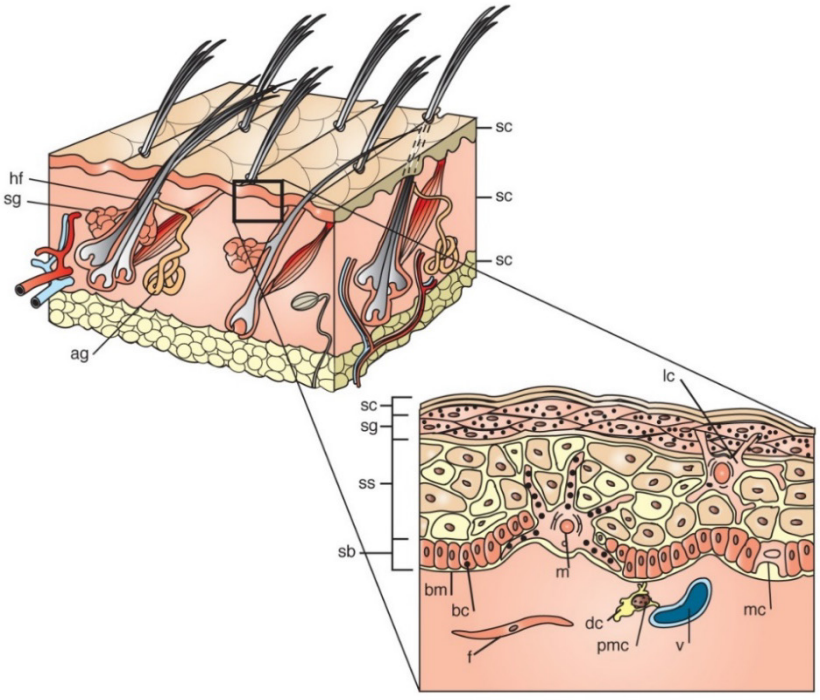

FIGURE 4-2 Microscopic anatomy of the skin. The top diagram illustrates the main components of the skin in all animals: the epidermis or outer layer (sc), the dermis (sc) which encompasses hair follicles (hf) and glands (sb, sebaceous gland; ag, apocrine glands); and the deeper layer of adipose or fat (sc) variably present in areas of the skin. The bottom diagram is a magnification of the epidermis and epidermal dermal junction showing the complexity of the layers (sc, stratum corneum; sg, stratum granulosum; ss, stratum spinosum; sb, stratum basale; bm, basement membrane; m, melanocyte; f, fiber; dc, dendritic cell; pmc, perivascular mast cell; mc, merkel cell; v, vessel; lc, langerhans cell). The epidermis is continually exposed to the outer environment and is continually regenerating as cells slough off. SOURCE: Hargis and Ginn (2011).

A Review of Methods for Detecting Soreness in Horses

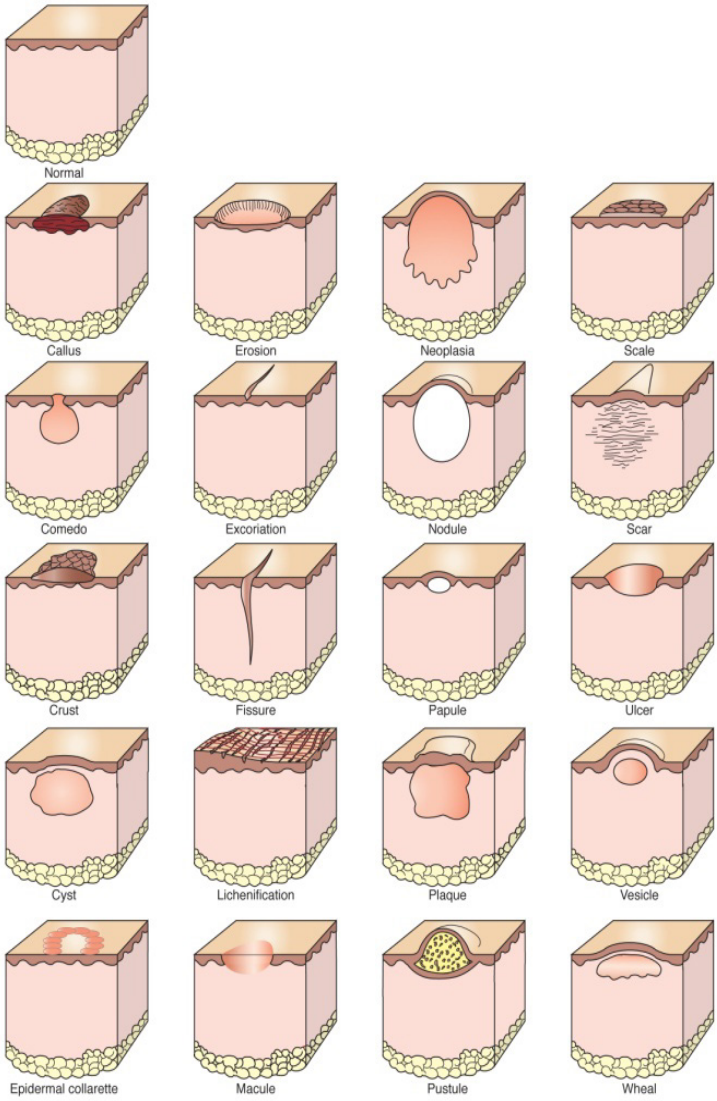

FIGURE 4-3 Examples of primary and secondary lesions of the skin. SOURCE: Hargis and Ginn (2011).

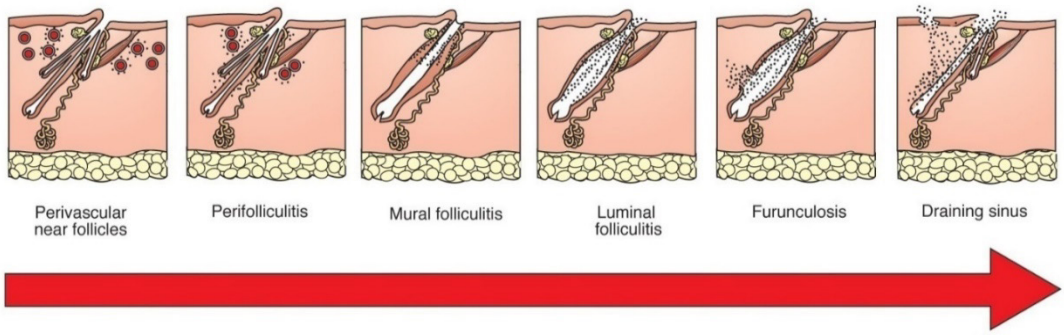

FIGURE 4-4 Example of the evolution of a lesion over time. A primary lesion of a papule (palpable bump less than 1.0 cm) corresponding to inflammation in the dermis around a hair follicle leads to inflammation in the follicle and eventual rupture of the hair follicle. The follicular contents in the dermis evolve into the secondary lesion of pyogranulomatous dermatitis with a draining tract. SOURCE: Hargis and Ginn (2011).

MICROSCOPIC EVALUATION OF SKIN BIOPSIES OF TENNESSEE WALKING HORSES FOUND TO BE IN VIOLATION OF THE SCAR RULE

To date, no peer-reviewed studies have been published on microscopic lesions of the skin from horses determined to have either skin lesions or other types of violations of the scar rule. In fact, the Horse Protection Regulations and the scar rule were written without any microscopic evaluation of skin lesions from horses suspected of being in violation of the HPA or scar rule. However, an unpublished but peer-reviewed study (Stromberg, 2017) that evaluated 136 pastern biopsies (right and left pastern from each horse) from 68 TWHs that had been disqualified for violations of the scar rule during the Celebration events of 2015 and 2016 was made available to the committee by a representative of the TWH industry. In this study, 6-mm punch biopsies were collected from the right and left palmar aspect of the pastern from each of the 68 TWHs. The skin biopsies were evaluated independently by two well-respected veterinary anatomic pathologists[3] certified by the American College of Veterinary Pathologists. According to the manuscript the two pathologists agreed in their reports of abnormal findings of variable (moderate to severe) epidermal hyperplasia in the form of acanthosis (thickening of the stratum spinosum layer of the epidermis) and variable degrees of hyperkeratosis (thickening of the stratum corneum layer of the epidermis; see Figure 4-5a,b**).** The hyperkeratosis varied from mild to severe. Other, less consistent findings included folliculitis, follicular atrophy, and follicular distortion and mild changes in elastin fibers. The evaluators did not find any evidence of scar tissue or granulomatous inflammation and therefore concluded there was no basis or proof of scar rule violation. The selection of the appropriate site to biopsy is heavily dependent upon the recognition and understanding of the clinical (gross) lesions present. Unfortunately, it is important to note that images of gross lesions corresponding to the biopsy selection areas were not available for the biopsy samples evaluated.

The two pathologists graciously provided 24 pairs out of the 68 pairs from the original study for additional review by Dr. Pamela E. Ginn, a member of the study committee and a board-certified veterinary pathologist who is a specialist in veterinary dermatopathology. Ginn's morphologic findings for the 24 pairs of pastern biopsies she reviewed were comparable to those reported by Stromberg and Cassone. Most significantly, no scar formation or granulomatous inflammation was present in any of the tissue samples. Collections of elastin fibers that were hypereosinophilic, thin, and wavy compared with normal fibers were identified in some biopsies. Rarely, these fibers were associated with pigment-laden macrophages. The pigment was interpreted to be hemosiderin, but this would need to be substantiated by histochemical staining. Elastin fiber abnormalities such as these are sometimes seen in skin that has been subjected to repeated low-level thermal (heat) source—a condition known as erythema ab igne (Kettelhut et al., 2020). Other changes that would further substantiate a possible heat-related injury were not present.

Ginn's interpretation of the significance or cause of the lesions differs from that of Stromberg. The changes of hyperkeratosis and acanthosis were prominent in the biopsy specimens. These changes are recognized as secondary, chronic lesions and do not provide clear evidence of the primary lesion or initial injury to the skin that led to these chronic changes. The changes observed would be expected to correlate with the gross lesions of detectable irregular epidermal thickening known as lichenification. Lichenification is a term for a rough, thickened epidermis with visibly exaggerated epidermal creases or folds. Lichenified skin appears leather-like and usually is concurrent with hair loss (alopecia) (Figure 4-6). Microscopically, the stratum spinosum layer of the epidermis is thickened. There is often concurrent thickening of the stratum corneum (Figure 4-7).

[3] Dr. Paul Stromberg from Ohio State University, Columbus, and Dr. Lynne Cassone of the University of Kentucky, Lexington.

A Review of Methods for Detecting Soreness in Horses

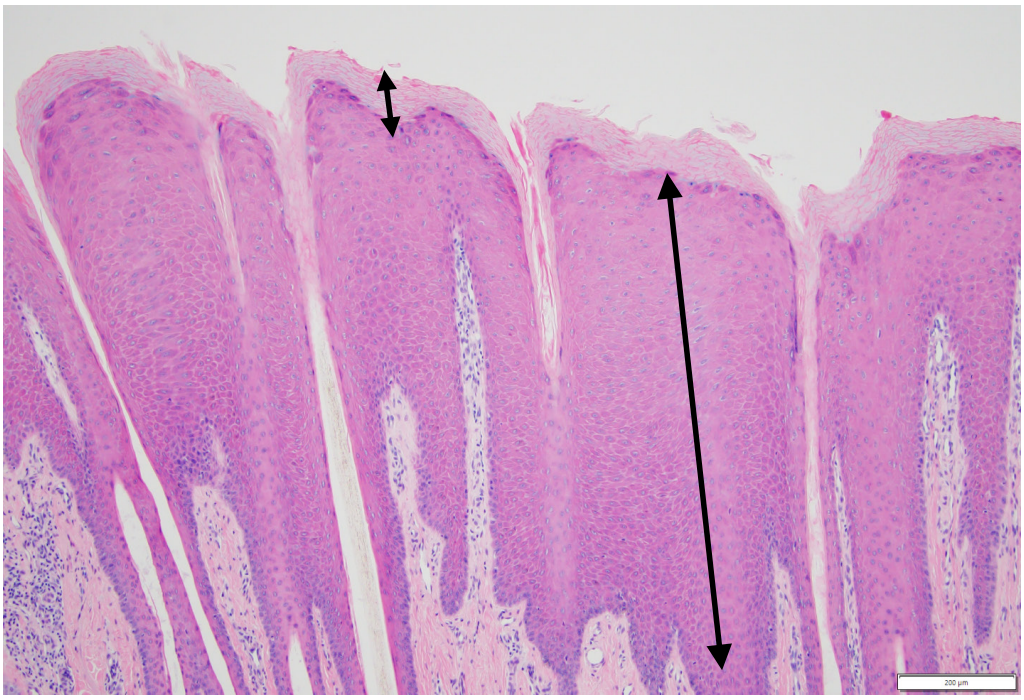

FIGURE 4-5a Photomicrograph of the caudal pastern of the skin of a horse included in the Stromberg study. The epidermis (long arrow) is markedly thickened. The stratum corneum (small arrow) is compact and thickened. SOURCE: Photo courtesy of P. E. Ginn, D.V.M.

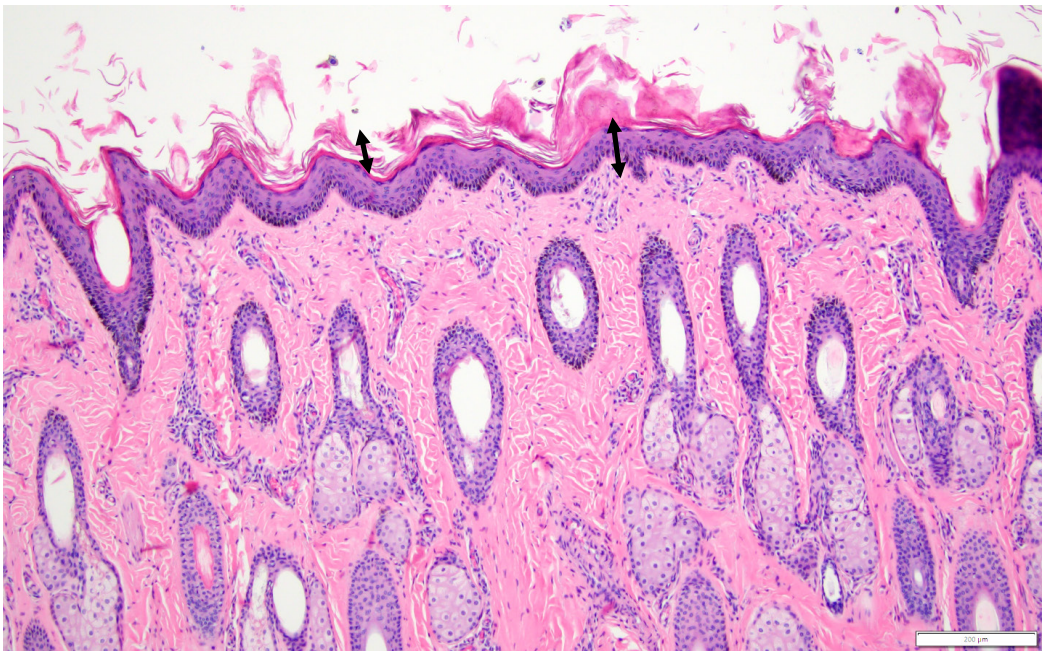

FIGURE 4-5b Photomicrograph of the normal skin of the caudal pastern of a horse. Short arrow points to the stratum corneum. Long arrow points to the epidermis. SOURCE: Photo courtesy of P. E. Ginn, D.V.M.

FIGURE 4-6 Lichenified skin on the mane of a horse. The skin is visibly and palpably thickened and there is a loss of hair. In this case, chronic rubbing to pruritus (itchiness) led to this change. SOURCE: Photo courtesy of P. E. Ginn, D.V.M.

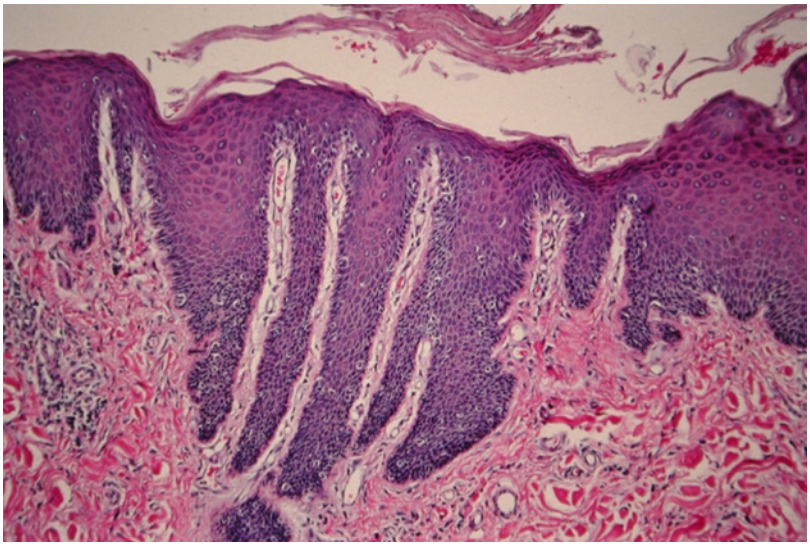

FIGURE 4-7 Microscopic image of lichenification. The epidermis is markedly thickened by irregular hyperplasia of the stratumspinosum layer of the epidermis. The stratumcorneum is also thickened and forms a layer of sloughed degenerated cells on the surface that exfoliates. SOURCE: Photo courtesy of P. E. Ginn, D.V.M.

Lichenification is a pathologic change most often caused by rubbing, scratching, or some other repeated irritation of the skin. The skin changes are not incidental or insignificant and do not represent the normal character of the palmar aspect of the pastern of the horse (Figure 4-8). In addition, the subtle changes in the elastin fibers of the dermis in some horses with lichenification may be a clue to what the primary injury was. The primary injuries to the pastern of the horses in the Stromberg study or any of the TWHs presenting with lichenification of the skin of the palmar aspect of the pastern are not known (Figure 4-9). It is possible that the action devices used on the TWHs could contribute to the formation of these lesions, but this seems extreme. The caudal pastern of a horse is an area that is not very accessible to the horse, making lichenification due to some form of self-inflicted repeated injury to this area of the skin by the horse unlikely.

A long-standing federal court ruling currently limits the weight of the action devices to a maximum weight of 6 ounces, a weight limit determined not to cause injury to the pastern of the horse. The weight-limit regulation applies to action devices used during competition as well as during any training so as to eliminate any soring abuse. It is well known that action devices of weight greater than 6 ounces are used during training, so it is possible that these heavier devices could lead to the changes seen. This would still be a violation of the Horse Protection Regulations. Equine veterinarians on the committee noted that skin changes seen on the pasterns of TWHs are not observed on the pasterns of other breeds of horses (Arabians, American Saddlebreds, Morgan horses), which also train with action devices such as chains and rollers but do not wear them when shown at competitions. Action devices used in other breeds are not limited by weight and usually of lower weight than those used in TWHs. Walking horses are often trained with action devices weighing in excess of the 6-ounce action devices currently allowed for competition. The use of heavier or more cumbersome devices in training may be more likely to contribute to the formation of the lesions described in this report.

A horse included in the Stromberg study and documented as disqualified from competition at the 2015 Tennessee Walking Horse National Celebration was featured in an online article posted in 2016 that included a photograph of the horse's pastern at the time of disqualification (Billy Go Boy Chat, 2016). The photograph of this horse shows gross lesions of erythema (redness) and swelling of the coronary band along the medial, lateral, and caudal aspect of the hoof wall. In addition, the palmar aspect of the pastern has ulceration in a V-shaped pattern in the mid region of the caudal palmar pastern of the front limb. Additional lesions of erythema and possible ulceration are present at the palmar aspect of the limb in the region of the fetlock. These acute and subacute gross lesions do not correlate with the histological findings reported in the Stromberg study which represent more chronic lesions.

Finding 4-1: Evaluation of skin samples collected from TWHs that were found to be noncompliant with the scar rule indicated variable (moderate to severe) epidermal hyperplasia (clinically evident thickening and roughness or lichenification) in the form of acanthosis (thickening of the stratum spinosum layer of the epidermis) and variable degrees of hyperkeratosis (thickening of the stratum corneum layer of the epidermis). These skin changes are not incidental or insignificant and do not represent the normal character of the palmar aspect of the horse's pastern. In addition, skin changes seen on the pasterns of TWHs are not observed on those of other breeds of horses, which also train with action devices but usually of lower weight compared to those used on TWHs.

Finding 4-2: The changes of hyperkeratosis and acanthosis, which were prominent in the biopsy specimens, do not normally occur without a previously inflicted injury on the pasterns. These changes are recognized as secondary, chronic lesions, and they do not provide clear evidence of the initial injury to the skin leading to these changes. They are, however, expected to correlate with the grossly detectable lesions of irregular epidermal thickening known as lichenification, a pathologic change most often caused by rubbing, scratching, or some other repeated trauma to the skin.

Conclusion 4-1: The primary injury to the pastern of horses from which skin samples were collected or of any of the TWHs presenting with lichenification of the skin of the palmar aspect of the pastern is not known. It is possible that action devices alone worn by walking horses could have led to the formation of these lesions; however, this seems highly unlikely if the federal regulation limiting the weight of the action device to 6 ounces was followed.

Conclusion 4-2: More studies are needed to determine if training practices that can cause soreness in TWHs also result in lichenification. A longer-term observation of horses that are subjected to training conditions identical to TWHs training for competition but without use of any chemicals or other agents known to have been used for soring is needed. These studies might elucidate at what point, if at all, during training epidermal hyperplasia and lichenification would develop and what particular training practices

would cause these conditions. It is important that observations include periodic biopsy of the palmar aspect of the pastern to check for microscopic changes.

Conclusion 4-3: Studies are also needed to determine if epidermal thickening (hyperplasia) and lichenification are solely caused by the action devices worn by TWHs. This would require observing pasterns of walking horses that were not trained for competition but were made to wear action devices under circumstances identical to TWHs in training for competition.

FIGURE 4-8 Normal appearance of the skin of the palmar aspect of a horse. SOURCE: Photograph by J. Kevin Hahn, D.V.M. Used with permission.

EVALUATION OF THE SCAR RULE CRITERIA FOR COMPLIANCE WITH THE HORSE PROTECTION ACT

The HPA and scar rule were written without any microscopic evaluation of skin lesions from horses suspected of being sore. The language of the rule was based on clinical evaluation of the skin only and has not been reviewed since its original inclusion in the Horse Protection Regulations and its implementation in 1979. Veterinary dermatopathology is now a well-recognized field of study and provides a solid framework for the accurate evaluation and characterization of skin lesions in animals. The committee believes that the rule should be revised using well-defined current medical terms that accurately describe the lesions seen today from both the clinical and histopathological standpoints.

FIGURE 4-9 Pastern of a chronically sored horse in violation of the scar rule. There is marked lichenification and alopecia (hair loss of the palmar surface of the pastern. Note the exaggerated, thick, deep skin folds. This type of fold does not flatten with digital pressure. The gross lesions are consistent with the pathological changes (marked irregular epidermal hyperplasia) in the skin of the horses evaluated in the Stromberg study. SOURCE: Photo courtesy of the Humane Society of the United States.

A Review of Methods for Detecting Soreness in Horses

Basis of the Scar Rule

The language of the scar rule is based on the assumptions that certain lesions exist microscopically, that those lesions can be detected by gross clinical dermatologic exam, and that the terms used in the scar rule were used appropriately. In addition, it is assumed that the rule can be interpreted and applied in a consistent manner by Animal and Plant Health Inspection Service (APHIS) veterinary medical officers (VMOs) and by designated qualified persons (DQPs) tasked with examining horses for scar rule violations. None of these assumptions hold true today, and therefore the rule as written is not enforceable. Veterinary medicine is far advanced compared with its state in 1979. In fact, the American College of Veterinary Pathologists, a specialized group of veterinarians whose focus is studying the pathologic basis of disease, was in its infancy, with it certifying examination process not available until 1978. Experts in the recognition, description, and interpretation of pathologic lesions of the skin of animals were not recognized at that time. They are today.

The first fallacy of the scar rule is the assumption that the clinical examination of gross lesions can accurately and reliably correlate with the true underlying pathologic changes in the tissue without a microscopic examination. For instance, the rule states that the fore pasterns must be free of "bilateral granulomas." When the scar rule was written, it was common for TWHs to have very obvious skin lesions, many of which were likely a result of foreign substance injected or applied and absorbed into the skin. A granuloma is an inflammatory lesion composed of specific types of leukocytes arranged in a particular way. Granulomas most commonly form in response to foreign material and certain types of infectious agents. There is no evidence in the literature to indicate that granulomatous inflammation or granulomas have been present in the lesions of sore horses. The assumption that this type of inflammatory response may have occurred as a consequence of injection of foreign substances into the skin is reasonable, but it has never been proven to be true. In addition, this type of lesion cannot be determined to be present by the presence of clinical gross lesions alone. A microscopic evaluation of the tissue is absolutely necessary to establish the presence of granulomatous inflammation. Likewise, the use of the term "proliferating granuloma tissue" leads to confusion. In its original meaning, "proliferating granuloma tissue" may have referred to granulation tissue, but it may also have been referring to areas of granulomatous inflammation, which do not "proliferate." Again, granulomas cannot be determined to be present by gross examination alone. The use of the word "granuloma" may have been intended to refer to the proliferation of granulation tissue which can often be recognized grossly and which corresponds microscopically to the proliferation of small capillaries and collagen-producing fibroblasts arranged in a specific pattern. Granulation tissue formation is a common finding in open wounds of horses, and it is possible to recognize granulation tissue clinically. The terms granuloma and granulation tissue are likely still used in practice to both refer to granulation tissue. Clarification of the proper use of terms in the scar rule is needed for legal enforceability. The scar rule also refers to bilaterally *uniformly* thickened epithelial tissue, which is confusing. The thickening of the epidermis present in the biopsy specimens reviewed is not "uniform." It is irregular and characteristic of lichenification.

The lesions of cardinal signs of inflammation such as edema and erythema (reddening) of tissue and also pain and the presence of moisture can likely be detected by most examiners.

The name of the rule itself, "the scar rule," is very misleading but has been in common use for decades and refers to recognizable lesions in violation of the rule. It is still important to correct the language of the rule if it is to be enforceable in a court of law. Scars have not been documented microscopically in TWHs that have been found to be sore. A scar is an area of tissue where the normal components and organization of the tissue have been lost and replaced by fibrous connective tissue. Scars can be grossly evident, but there is no reliable documentation in the literature of a gross lesion found on a sore TWH that is compatible with a scar. Scars were very likely present in the lesions seen on sore TWHs before the enactment of the HPA. Lesions present today are more subtle, and the limited microscopic studies that have been done have not documented scars in horses determined to be in violation of the scar rule, which renders the usage of the term "scar" inappropriate.

History of Skin Lesions in Tennessee Walking Horses Suspected of Being Sore

Prior to the enactment of the Horse Protection Act and the implementation of the scar rule, lesions in sore horses were grossly evident and located primarily on the anterior skin of the dorsal and palmar (caudal) pastern regions. Though not evaluated histologically, the gross lesions and history of substances applied were very suggestive of the type of injuries seen with contact irritants and most likely were characterized by the primary lesions of vesicles and secondary lesions of erosions and ulcers similar to what might have been seen with an exaggerated application of the blistering process that used to be in practice in the treatment of certain conditions of the distal limb of the horse.

After the enactment of the HPA and implementation of the scar rule, the focus on detecting a skin lesion or scar rule violation shifted to primarily involving the caudal pastern, though clearly there was still an effort to cosmetically alter the anterior surface of the pastern and coronary band region to hide more subtle evidence of injury. The reasons for the shift of focus in the location of more obvious lesions is not documented but may have occurred as weights of action devices changed and attempts were made to hide evidence of injury.

Proposal of New Scar Rule Language

A gross examination of the skin of the distal limb of the horse should still be part of the inspection process. Evaluating biopsy tissue from horses is not practical and is likely to be considered invasive, and clearly repeated biopsies could lead to tissue changes that could be confused with lesions consistent with a violation (an alternative method to study tissue changes in TWHs would be the use of ultrasonography, see Box 4-1). The language describing what constitutes a violation of the HPA should be based on what can accurately be assessed by a gross examination. Furthermore, the examination should be performed only by an experienced equine practitioner. The language of the rule should not be prescriptive and should be written so as to include any evidence of injury to the skin of distal limb. Evidence of both acute (primary) and chronic lesions should be considered evidence of an HPA violation. The committee proposes the language below as replacement for the current language in the scar rule:

> A trained inspector should examine skin of the front limb of the horse from the knee (carpus) to the hoof with particular attention to skin of pastern and fetlock and the coronary band. All areas of skin from carpus to hoof of both limbs should be free of foreign substances such as dyes, hair fillers, ointments, and other substances designed to camouflage scar rule violations during pre- and post-show inspections. Detection of previously approved substances such as lubricants during post-competition inspection does not constitute a violation. There should be no chemical smell emanating from the skin and no substance present that can be rubbed off onto the hands or a cloth. Skin should be haired with no areas of loss of hair, patchy or diffuse. There can be no swelling, redness, excoriation, erosions, ulcers, seeping of fluids, or signs of a response to chronic injury such as epidermal thickening or presence of scales. Photo documentation of lesions, identifying information about the horse, and a date should be provided for any horse determined to be or suspected of being in violation of the scar rule.

Finding 4-3: The Horse Protection Regulations and scar rule were written without any microscopic evaluation of skin lesions from horses suspected of being sore. The scar rule language was based on a clinical evaluation of the skin only and has not been reviewed since its inclusion in the regulations.

Conclusion 4-4: The scar rule language is based on the assumption that certain lesions exist microscopically and that those lesions can be detected by gross clinical dermatologic examination and also that the terms used in the scar rule were used appropriately. In addition, it is assumed that the rule can be interpreted and applied in a consistent manner by VMOs and DQPs tasked with examination of horses for scar rule violations. None of these assumptions hold true today, and therefore the rule as written is not enforceable.

A Review of Methods for Detecting Soreness in Horses

BOX 4-1 Ultrasonography to Study Pastern Tissue Injury in Tennessee Walking Horses

Ultrasonography or the use of ultrasound equipment to evaluate healthy skin and pathological lesions is a method that is gaining popularity (Mlosek and Mainowska, 2013). In veterinary medicine, ultrasonography is now routinely used in various applications to help in diagnosis and therapy. With the availability of portable laptop-size units, ultrasonography can now be conveniently performed in a barn (Baird, 2017). In equine medicine, ultrasonography has been found to be an invaluable diagnostic tool because it allows quantification of morphologic changes resulting from soft tissue injuries even in cases when clinical findings are inconclusive or insufficient. Additionally, diagnostic ultrasound provides a way to visually demonstrate the location, size, and extent of lesions in the limb. Ultrasonography has been used in diagnosing equine lameness and in evaluating pastern injuries, among other applications (Genovese et al., 1986).

Ultrasound imaging of the skin as a means to determine abnormalities in the thickness of skin could be used as an additional tool for determining whether or not a horse is compliant or in violation of the scar rule. Ultrasonography of the skin can be used to accurately measure the thickness of the three main compartments of the skin: epidermis, dermis, and subcutis. Echogenicity of the three layers and evaluation of the vasculature are all possible. Normal parameters for the thickness of these regions of the skin and the normal blood vascular pattern could be established and used as a standard against which alterations could be objectively measured and documented via image capture. The degree of epidermal thickening present in the biopsies evaluated in the Stromberg study could be determined in a horse, thereby eliminating the need for biopsy. Initial studies to establish normal patterns for this region of the pastern and for the TWH would need to be conducted. Ultrasonography is not invasive, easy to employ, and can be video recorded for documentation.

Conclusion 4-5: The scar rule language needs to be based on what can accurately be assessed by a gross examination, which ideally would only be performed by an experienced equine practitioner.

RECOMMENDATION

Recommendation 4-1: Regardless of why the scar rule was written with limited information and limited expertise in pathological changes in the skin, the committee recommends that the rule be revised. The committee's proposed language is as follows:

> A trained inspector should examine skin of the front limb of the horse from the knee (carpus) to the hoof with particular attention to skin of pastern and fetlock and the coronary band. All areas of skin from carpus to hoof of both limbs should be free of foreign substances such as dyes, hair fillers, ointments, and other substances designed to camouflage scar rule violations during pre- and post-show inspections. Detection of previously approved substances such as lubricants during post-competition inspection does not constitute a violation. There should be no chemical smell emanating from the skin and no substance present that can be rubbed off onto the hands or a cloth. Skin should be haired with no areas of loss of hair, patchy or diffuse. There can be no swelling, redness, excoriation, erosions, ulcers, seeping of fluids, or signs of a response to chronic injury such as epidermal thickening or presence of scales. Photo documentation of lesions, identifying information about the horse, and a date should be provided for any horse determined to be or suspected of being in violation of the scar rule.

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Appendix A

Biographical Sketches of Committee Members

Jerry Black, D.V.M. (*Chair*), is a visiting professor in the School of Veterinary Medicine at Texas Tech University and an emeritus professor in the Department of Animal Sciences, College of Agriculture Sciences, Colorado State University (CSU). As emeritus professor, he is the holder of the Wagonhound Land and Livestock Chair and the director of equine sciences at CSU. Dr. Black obtained his D.V.M. from CSU in 1971. After graduation and prior to joining the CSU faculty in 2010, Dr. Black served as a senior clinician at Pioneer Equine Hospital, Inc., in Oakdale, California (1973–2010); as a resident veterinarian at Valley Oak Ranch in Oakdale, California (1995–2010); and as a college instructor (1974–1988) and a visiting instructor at the University of California, Davis (1993–2010). Dr. Black has also served as a principal investigator or co-principal investigator in a number of research studies since 1979; he has 38 years of experience in applied clinical investigation in equine veterinary medicine. He is a member of several professional societies and associations and has held numerous professional positions, including president of the American Association of Equine Practitioners (AAEP; 2002); president of the Pacific Coast Cutting Horse Association (1997–1999, 2006); chair of the board of trustees of the American Horse Council (2003–2018); member of the American Quarter Horse Association Animal Welfare Commission (2012–present); and chair of the medication review committee of the National Cutting Horse Association (2011–present). Dr. Black is a member of the U.S. Equestrian Federation (USEF) and was a USEF-approved official show veterinarian from 1985 to 2016. He served as an approved official veterinarian in jumping, dressage, eventing, combined driving, and reigning for the International Federation for Equestrian Sports from 1985 to 2014 and was an Olympic veterinarian (on-call veterinarian during equestrian events) for the 1984 Summer Olympics in Los Angeles, California. He has been invited to speak at various professional conferences and conventions in the United States and in Mexico, New Zealand, and Argentina and to conduct in-depth seminars on various topics, including hind limb lameness of the Western performance horse, diagnosis and treatment of distal forelimb lameness, and practical considerations for the use of intra-articular medications, at numerous veterinary conventions in the United States. In 2001 Dr. Black received the Pacific Coast Cutting Horse Association's Ed Smith Memorial Award for his dedication and service to the cutting horse industry on the Pacific Coast; in 2006 he received the California Veterinary Medical Association's Dan Evans Memorial Award for significant contributions to the practice of equine veterinary medicine, to the profession, and to his community; and he was inducted into the Pacific Coast Cutting Horse Association Hall of Fame in the same year. He received the AAEP Distinguished Life Member Award in 2010 and the Colorado State University Distinguished Alumni Award, College of Veterinary Medicine and Biological Sciences, in 2011.

Robin Foster, Ph.D., is a certified horse behavior consultant with the International Association of Animal Behavior Consultants, a Certified Applied Animal Behaviorist (CAAB) with the Animal Behavior Society, and a Fear-Free Certified Professional. She holds a Ph.D. in animal behavior from the University of Washington and a dual B.S. in biology and psychology from the University of Michigan. Her practical experience with animals includes working as a full-time animal care officer for the Humane Society and as a stable groom and trainer's assistant at Emerald Downs, showing dogs in conformation, and owning and breeding thoroughbred racehorses. As a full professor at the University of Puget Sound, she conducted research in animal learning and social behavior and taught courses in learning and behavior, animal communication, behavior genetics, and research methods and applied statistics. Dr. Foster has also served as chair of the psychology department, co-director of the neuroscience program,

and chair of the institutional animal care and use committee. Although she retired from full-time teaching in 2011, she continues to be active in scholarly work and currently holds positions as a research professor in psychology at the University of Puget Sound and an affiliate professor at the University of Washington, where she currently teaches a course in zoo animal behavior. Dr. Foster is also the current chair of the Applied Animal Behavior Committee, the CAAB-certifying body of the Animal Behavior Society, and a board member of the International Association of Animal Behavior Consultants. Her research for the past decade has focused on horses, with a mission to promote equine welfare and improve horse–human interactions. Dr. Foster's articles and commentaries on equine behavior are regularly published in *The Horse*.

Pamela Eve Ginn, D.V.M., Dipl. ACVP, is an associate professor and senior pathologist at the Department of Comparative Diagnostic and Population Medicine at the University of Florida (UF) College of Veterinary Medicine in Gainesville. She received her D.V.M. from Colorado State University in 1983 and was a small-animal practitioner for 7 years (1983–1990) before accepting a residency in anatomic pathology at the UF College of Veterinary Medicine (1990–1993). In 1993 Dr. Ginn joined the UF faculty and became the chief of the surgical pathology service (1993–2003). It was during this time that she developed her interest and expertise in dermatopathology. She has spent most of her career focused on the study of naturally occurring cutaneous disease in animals and teaching students and residents in dermatopathology. In 2012 she was named associate dean for students and instruction at the UF College of Veterinary Medicine, a position she held until 2015. From 2012 to 2017 she served as admissions director for the same college. Dr. Ginn is a member of several professional societies, including the American Veterinary Medical Association and the International Society for Veterinary Dermatopathology, of which she is a founding member. Her awards include the Special Service Award from the University of Florida Alumni Council (2015), the Excellence in Teaching Award from the American College of Veterinary Dermatologists (2011), and the Norden Distinguished Teacher of the Year Award from the UF College of Veterinary Medicine (1998).

Sarah le Jeune, D.V.M., DACVS, DACVSMR, CVA, Cert. Vet. Chiro, is a member of the American College of Veterinary Sports Medicine and Rehabilitation and focuses on the diagnosis and treatment of lameness and various performance-related musculoskeletal injuries with an integrative approach including acupuncture and chiropractic. She is the chief of the Equine Integrative Sports Medicine Service at University of California (UC), Davis. Dr. le Jeune is also a board-certified equine surgeon and has been a member of the UC Davis equine surgery faculty since 2003. She is a certified veterinary acupuncturist with extensive acupuncture training from the Colorado State University and the Chi Institute in Florida. She also obtained certification in veterinary chiropractic from the International Veterinary Chiropractic Association and is certified in veterinary thermographic imaging.

Bart Sutherland, D.V.M., is currently a private-practice large-animal veterinarian in Oxford, Mississippi. In previous years he has also worked for the U.S. Equestrian Federation/American Quarter Horse Association (USEF/AQHA) drug and medication program (2002–2015); as a veterinary medical officer (VMO) with the U.S. Department of Agriculture (USDA) (2010–2018); as a VMO with the USDA Horse Protection Program and Animal Care (2010–2017); and as interim director for the USDA Horse Protection Program (2016). While at USDA, Dr. Sutherland served as lead VMO in USDA team inspections and was responsible for initiating over 400 federal cases for violation of the Horse Protection Act (HPA) in nine states. He led numerous training sessions on HPA for USDA veterinarians and inspectors and horse show managers as well as demonstrations for and discussions with various federal and state delegations. He also served as an Animal Care program inspector for various veterinary and medical colleges and research institutions to ensure compliance with the Animal Care Act. Throughout his career, Dr. Sutherland has served as an expert witness on cases involving horses, including as an expert witness for the HPA in state and federal criminal and civil courts and as a USDA-designated expert witness for the HPA at USEF administrative hearings. He was a USDA subject-matter expert for the HPA

A Review of Methods for Detecting Soreness in Horses

proposed rule change in 2016. Dr. Sutherland is a member of the American Association of Equine Practitioners, American Veterinary Medicine Association, American Academy of Veterinary Consultants, and the advisory board for Christian Veterinary Mission's V.E.T. Net Mongolia, a nongovernmental organization. He obtained his D.V.M. from Mississippi State University in 1994.

Tracy Turner, D.V.M., DACVS, DACVSMR, is the president and owner of Turner Equine Sports Medicine and Surgery in Stillwater, Minnesota (2016–present). Dr. Turner has over 40 years' experience as an equine veterinarian and as a farrier. After obtaining his D.V.M. degree from Colorado State University (1978) and his M.S. from Purdue University (1981), Dr. Turner served on the faculty of the University of Illinois in Urbana (assistant professor, 1981–1983); the University of Florida in Gainesville (assistant professor, 1983–1988; associate professor, 1988–1990); and the University of Minnesota, St. Paul (associate professor, 1992–2000; full professor, 2000–2004). He also served as the chief of large-animal surgery at the Veterinary Teaching Hospital at the University of Florida (1984–1985) and at the University of Minnesota (1992–1995; 2001–2003). From 2004 to 2016, Dr. Turner was an associate veterinarian at the Anoka Equine Veterinary Services in Elk River, Minnesota. He also served as a consultant for the U.S. Department of Agriculture Horse Protection Program and a consultant on limb sensitivity for the U.S. Equestrian Federation and the International Federation for Equestrian Sports. He worked at three Pan American Games, one Olympics, and one World Equestrian Games. He has authored 31 book chapters and written more than 100 peer-reviewed publications and hundreds of nonrefereed manuscripts, 90 percent of which are about pain assessment in horses and imaging. Dr. Turner is a member of several professional organizations, including the American Veterinary Medicine Association, the American Association of Equine Practitioners (AAEP), the American Academy of Thermology (AAT), the American Farrier's Association, and the Minnesota Association of Equine Practitioners (he was also the past president). Currently, he is a member of the board of directors of the AAEP (since 2017) and the AAT (since 2013) and is the current AAT president and is an AAT fellow. In 2004 Dr. Turner was inducted into the International Equine Veterinarians Hall of Fame, which was established in 1997 to honor veterinarians who have contributed to the knowledge and recognition of proper hoof care for horses.

Susan L. White, D.V.M., M.S., Dipl. ACVIM, is the Josiah Meigs Distinguished Professor Emeritus of Large Animal Medicine at the University of Georgia College of Veterinary Medicine. She graduated from the University of California, Davis, School of Veterinary Medicine in 1973. After a period of general large-animal practice, Dr. White completed an internship at Kansas State University School of Veterinary Medicine and a residency in large-animal internal medicine at the University of Georgia College of Veterinary Medicine. She also completed an M.S. in veterinary pathology and is board certified by the American College of Veterinary Internal Medicine. Dr. White spent most of her career as a professor of large-animal medicine at the University of Georgia. She has had a long-standing interest in equine dermatology and has spoken internationally and nationally on equine dermatology over many years and maintains a dermatology consulting service. Dr. White was a member of the American Association of Equine Practitioners task force that wrote the 2008 paper on Tennessee walking horse abuse, detection of soring, and the next steps recommended at that time.

Appendix B

Open Session and Webinar Agendas

COMMITTEE ON A REVIEW OF METHODS FOR DETECTING SORENESS IN HORSES

COMMITTEE MEETING 1
October 16, 2019
Virtual Meeting

OPEN SESSION—*Open to the Public*

11:00 **Welcome; Purpose of the Open Session**
Jerry Black, Committee Chair

11:05 **Quick Overview of the NASEM Study Process**
Camilla Ables, Study Director

11:20 **Disclaimer**
Jerry Black, Committee Chair
Context and Expectations from the Study

11:22 *Carrie Ricci, Robert Gibbens, and Aaron Rhyner, USDA APHIS*

11:42 *Tom Blankenship, Tennessee Walking Horse Industry*

12:02 **Follow-up Questions for Sponsors**

12:10 **Public Comments**—Members of the public can send written comments; a media officer from the Office of News and Public Information will read the comments aloud until the adjournment of the session.

12:30 **Adjourn Open Session**

COMMITTEE MEETING 3
February 18–19, 2020
Room 206
Keck Center
500 Fifth Street, NW
Washington, DC 20001

OPEN SESSION 1—*Open to the Public*

9:10 **Welcome; Purpose of the Open Session/Disclaimer**
Jerry Black, Committee Chair

A Review of Methods for Detecting Soreness in Horses

9:15 **Limb Sensitivity Testing**
Colin Roberts, University of Cambridge, UK (via Zoom)

9:45 **Q&A**

9:55 **Adjourn Open Session**

OPEN SESSION 2—*Open to the Public*

1:00 **Welcome; Purpose of the Open Session/Disclaimer**
Jerry Black, Committee Chair

1:05 **Drug Testing in Tennessee Walking Horses**
Scott Stanley, University of Kentucky (via Zoom)

1:35 **Q&A**

1:55 **Adjourn Open Session**

COMMITTEE MEETING 4
May 7, 2020
Virtual Meeting

OPEN SESSION

10:00 **Welcome; Purpose of the Open Session/Disclaimer**
Jerry Black, Committee Chair

1:05 **A Discussion of Issues Surrounding the Scar Rule and the Detection of Soring in Tennessee Walking Horses**
Paul Stromberg, Ohio State University (via Zoom)

1:35 **Q&A**

10:45 **Adjourn Open Session**

WEBINAR AGENDAS

Webinar #1: Horse Facial Expressions to Assess Pain

December 2, 2019
11:00 a.m. to 12:00 p.m. (Eastern Time)

11:00 **Welcome, Introductions, and Ground Rules**
Jerry Black, Committee Chair

11:10 **Presentation on Horse Facial Expressions to Assess Pain**
Pia Haubro Andersen, Swedish University of Agricultural Sciences
There will be a Q&A session after the presentation—only committee members can ask questions. There will be no time for public comments.

12:00 p.m. **Adjourn Webinar**

Webinar #2: Algometry for Assessing Pain in Tennessee Walking Horses

December 2, 2019
6:00 p.m. to 7:00 p.m. (Eastern time)

6:00 p.m. **Welcome, Introductions, and Ground Rules**
Jerry Black, Committee Chair

6:10 **Presentation on Algometry for Assessing Pain in Tennessee Walking Horses**
Todd Behre (USDA) and Kevin Haussler (Colorado State University)
There will be a Q&A session after the presentation—only committee members can ask questions. There will be no time for public comments.

7:00 **Adjourn Webinar**

Webinar on Equine Pain: Physiology and Assessment and Prohibited Substance Detection and Testing on Tennessee Walking Horses

April 2, 2020
11 a.m. to 12:15 p.m. (Eastern time)

11:00 **Opening Remarks**
Jerry Black, Committee Chair

11:05 **Equine Pain: Physiology and Assessment**
Alonso Guedes, University of Minnesota

11:25 **Q&A** (Speaker and committee members)

11:35 **Introduction of Next Speaker(s)**
Jerry Black

11:37 **Prohibited Substance Detection and Testing on Tennessee Walking Horses**
Aaron Rhyner and Melissa Radel

11:57 **Q&A** (Speakers and committee members)

12:15 **Adjourn Webinar**

Appendix C

The Horse Protection Act of 1970—Regulations[1]

Electronic Code of Federal Regulations

e-CFR data is current as of August 29, 2019

Title 9 → Chapter I → Subchapter A → Part 11

Title 9: Animals and Animal Products

PART 11—HORSE PROTECTION REGULATIONS

Contents

AUTHORITY: 15 U.S.C. 1823–1825 and 1828; 7 CFR 2.22, 2.80, and 371.7.

SOURCE: 44 FR 25179, Apr. 27, 1979, unless otherwise noted.

§11.1 Definitions.

For the purpose of this part, unless the context otherwise requires, the following terms shall have the meanings assigned to them in this section. The singular form shall also impart the plural and the masculine form shall also impart the feminine. Words of art undefined in the following paragraphs shall have the meaning attributed to them by trade usage or general usage as reflected by definition in a standard dictionary, such as "Webster's."

[1] See https://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=3e963cf120a1af9fe2fd6d98a20639ec&rgn=div5&view=text&node=9:1.0.1.1.5&idno=9 (accessed on September 3, 2019).

Act means the Horse Protection Act of 1970 (Pub. L. 91-540) as amended by the Horse Protection Act Amendments of 1976 (Pub. L. 94-360), 15 U.S.C. 1821 *et seq*., and any legislation amendatory thereof.

Action device means any boot, collar, chain, roller, or other device which encircles or is placed upon the lower extremity of the leg of a horse in such a manner that it can either rotate around the leg, or slide up and down the leg so as to cause friction, or which can strike the hoof, coronet band or fetlock joint.

Administrator means the Administrator, Animal and Plant Health Inspection Service, or any person authorized to act for the Administrator.

Animal and Plant Health Inspection Service (APHIS) means the Animal and Plant Health Inspection Service of the United States Department of Agriculture.

APHIS representative means any employee of APHIS, or any officer or employee of any State agency who is authorized by the Administrator to perform inspections or any other functions authorized by the Act, including the inspection of the records of any horse show, horse exhibition, horse sale or horse auction.

APHIS Show Veterinarian means the APHIS Doctor of Veterinary Medicine responsible for the immediate supervision and conduct of the Department's activities under the Act at any horse show, horse exhibition, horse sale or horse auction.

Department means the United States Department of Agriculture.

Designated Qualified Person or *DQP* means a person meeting the requirements specified in §11.7 of this part who has been licensed as a DQP by a horse industry organization or association having a DQP program certified by the Department and who may be appointed and delegated authority by the management of any horse show, horse exhibition, horse sale or horse auction under section 4 of the Act to detect or diagnose horses which are sore or to otherwise inspect horses and any records pertaining to such horses for the purposes of enforcing the Act.

Exhibitor means (1) any person who enters any horse, any person who allows his horse to be entered, or any person who directs or allows any horse in his custody or under his direction, control or supervision to be entered in any horse show or horse exhibition; (2) any person who shows or exhibits any horse, any person who allows his horse to be shown or exhibited, or any person who directs or allows any horse in his custody or under his direction, control, or supervision to be shown or exhibited in any horse show or horse exhibition; (3) any person who enters or presents any horse for sale or auction, any person who allows his horse to be entered or presented for sale or auction, or any person who allows any horse in his custody or under his direction, control, or supervision to be entered or presented for sale or auction in any horse sale or horse auction; or (4) any person who sells or auctions any horse, any person who allows his horse to be sold or auctioned, or any person who directs or allows any horse in his custody or under his direction, control, or supervision to be sold or auctioned.

Horse means any member of the species *Equus caballus.*

Horse exhibition means a public display of any horses, singly or in groups, but not in competition, except events where speed is the prime factor, rodeo events, parades, or trail rides.

Horse industry organization or association means an organized group of people, having a formal structure, who are engaged in the promotion of horses through the showing, exhibiting, sale, auction, registry, or any activity which contributes to the advancement of the horse.

Horse sale or horse auction means any event, public or private, at which horses are sold or auctioned, regardless of whether or not said horses are exhibited prior to or during the sale or auction.

Horse show means a public display of any horses, in competition, except events where speed is the prime factor, rodeo events, parades, or trail rides.

Inspection means the examination of any horse and any records pertaining to any horse by use of whatever means are deemed appropriate and necessary for the purpose of determining compliance with the Act and regulations. Such inspection may include, but is not limited to, visual examination of a horse and records, actual physical examination of a horse including touching, rubbing, palpating and observation of vital signs, and the use of any diagnostic device or instrument, and may require the removal of any shoe, pad, action device, or any other equipment, substance or paraphernalia from the horse when deemed necessary by the person conducting such inspection.

Lubricant means mineral oil, glycerine or petrolatum, or mixtures exclusively thereof, that is applied to the limbs of a horse solely for protective and lubricating purposes while the horse is being shown or exhibited at a horse show, horse exhibition, horse sale or horse auction.

Management means any person or persons who organize, exercise control over, or administer or are responsible for organizing, directing, or administering any horse show, horse exhibition, horse sale or horse auction and specifically includes, but is not limited to, the sponsoring organization and show manager.

Person means any individual, corporation, company, association, firm, partnership, society, organization, joint stock company, or other legal entity.

Regional Director means the APHIS veterinarian who is assigned by the Administrator to supervise and perform official duties of APHIS under the Act in a specified State or States.[1]

[1]Information as to the name and address of the Regional Director for the State or States concerned can be obtained by writing to the Animal and Plant Health Inspection Service, Animal Care, 4700 River Road Unit 84, Riverdale, MD 20737-1234.

Secretary means the Secretary of Agriculture or anyone who has heretofore or may hereafter be delegated authority to act in his stead.

Show manager means the person who has been delegated primary authority by a sponsoring organization for managing a horse show, horse exhibition, horse sale or horse auction.

Sore when used to describe a horse means:

(1) An irritating or blistering agent has been applied, internally or externally by a person to any limb of a horse,

(2) Any burn, cut, or laceration has been inflicted by a person on any limb of a horse,

(3) Any tack, nail, screw, or chemical agent has been injected by a person into or used by a person on any limb of a horse, or

(4) Any other substance or device has been used by a person on any limb of a horse or a person has engaged in a practice involving a horse, and, as a result of such application, infliction, injection, use, or practice, such horse suffers, or can reasonably be expected to suffer, physical pain or distress, inflammation, or

lameness when walking, trotting, or otherwise moving, except that such term does not include such an application, infliction, injection, use, or practice in connection with the therapeutic treatment of a horse by or under the supervision of a person licensed to practice veterinary medicine in the State in which such treatment was given.

Sponsoring organization means any person under whose immediate auspices and responsibility a horse show, horse exhibition, horse sale, or horse auction is conducted.

State means any of the several States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, or the Trust Territory of the Pacific Islands.

[44 FR 1561, Jan. 5, 1979, as amended at 53 FR 14782, Apr. 26, 1988; 53 FR 28372, July 28, 1988; 56 FR 13749, Apr. 4, 1991; 59 FR 67612, Dec. 30, 1994; 63 FR 62927, Nov. 10, 1998]

§11.2 Prohibitions concerning exhibitors.

(a) *General prohibitions.* Notwithstanding the provisions of paragraph (b) of this section, no chain, boot, roller, collar, action device, nor any other device, method, practice, or substance shall be used with respect to any horse at any horse show, horse exhibition, or horse sale or auction if such use causes or can reasonably be expected to cause such horse to be sore.

(b) *Specific prohibitions.* The use of any of the following devices, equipment, or practices on any horse at any horse show, horse exhibition, or horse sale or auction is prohibited:

(1) All beads, bangles, rollers, and similar devices, with the exception of rollers made of lignum vitae (hardwood), aluminum, or stainless steel, with individual rollers of uniform size, weight and configuration, provided each such device may not weigh more than 6 ounces, including the weight of the fastener.

(2) Chains weighing more than 6 ounces each, including the weight of the fastener.

(3) Chains with links that are not of uniform size, weight and configuration; and, chains that have twisted links or double links.

(4) Chains that have drop links on any horse that is being ridden, worked on a lead, or otherwise worked out or moved about.

(5) More than one action device on any one limb of a horse.

(6) Chains or lignum vitae, stainless steel, or aluminum rollers which are not smooth and free of protrusions, projections, rust, corrosion, or rough or sharp edges.

(7)(i) Boots, collars, or any other devices, with protrusions or swellings, or rigid, rough, or sharp edges, seams or any other abrasive or abusive surface that may contact a horse's leg; and

(ii) Boots, collars, or any other devices that weigh more than 6 ounces, except for soft rubber or soft leather bell boots and quarter boots that are used as protective devices.

(8) Pads or other devices on yearling horses (horses up to 2 years old) that elevate or change the angle of such horses' hooves in excess of 1 inch at the heel.

(9) Any weight on yearling horses, except a keg or similar conventional horseshoe, and any horseshoe on yearling horses that weighs more than 16 ounces.

(10) Artificial extension of the toe length, whether accomplished with pads, acrylics or any other material or combinations thereof, that exceeds 50 percent of the natural hoof length, as measured from the coronet band, at the center of the front pastern along the front of the hoof wall, to the distal portion of the hoof wall at the tip of the toe. The artificial extension shall be measured from the distal portion of the hoof wall at the tip of the toe at a 90 degree angle to the proximal (foot/hoof) surface of the shoe.

(11) Toe length that does not exceed the height of the heel by 1 inch or more. The length of the toe shall be measured from the coronet band, at the center of the front pastern along the front of the hoof wall to the ground. The heel shall be measured from the coronet band, at the most lateral portion of the rear pastern, at a 90 degree angle to the ground, not including normal caulks at the rear of a horseshoe that do not exceed ¾ inch in length. That portion of caulk at the rear of a horseshoe in excess of ¾ of an inch shall be added to the height of the heel in determining the heel/toe ratio.

(12) Pads that are not made of leather, plastic, or a similar pliant material.

(13) Any object or material inserted between the pad and the hoof other than acceptable hoof packing, which includes pine tar, oakum, live rubber, sponge rubber, silicone, commercial hoof packing or other substances used to maintain adequate frog pressure or sole consistency.

(14) Single or double rocker-bars on the bottom surface of horseshoes which extend more than 1½ inches back from the point of the toe, or which would cause, or could reasonably be expected to cause, an unsteadiness of stance in the horse with resulting muscle and tendon strain due to the horse's weight and balance being focused upon a small fulcrum point.[2]

[2]This prohibition is not intended to disallow corrective devices, such as Memphis bars which consist of a metal bar(s) crossing from the ground surface of one side of the horseshoe to the ground surface of the other side of the horseshoe, and the purpose of which is to correct a lameness or pathological condition of the foot: *Provided,* That such metal bar(s) do not act as a single fulcrum point so as to affect the balance of the horse.

(15) Metal hoof bands, such as used to anchor or strengthen pads and shoes, placed less than ½ inch below the coronet band.

(16) Metal hoof bands that can be easily and quickly loosened or tightened by hand, by means such as, but not limited to, a wing-nut or similar fastener.

(17) Any action device or any other device that strikes the coronet band of the foot of a horse except for soft rubber or soft leather bell boots that are used as protective devices.

(18) Shoeing a horse, or trimming a horse's hoof in a manner that will cause such horse to suffer, or can reasonably be expected to cause such horse to suffer pain or distress, inflammation, or lameness when walking, trotting, or otherwise moving.

(19) Lead or other weights attached to the outside of the hoof wall, the outside surface of the horseshoe, or any portion of the pad except the bottom surface within the horseshoe. Pads may not be hollowed out for the purpose of inserting or affixing weights, and weights may not extend below the bearing surface of the shoe. Hollow shoes or artificial extensions filled with mercury or similar substances are prohibited.

(c) *Substances.* All substances are prohibited on the extremities above the hoof of any Tennessee Walking Horse or racking horse while being shown, exhibited, or offered for sale at any horse show, horse exhibition, or horse sale or auction, except lubricants such as glycerine, petrolatum, and mineral oil, or mixtures thereof: *Provided,* That:

(1) The horse show, horse exhibition, or horse sale or auction management agrees to furnish all such lubricants and to maintain control over them when used at the horse show, horse exhibition, or horse sale or auction.

(2) Any such lubricants shall be applied only after the horse has been inspected by management or by a DQP and shall only be applied under the supervision of the horse show, horse exhibition, or horse sale, or auction management.

(3) Horse show, horse exhibition, or horse sale or auction management makes such lubricants available to Department personnel for inspection and sampling as they deem necessary.

(d) *Competition restrictions—2 Year-Old Horses.* Horse show or horse exhibition workouts or performances of 2-year-old Tennessee Walking Horses and racking horses and working exhibitions of 2-year-old Tennessee Walking Horses and racking horses (horses eligible to be shown or exhibited in 2-year-old classes) at horse sales or horse auctions that exceed a total of 10 minutes continuous workout or performance without a minimum 5-minute rest period between the first such 10-minute period and the second such 10-minute period, and, more than two such 10-minute periods per performance, class, or workout are prohibited.

(e) *Information requirements—horse related.* Failing to provide information or providing any false or misleading information required by the Act or regulations or requested by Department representatives, by any person that owns, trains, shows, exhibits, or sells or has custody of, or direction or control over any horse shown, exhibited, sold, or auctioned or entered for the purpose of being shown, exhibited, sold, or auctioned at any horse show, horse exhibition, or horse sale or auction is prohibited. Such information shall include, but is not limited to: Information concerning the registered name, markings, sex, age, and legal ownership of the horse; the name and address of the horse's training and/or stabling facilities; the name and address of the owner, trainer, rider, any other exhibitor, or other legal entity bearing responsibility for the horse; the class in which the horse is entered or shown; the exhibitor identification number; and, any other information reasonably related to the identification, ownership, control, direction, or supervision of any such horse.

[44 FR 25179, Apr. 27, 1979, as amended at 53 FR 14782, Apr. 26, 1988, 53 FR 15641, May 2, 1988, 53 FR 28372, July 28, 1988, 53 FR 41562, Oct. 24, 1988, 53 FR 45854, Nov. 14, 1988; 54 FR 7178, Feb. 17, 1989]

§11.3 Scar rule.

The scar rule applies to all horses born on or after October 1, 1975. Horses subject to this rule that do not meet the following scar rule criteria shall be considered to be "sore" and are subject to all prohibitions of section 5 of the Act. The scar rule criteria are as follows:

(a) The anterior and anterior-lateral surfaces of the fore pasterns (extensor surface) must be free of bilateral granulomas,[5] other bilateral pathological evidence of inflammation, and, other bilateral evidence of abuse indicative of soring including, but not limited to, excessive loss of hair.

[3] [4][Reserved]

[5]Granuloma is defined as any one of a rather large group of fairly distinctive focal lesions that are formed as a result of inflammatory reactions caused by biological, chemical, or physical agents.

A Review of Methods for Detecting Soreness in Horses

(b) The posterior surfaces of the pasterns (flexor surface), including the sulcus or "pocket" may show bilateral areas of uniformly thickened epithelial tissue if such areas are free of proliferating granuloma tissue, irritation, moisture, edema, or other evidence of inflammation.

[44 FR 25179, Apr. 27, 1979, as amended at 53 FR 14782, Apr. 26, 1988, 53 FR 28373, July 28, 1988]

§11.4 Inspection and detention of horses.

For the purpose of effective enforcement of the Act:

(a) Each horse owner, exhibitor, trainer, or other person having custody of, or responsibility for, any horse at any horse show, horse exhibition, or horse sale or auction, shall allow any APHIS representative to reasonably inspect such horse at all reasonable times and places the APHIS representative may designate. Such inspections may be required of any horse which is stabled, loaded on a trailer, being prepared for show, exhibition, or sale or auction, being exercised or otherwise on the grounds of, or present at, any horse show, horse exhibition, or horse sale or auction, whether or not such horse has or has not been shown, exhibited, or sold or auctioned, or has or has not been entered for the purpose of being shown or exhibited or offered for sale or auction at any such horse show, horse exhibition, or horse sale or auction. APHIS representatives will not generally or routinely delay or interrupt actual individual classes or performances at horse shows, horse exhibitions, or horse sales or auctions for the purpose of examining horses, but they may do so in extraordinary situations, such as but not limited to, lack of proper facilities for inspection, refusal of management to cooperate with Department inspection efforts, reason to believe that failure to immediately perform inspection may result in the loss, removal, or masking of any evidence of a violation of the Act or the regulations, or a request by management that such inspections be performed by an APHIS representative.

(b) When any APHIS representative notifies the owner, exhibitor, trainer, or other person having custody of or responsibility for a horse at any horse show, horse exhibition, or horse sale or auction that APHIS desires to inspect such horse, it shall not be moved from the horse show, horse exhibition, or horse sale or auction until such inspection has been completed and the horse has been released by an APHIS representative.

(c) For the purpose of examination, testing, or taking of evidence, APHIS representatives may detain for a period not to exceed 24 hours any horse, at any horse show, horse exhibition, or horse sale or auction, which is sore or which an APHIS veterinarian has probable cause to believe is sore. Such detained horse may be marked for identification and any such identifying markings shall not be removed by any person other than an APHIS representative.

(d) Detained horses shall be kept under the supervision of an APHIS representative or secured under an official USDA seal or seals in a horse stall, horse trailer, or other facility to which access shall be limited. It shall be the policy of APHIS to have at least one representative present in the immediate detention area when a horse is being held in detention. The official USDA seal or seals may not be broken or removed by any person other than an APHIS representative, unless:

(1) The life or well-being of the detained horse is immediately endangered by fire, flood, windstorm, or other dire circumstances that are beyond human control.

(2) The detained horse is in need of such immediate veterinary attention that its life may be in peril before an APHIS representative can be located.

(3) The horse has been detained for a maximum 24-hour detention period, and an APHIS representative is not available to release the horse.

(e) The owner, exhibitor, trainer, or other person having custody of or responsibility for any horse detained by APHIS for further examination, testing, or the taking of evidence shall be allowed to feed, water, and provide other normal custodial and maintenance care, such as walking, grooming, etc., for such detained horse: *Provided,* That:

(1) Such feeding, watering, and other normal custodial and maintenance care of the detained horse is rendered under the direct supervision of an APHIS representative.

(2) Any non-emergency veterinary care of the detained horse requiring the use, application, or injection of any drugs or other medication for therapeutic or other purposes is rendered by a Doctor of Veterinary Medicine in the presence of an APHIS representative and, the identity and dosage of the drug or other medication used, applied, or injected and its purpose is furnished in writing to the APHIS representative prior to such use, application, or injection by the Doctor of Veterinary Medicine attending the horse. The use, application, or injection of such drug or other medication must be approved by the APHIS Show Veterinarian or his appointed representative.

(f) It shall be the policy of APHIS to inform the owner, trainer, exhibitor, or other person having immediate custody of or responsibility for any horse allegedly found to be in violation of the Act or the regulations of such alleged violation or violations before the horse is released by an APHIS representative.

(g) The owner, trainer, exhibitor, or other person having immediate custody of or responsibility for any horse or horses that an APHIS representative determines shall be detained for examination, testing, or taking of evidence pursuant to paragraph (e) of this section shall be informed after such determination is made and shall allow said horse to be immediately put under the supervisory custody of APHIS or secured under official USDA seal as provided in paragraph (d) of this section until the completion of such examination, testing, or gathering of evidence, or until the 24-hour detention period expires.

(h) The owner, trainer, exhibitor, or other person having custody of or responsibility for any horse allegedly found to be in violation of the Act or regulations, and who has been notified of such alleged violation by an APHIS representative as stated in paragraph (f) of this section, may request reexamination and testing of said horse within a 24-hour period: *Provided,* That:

(1) Such request is made to the APHIS Show Veterinarian immediately after the horse has been examined by APHIS representatives and before such horse has been removed from the APHIS inspection facilities; and

(2) The APHIS Show Veterinarian determines that sufficient cause for reexamination and testing exists; and

(3) The horse is maintained under APHIS supervisory custody as prescribed in paragraph (d) of this section until such reexamination and testing has been completed.

(i) The owner, exhibitor, trainer, or other person having custody of, or responsibility for any horse being inspected shall render such assistance as the APHIS representative may request for purposes of such inspection.

(ii) [Reserved]

[44 FR 25179, Apr. 27, 1979, as amended at 56 FR 13750, Apr. 4, 1991]

§11.5 Access to premises and records.

A Review of Methods for Detecting Soreness in Horses

Requirements regarding access to premises for inspection of horses and records are as follows:

(a) *Management.* (1) The management of any horse show, horse exhibition, or horse sale or auction shall, without fee, charge, assessment, or other compensation, provide APHIS representatives with unlimited access to the grandstands, sale ring, barns, stables, grounds, offices, and all other areas of any horse show, horse exhibition, or horse sale or auction, including any adjacent areas under their direction, control, or supervision for the purpose of inspecting any horses, or any records required to be kept by regulation or otherwise maintained.

(2) The management of any horse show, horse exhibition, or horse sale or auction shall, without fee, charge, assessment, or other compensation, provide APHIS representatives with an adequate, safe, and accessible area for the visual inspection and observation of horses while such horses are competitively or otherwise performing at any horse show or horse exhibition, or while such horses are being sold or auctioned or offered for sale or auction at any horse sale or horse auction.

(b) *Exhibitors.* (1) Each horse owner, exhibitor, or other person having custody of or responsibility for any horse at any horse show, horse exhibition, or horse sale or auction shall, without fee, charge, assessment, or other compensation, admit any APHIS representative or Designated Qualified Person appointed by management, to all areas of barns, compounds, horse vans, horse trailers, stables, stalls, paddocks, or other show, exhibition, or sale or auction grounds or related areas at any horse show, horse exhibition, or horse sale or auction, for the purpose of inspecting any such horse at any and all reasonable times.

(2) Each owner, trainer, exhibitor, or other person having custody of or responsibility for, any horse at any horse show, horse exhibition, or horse sale or auction shall promptly present his horse for inspection upon notification, orally or in writing, by any APHIS representative or Designated Qualified Person appointed by management, that said horse has been selected for examination for the purpose of determining whether such horse is in compliance with the Act and regulations.

[44 FR 25179, Apr. 27, 1979, as amended at 56 FR 13750, Apr. 4, 1991]

§11.6 Inspection space and facility requirements.

The management of every horse show, horse exhibition, or horse sale or auction, containing Tennessee Walking Horses or racking horses, shall provide, without fee, sufficient space and facilities for APHIS representatives to carry out their duties under the Act and regulations at every horse show, horse exhibition, or horse sale or auction, containing Tennessee Walking Horses or racking horses, whether or not management has received prior notification or otherwise knows that such show may be inspected by APHIS. The management of every horse show, horse exhibition, horse sale or auction which does not contain Tennessee Walking Horses or racking horses shall provide, without fee, such sufficient space and facilities when requested to do so by APHIS representatives. With respect to such space and facilities, it shall be the responsibility of management to provide at least the following:

(a) Sufficient space in a convenient location to the horse show, horse exhibition, or horse sale or auction arena, acceptable to the APHIS Show Veterinarian, in which horses may be physically, thermographically, or otherwise inspected.

(b) Protection from the elements of nature, such as rain, snow, sleet, hail, windstorm, etc., if required by the APHIS Show Veterinarian.

(c) A means to control crowds or onlookers in order that APHIS personnel may carry out their duties without interference and with a reasonable measure of safety, if requested by the APHIS Show Veterinarian.

(d) An accessible, reliable, and convenient 110-volt electrical power source, if electrical service is available at the show, exhibition, or sale or auction site and is requested by the APHIS Show Veterinarian.

(e) An appropriate area adjacent to the inspection area for designated horses to wait for inspection, and an area to be used for detention of horses.

[44 FR 25181, Apr. 27, 1979, as amended at 56 FR 13750, Apr. 4, 1991]

§11.7 Certification and licensing of designated qualified persons (DQP's).

(a) *Basic qualifications of DQP applicants.* DQP's holding a valid, current DQP license issued in accordance with this part may be appointed by the management of any horse show, horse exhibition, horse sale, or horse auction, as qualified persons in accordance with section 4(c) of the Act, to inspect horses to detect or diagnose soring and to otherwise inspect horses, or any records pertaining to any horse for the purpose of enforcing the Act. Individuals who may be licensed as DQP's under this part shall be:

(1) Doctors of Veterinary Medicine who are accredited in any State by the United States Department of Agriculture under part 161 of chapter I, title 9 of the Code of Federal Regulations, and who are:

(i) Members of the American Association of Equine Practitioners, or

(ii) Large animal practitioners with substantial equine experience, or

(iii) Knowledgeable in the area of equine lameness as related to soring and soring practices (such as Doctors of Veterinary Medicine with a small animal practice who own, train, judge, or show horses, or Doctors of Veterinary Medicine who teach equine related subjects in an accredited college or school of veterinary medicine). Accredited Doctors of Veterinary Medicine who meet these criteria may be licensed as DQP's by a horse industry organization or association whose DQP program has been certified by the Department under this part without undergoing the formal training requirements set forth in this section.

(2) Farriers, horse trainers, and other knowledgeable horsemen whose past experience and training would qualify them for positions as horse industry organization or association stewards or judges (or their equivalent) and who have been formally trained and licensed as DQP's by a horse industry organization or association whose DQP program has been certified by the Department in accordance with this section.

(b) *Certification requirements for DQP programs.* The Department will not license DQP's on an individual basis. Licensing of DQP's will be accomplished only through DQP programs certified by the Department and initiated and maintained by horse industry organizations or associations. Any horse industry organization or association desiring Department certification to train and license DQP's under the Act shall submit to the Administrator[6] a formal request in writing for certification of its DQP program and a detailed outline of such program for Department approval. Such outline shall include the organizational structure of such organization or association and the names of the officers or persons charged with the management of the organization or association. The outline shall also contain at least the following:

[6]Animal and Plant Health Inspection Service, Animal Care, 4700 River Road, Unit 84, Riverdale, Maryland 20737-1234.

(1) The criteria to be used in selecting DQP candidates and the minimum qualifications and knowledge regarding horses each candidate must have in order to be admitted to the program.

(2) A copy of the formal training program, classroom and practical, required to be completed by each DQP candidate before being licensed by such horse industry organization or association, including the minimum number of hours, classroom and practical, and the subject matter of the training program. Such training program must meet the following minimum standards in order to be certified by the Department under the Act.

(i) Two hours of classroom instruction on the anatomy and physiology of the limbs of a horse. The instructor teaching the course must be specified, and a resume of said instructor's background, experience, and qualifications to teach such course shall be provided to the Administrator.[6]

(ii) Two hours of classroom instruction on the Horse Protection Act and regulations and their interpretation. Instructors for this course must be furnished or recommended by the Department. Requests for instructors to be furnished or recommended must be made to the Administrator[6] in writing at least 30 days prior to such course.

(iii) Four hours of classroom instruction on the history of soring, the physical examination procedures necessary to detect soring, the detection and diagnosis of soring, and related subjects. The instructor teaching the course must be specified and a summary of said instructor's background, experience, and qualifications to teach such course must be provided to the Administrator.[6]

(iv) Four hours of practical instruction in clinics and seminars utilizing live horses with actual application of the knowledge gained in the classroom subjects covered in paragraphs (b)(2)(i), (ii), and (iii) of this section. Methods and procedures required to perform a thorough and uniform examination of a horse shall be included. The names of the instructors and a resume of their background, academic and practical experience, and qualifications to present such instruction shall be provided to the Administrator.[6] Notification of the actual date, time, duration, subject matter, and geographic location of such clinics or seminars must be sent to the Administrator[6] at least 10 days prior to each such clinic or seminar.

(v) One hour of classroom instruction regarding the DQP standards of conduct promulgated by the licensing organization or association pursuant to paragraph (d)(7) of this section.

(vi) One hour of classroom instruction on recordkeeping and reporting requirements and procedures.

(3) A sample of a written examination which must be passed by DQP candidates for successful completion of the program along with sample answers and the scoring thereof, and proposed passing and failing standards.

(4) The criteria to be used to determine the qualifications and performance abilities of DQP candidates selected for the training program and the criteria used to indicate successful completion of the training program, in addition to the written examination required in paragraph (b)(3) of this section.

(5) The criteria and schedule for a continuing education program and the criteria and methods of monitoring and appraising performance for continued licensing of DQP's by such organization or association. A continuing education program for DQP's shall consist of not less than 4 hours of instruction per year.

(6) Procedures for monitoring horses in the unloading, preparation, warmup, and barn areas, or other such areas. Such monitoring may include any horse that is stabled, loaded on a trailer, being prepared for show, exhibition, sale, or auction, or exercised, or that is otherwise on the grounds of, or present at, any horse show, horse exhibition, or horse sale or auction.

(7) The methods to be used to insure uniform interpretation and enforcement of the Horse Protection Act and regulations by DQP's and uniform procedures for inspecting horses for compliance with the Act and regulations;

(8) Standards of conduct for DQP's promulgated by the organization or association in accordance with paragraph (d)(7) of this section; and

(9) A formal request for Department certification of the DQP program.

The horse industry organizations or associations that have formally requested Department certification of their DQP training, enforcement, and maintenance program will receive a formal notice of certification from the Department, or the reasons, in writing, why certification of such program cannot be approved. A current list of certified DQP programs and licensed DQP's will be published in the FEDERAL REGISTER at least once each year, and as may be further required for the purpose of deleting programs and names of DQP's that are no longer certified or licensed, and of adding the names of programs and DQP's that have been certified or licensed subsequent to the publication of the previous list.

(c) *Licensing of DQP's.* Each horse industry organization or association receiving Department certification for the training and licensing of DQP's under the Act shall:

(1) Issue each DQP licensed by such horse industry organization or association a numbered identification card bearing the name and personal signature of the DQP, a picture of the DQP, and the name and address, including the street address or post office box and zip code, of the licensing organization or association;

(2) Submit a list to the Administrator[6] of names and addresses including street address or post office box and zip code, of all DQP's that have successfully completed the certified DQP program and have been licensed under the Act and regulations by such horse industry organization or association;

[6]See footnote 6 to this section.

(3) Notify the Department of any additions or deletions of names of licensed DQP's from the licensed DQP list submitted to the Department or of any change in the address of any licensed DQP or any warnings and license revocations issued to any DQP licensed by such horse industry organization or association within 10 days of such change;

(4) Not license any person as a DQP if such person has been convicted of any violation of the Act or regulations occurring after July 13, 1976, or paid any fine or civil penalty in settlement of any proceeding regarding a violation of the Act or regulations occurring after July 13, 1976, for a period of at least 2 years following the first such violation, and for a period of at least 5 years following the second such violation and any subsequent violation;

(5) Not license any person as a DQP until such person has attended and worked two recognized or affiliated horse shows, horse exhibitions, horse sales, or horse auctions as an apprentice DQP and has demonstrated the ability, qualifications, knowledge and integrity required to satisfactorily execute the duties and responsibilities of a DQP;

(6) Not license any person as a DQP if such person has been disqualified by the Secretary from making detection, diagnosis, or inspection for the purpose of enforcing the Act, or if such person's DQP license is canceled by another horse industry organization or association.

(d) *Requirements to be met by DQP's and Licensing Organizations or Associations.* (1) Any licensed DQP appointed by the management of any horse show, horse exhibition, horse sale or auction to inspect horses for the purpose of detecting and determining or diagnosing horses which are sore and to otherwise inspect horses for the purpose of enforcing the Act and regulations, shall keep and maintain the following information and records concerning any horse which said DQP recommends be disqualified or excused for any reason at such horse show, horse exhibition, horse sale or auction, from being shown, exhibited, sold or auctioned, in a uniform format required by the horse industry organization or association that has licensed said DQP:

(i) The name and address, including street address or post office box and zip code, of the show and the show manager.

(ii) The name and address, including street address or post office box and zip code, of the horse owner.

(iii) The name and address, including street address or post office box and zip code, of the horse trainer.

(iv) The name and address, including street address or post office box and zip code, of the horse exhibitor.

(v) The exhibitors number and class number, or the sale or auction tag number of said horse.

(vi) The date and time of the inspection.

(vii) A detailed description of all of the DQP's findings and the nature of the alleged violation, or other reason for disqualifying or excusing the horse, including said DQP's statement regarding the evidence or facts upon which the decision to disqualify or excuse said horse was based.

(viii) The name, age, sex, color, and markings of the horse; and

(ix) The name or names of the show manager or other management representative notified by the DQP that such horse should be excused or disqualified and whether or not such manager or management representative excused or disqualified such horse.

Copies of the above records shall be submitted by the involved DQP to the horse industry organization or association that has licensed said DQP within 72 hours after the horse show, horse exhibition, horse sale, or horse auction is over.

(2) The DQP shall inform the custodian of each horse allegedly found in violation of the Act or its regulations, or disqualified or excused for any other reason, of such action and the specific reasons for such action.

(3) Each horse industry organization or association having a Department certified DQP program shall submit a report to the Department containing the following information, from records required in paragraph (d)(1) of this section and other available sources, to the Department on a monthly basis:

(i) The identity of all horse shows, horse exhibitions, horse sales, or horse auctions that have retained the services of DQP's licensed by said organization or association during the month covered by the report. Information concerning the identity of such horse shows, horse exhibitions, horse sales, or horse auctions shall include:

(A) The name and location of the show, exhibition, sale, or auction.

(B) The name and address of the manager.

(C) The date or dates of the show, exhibition, sale, or auction.

(ii) The identity of all horses at each horse show, horse exhibition, horse sale, or horse auction that the licensed DQP recommended be disqualified or excused for any reason. The information concerning the identity of such horses shall include:

(A) The registered name of each horse.

(B) The name and address of the owner, trainer, exhibitor, or other person having custody of or responsibility for the care of each such horse disqualified or excused.

(4) Each horse industry organization or association having a Department certified DQP program shall provide, by certified mail if personal service is not possible, to the trainer and owner of each horse allegedly found in violation of the Act or its regulations or otherwise disqualified or excused for any reason, the following information;

(i) The name and date of the show, exhibition, sale, or auction.

(ii) The name of the horse and the reason why said horse was excused, disqualified, or alleged to be in violation of the Act or its regulations.

(5) Each horse industry organization or association having a Department certified DQP program shall provide each of its licensed DQP's with a current list of all persons that have been disqualified by order of the Secretary from showing or exhibiting any horse, or judging or managing any horse show, horse exhibition, horse sale, or horse auction. The Department will make such list available, on a current basis, to organizations and associations maintaining a certified DQP program.

(6) Each horse industry organization or association having a Department certified DQP program shall develop and provide a continuing education program for licensed DQP's which provides not less than 4 hours of instruction per year to each licensed DQP.

(7) Each horse industry organization or association having a Department certified DQP program shall promulgate standards of conduct for its DQP's, and shall provide administrative procedures within the organization or association for initiating, maintaining, and enforcing such standards. The procedures shall include the causes for and methods to be utilized for canceling the license of any DQP who fails to properly and adequately carry out his duties. Minimum standards of conduct for DQP's shall include the following;

(i) A DQP shall not exhibit any horse at any horse show or horse exhibition, or sell, auction, or pruchase any horse sold at a horse sale or horse auction at which he or she has been appointed to inspect horses;

(ii) A DQP shall not inspect horses at any horse show, horse exhibition, horse sale or horse auction in which a horse or horses owned by a member of the DQP's immediate family or the DQP's employer are competing or are being offered for sale;

(iii) A DQP shall follow the uniform inspection procedures of his certified organization or association when inspecting horses; and

(iv) The DQP shall immediately inform management of each case regarding any horse which, in his opinion, is in violation of the Act or regulations.

A Review of Methods for Detecting Soreness in Horses

(e) *Prohibition of appointment of certain persons to perform duties under the Act.* The management of any horse show, horse exhibition, horse sale, or horse auction shall not appoint any person to detect and diagnose horses which are sore or to otherwise inspect horses for the purpose of enforcing the Act, if that person:

(1) Does not hold a valid, current DQP license issued by a horse industry organization or association having a DQP program certified by the Department.

(2) Has had his DQP license canceled by the licensing organization or association.

(3) Is disqualified by the Secretary from performing diagnosis, detection, and inspection under the Act, after notice and opportunity for a hearing,[7] when the Secretary finds that such person is unfit to perform such diagnosis, detection, or inspection because he has failed to perform his duties in accordance with the Act or regulations, or because he has been convicted of a violation of any provision of the Act or regulations occurring after July 13, 1976, or has paid any fine or civil penalty in settlement of any proceeding regarding a violation of the Act or regulations occurring after July 13, 1976.

[7]Hearing would be in accordance with the Uniform Rules of Practice for the Department of Agriculture in subpart H of part 1, subtitle A, title 7, Code of Federal Regulations (7 CFR 1.130 *et seq*.)

(f) *Cancellation of DQP license.* (1) Each horse industry organization or association having a DQP program certified by the Department shall issue a written warning to any DQP whom it has licensed who violates the rules, regulations, by-laws, or standards of conduct promulgated by such horse industry organization or association pursuant to this section, who fails to follow the procedures set forth in §11.21 of this part, or who otherwise carries out his duties and responsibilities in a less than satisfactory manner, and shall cancel the license of any DQP after a second violation. Upon cancellation of his DQP license, the DQP may, within 30 days thereafter, request a hearing before a review committee of not less than three persons appointed by the licensing horse industry organization or association. If the review committee sustains the cancellation of the license, the DQP may appeal the decision of such committee to the Administrator within 30 days from the date of such decision, and the Administrator shall make a final determination in the matter. If the Administrator finds, after providing the DQP whose license has been canceled with a notice and an opportunity for a hearing,[7] that there is sufficient cause for the committee's determination regarding license cancellation, he shall issue a decision sustaining such determination. If he does not find that there was sufficient cause to cancel the license, the licensing organization or association shall reinstate the license.

(2) Each horse industry organization or association having a Department certified DQP program shall cancel the license of any DQP licensed under its program who has been convicted of any violation of the Act or regulations or of any DQP who has paid a fine or civil penalty in settlement of any alleged violation of the Act or regulations if such alleged violation occurred after July 13, 1976.

(g) *Revocation of DQP program certification of horse industry organizations or associations.* Any horse industry organization or association having a Department certified DQP program that has not received Department approval of the inspection procedures provided for in paragraph (b)(6) of this section, or that otherwise fails to comply with the requirements contained in this part, may have such certification of its DQP program revoked, unless, upon written notification from the Department of such failure to comply with the requirements in this section, such organization or association takes immediate action to rectify such failure and takes appropriate steps to prevent a recurrence of such noncompliance within the time period specified in the Department notification, or otherwise adequately explains such failure to comply to the satisfaction of the Department. Any horse industry organization or association whose DQP program certification has been revoked may appeal such revocation to the Administrator[6] in writing within 30 days after the date of such revocation and, if requested, shall be afforded an opportunity for a hearing.[7] All DQP licenses issued by a horse industry organization or association whose DQP program certification has been revoked shall expire 30

days after the date of such revocation, or 15 days after the date the revocation becomes final after appeal, unless they are transferred to a horse industry organization or association having a program currently certified by the Department.

[6 7]See previous footnotes 6 and 7.

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[44 FR 1563, Jan. 5, 1979, as amended at 44 FR 25182, Apr. 27, 1979; 48 FR 57471, Dec. 30, 1983; 55 FR 41993, Oct. 17, 1990; 56 FR 13750, Apr. 4, 1991; 59 FR 67612, Dec. 30, 1994; 63 FR 62927, Nov. 10, 1998; 77 FR 33618, June 7, 2012]

§11.20 Responsibilities and liabilities of management.

(a) The management of any horse show, horse exhibition, or horse sale or auction which does not appoint and retain a DQP shall be responsible for identifying all horses that are sore or otherwise in violation of the Act or regulations, and shall disqualify or disallow any horses which are sore or otherwise in violation of the Act or regulations from participating or competing in any horse show, horse exhibition, horse sale, or horse auction. Horses entered for sale or auction at a horse sale or horse auction must be identified as sore or otherwise in violation of the Act or regulations prior to the sale or auction and prohibited from entering the sale or auction ring. Sore horses or horses otherwise in violation of the Act or regulations that have been entered in a horse show or horse exhibition for the purpose of show or exhibition must be identified and excused prior to the show or exhibition. Any horses found to be sore or otherwise in violation of the Act or regulations during actual participation in the show or exhibition, must be removed from further participation prior to the tyeing of the class or the completion of the exhibition. All horses tyed first in each Tennessee Walking Horse or racking horse class or event at any horse show or horse exhibition shall be inspected after being shown or exhibited to determine if such horses are sore or otherwise in violation of the Act or regulations.

(b)(1) The management of any horse show, horse exhibition, horse sale or auction which designates and appoints a Designated Qualified Person (or persons) to inspect horses shall accord said DQP access to all records and areas of the grounds of such show, exhibition, sale, or auction and the same right to inspect horses and records as is accorded to any APHIS representative. Further, management shall not take any action which would interfere with or influence said DQP in carrying out his duties or making decisions concerning whether or not any horse is sore or otherwise in violation of the Act or regulations. In the event management is dissatisfied with the performance of a particular DQP, including disagreement with decisions concerning violations, management shall not dismiss or otherwise interfere with said DQP during the DQP's appointed tour of duty.[8] However, management should immediately notify, in writing, the Department[6] and the organization or association that licensed the DQP, as to why the performance of said DQP was inadequate or otherwise unsatisfactory. Management which designates and appoints a DQP shall immediately disqualify or disallow from being shown, exhibited, sold, or auctioned any horse identified by the DQP to be sore or otherwise in violation of the Act or regulations or any horse otherwise known by management to be sore or in violation of the Act or regulations. Should management fail to disqualify or disallow from being shown, exhibited, sold or auctioned any such horse, said management shall assume full responsibility for and liabilities arising from the showing, exhibition, sale, or auction of said horses.

[8]The duration of the show, exhibition, or sale or auction.

[6]See footnote 6 to §11.7.

(2) The DQP shall physically inspect: (i) All Tennessee Walking Horses and racking horses entered for sale or auction, (ii) all Tennessee Walking Horses and racking horses entered in any animated gait class (whether under saddle, horse to cart, or otherwise), (iii) all Tennessee Walking Horses and racking horses

A Review of Methods for Detecting Soreness in Horses

entered for exhibition before they are admitted to be shown, exhibited, sold, or auctioned, and (iv) all Tennessee Walking Horses and racking horses tyed first in their class or event at any horse show, horse exhibition, horse sale, or horse auction. Such inspection shall be for the purpose of determining whether any such horses are in violation of the Act or regulations. Such physical examination shall be conducted in accordance with the inspection procedures provided for in §11.21 of this part. The DQP shall observe horses in the warmup ring and during actual performances whenever possible, and shall inspect any Tennessee Walking Horse or racking horse at any time he deems necessary to determine whether any such horse shown, exhibited, sold, or auctioned is in violation of the Act or regulations. If present at other shows, he shall examine any horse which he determines should be examined for compliance with the Act and regulations.

(3) The DQP shall immediately report, to the management of any horse show, horse exhibition, or horse sale or auction, any horse which, in his opinion, is sore or otherwise in violation of the Act or regulations. Such report shall be made, whenever possible, before the show class or exhibition involving said horse has begun or before said horse is offered for sale or auction.

(c) The management of any horse show, exhibition, sale, or auction that designates and appoints a DQP to inspect horses shall appoint and designate at least two DQP's when more than 150 horses are entered.

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[44 FR 25182, Apr. 27, 1979, as amended at 48 FR 57471, Dec. 30, 1983; 55 FR 41993, Oct. 17, 1990; 56 FR 13750, Apr. 4, 1991; 57 FR 62175, Dec. 30, 1992]

§11.21 Inspection procedures for designated qualified persons (DQPs).

(a)(1) During the preshow inspection, the DQP shall direct the custodian of the horse to walk and turn the horse in a manner that allows the DQP to determine whether the horse exhibits signs of soreness. The DQP shall determine whether the horse moves in a free and easy manner and is free of any signs of soreness.

(2) The DQP shall digitally palpate the front limbs of the horse from knee to hoof, with particular emphasis on the pasterns and fetlocks. The DQP shall examine the posterior surface of the pastern by picking up the foot and examining the posterior (flexor) surface. The DQP shall apply digital pressure to the pocket (sulcus), including the bulbs of the heel, and continue the palpation to the medial and lateral surfaces of the pastern, being careful to observe for responses to pain in the horse. While continuing to hold onto the pastern, the DQP shall extend the foot and leg of the horse to examine the front (extensor) surfaces, including the coronary band. The DQP may examine the rear limbs of all horses inspected after showing, and may examine the rear limbs of any horse examined preshow or on the showgrounds when he deems it necessary, except that the DQP shall examine the rear limbs of all horses exhibiting lesions on, or unusual movement of, the rear legs. While carrying out the procedures set forth in this paragraph, the DQP shall also inspect the horse to determine whether the provisions of §11.3 of this part are being complied with, and particularly whether there is any evidence of inflammation, edema, or proliferating granuloma tissue.

(3) The DQP shall observe and inspect all horses for compliance with the provisions set forth in §11.2(a) through §11.2(c) of this part. All action devices, pads, and other equipment shall be observed and/or examined to assure that they are in compliance with the regulations. All such equipment on horses examined postshow, and on horses examined preshow that are not clearly in compliance, shall be weighed and/or measured.

(4) The DQP shall instruct the custodian of the horse to control it by holding the reins approximately 18 inches from the bit shank. The DQP shall not be required to examine a horse if it is presented in a manner that might cause the horse not to react to a DQP's examination, or if whips, cigarette smoke, or other actions or paraphernalia are used to distract a horse during examination. All such incidents shall be reported to the show management and the DQP licensing organization.

(b) The DQP shall inspect horses no more than three classes ahead of the time the inspected horses are to be shown, except that, in shows with fewer than 150 horses, the DQP shall inspect horses no more than 2 classes ahead of the time the inspected horses are to be shown. Inspected horses shall be held in a designated area that is under observation by the DQP or APHIS representative. Horses shall not be permitted to leave the designated area before showing. Only the horse, the rider, the groom, the trainer, the DQP(s) and APHIS representatives shall be allowed in the designated area.

(c) The DQP may carry out additional inspection procedures as he deems necessary to determine whether the horse is sore.

(d) The HIO that licensed the DQP shall assess and enforce penalties for violations in accordance with §11.25 and shall report all violations in accordance with §11.20(b)(3).

[55 FR 41993, Oct. 17, 1990, as amended at 56 FR 13750, Apr. 4, 1991; 57 FR 62175, Dec. 30, 1992; 77 FR 33618, June 7, 2012; 78 FR 27001, May 9, 2013]

§11.22 Records required and disposition thereof.

(a) The management of any horse show, horse exhibition, or horse sale or auction, that contains Tennessee Walking Horses or racking horses, shall maintain for a period of at least 90 days following the closing date of said show, exhibition, or sale or auction, all pertinent records containing:

(1) The dates and place of the horse show, horse exhibition, horse sale, or horse auction.

(2) The name and address (including street address or post office box number and ZIP code) of the sponsoring organization.

(3) The name and address of the horse show, exhibition, horse sale or horse auction management.

(4) The name and address (including street address or post office box number and ZIP code) of the DQP, if any, employed to conduct inspections under §11.20; and, the name of the horse industry organization or association certifying the DQP.

(5) The name and address (including street address or post office box number, and ZIP code) of each show judge.

(6) A copy of each class or sale sheet containing the names of horses, the names and addresses (including street address, post office box and ZIP code) of horse owners, the exhibitor number and class number, or sale number assigned to each horse, the show class or sale lot number, and the name and address (including street address, post office box, and ZIP code) of the person paying the entry fee and entering the horse in a horse show, horse exhibition, or horse sale or auction.

(7) A copy of the official horse show, horse exhibition, horse sale, or horse auction program, if any such program has been prepared.

(8) The identification of each horse, including the name of the horse, the name and address (including street address, post office box, and ZIP code) of the owner, the trainer, the rider or other exhibitor, and the location (including street address, post office box, and ZIP code) of the home barn or other facility where the horse is stabled.

A Review of Methods for Detecting Soreness in Horses

(b) The management of any horse show, horse exhibition, or horse sale or auction containing Tennessee Walking Horses or racking horses shall designate a person to maintain the records required in this section.

(c) The management of any horse show, horse exhibition, or horse sale or auction containing Tennessee Walking Horses or racking horses shall furnish to any APHIS representative, upon request, the name and address (including street address, or post office box, and ZIP code) of the person designated by the sponsoring organization or manager to maintain the records required by this section.

(d) The Administrator may, in specific cases, require that a horse show, horse exhibition, or horse sale or auction records be maintained by management for a period in excess of 90 days.

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(44 U.S.C. 3506)

[44 FR 25179, Apr. 27, 1979, as amended at 48 FR 57471, Dec. 30, 1983. Redesignated at 55 FR 41993, Oct. 17, 1990; 56 FR 13750, Apr. 4, 1991]

§11.23 Inspection of records.

(a) The management of any horse show, horse exhibition, or horse sale or auction shall permit any APHIS representative, upon request, to examine and make copies of any and all records pertaining to any horse, either required in any part of the regulations, or otherwise maintained, during ordinary business hours or such other times as may be mutually agreed upon. A room, table, or other facilities necessary for proper examination of such records shall be made available to the APHIS representative.

(b) Horse industry organizations or associations who train, maintain, and license DQP's under a certified DQP program shall permit any APHIS representative, upon request, to examine and copy any and all records relating to the DQP program which are required by any part of the regulations. Such requests shall be made during ordinary business hours or such other times as mutually agreed upon. A room, table or other facilities necessary for proper examination shall be made available upon the request of the APHIS representative.

[44 FR 25179, Apr. 27, 1979. Redesignated at 55 FR 41993, Oct. 17, 1990, as amended at 56 FR 13750, Apr. 4, 1991]

§11.24 Reporting by management.

(a) Within 5 days following the conclusion of any horse show, horse exhibition, or horse sale or auction, containing Tennessee Walking Horses or racking horses, the managements of such show, exhibition, sale or auction shall submit to the Regional Director[1] for the State in which the show, exhibition, sale or auction was held, the information required by §11.22(a)(1) through (6) for each horse excused or disqualified by management or its representatives from being shown, exhibited, sold or auctioned, and the reasons for such action. If no horses are excused or disqualified, the management shall submit a report so stating.

[1]See footnote 1 to §11.1.

(b) Within 5 days following the conclusion of any horse show, horse exhibition, or horse sale or auction which does not contain Tennessee Walking Horses or racking horses, the management of such show, exhibition, sale or auction shall inform the Regional Director for the State in which the show, exhibition, sale or auction was held, of any case where a horse was excused or disqualified by management or its representatives from being shown, exhibited, sold or auctioned because it was found to be sore.

(Approved by the Office of Management and Budget under control number 0579-0056)

[44 FR 25179, Apr. 27, 1979, as amended at 48 FR 57471, Dec. 30, 1983; 55 FR 41994, Oct. 17, 1990; 56 FR 13750, Apr. 4, 1991; 63 FR 62927, Nov. 10, 1998]

§11.25 Minimum penalties to be assessed and enforced by HIOs that license DQPs.

(a) *Rulebook.* Each HIO that licenses DQPs in accordance with §11.7 must include in its rulebook, and enforce, penalties for the violations listed in this section that equal or exceed the penalties listed in paragraph (c) of this section and must also enforce the requirement in paragraph (d) of this section.

(b) *Suspensions.* (1) For the violations listed in paragraph (c) of this section that require a suspension, any individuals who are responsible for showing the horse, exhibiting the horse, entering or allowing the entry of the horse in a show or exhibition, selling the horse, auctioning the horse, or offering the horse for sale or auction must be suspended. This may include, but may not be limited to, the manager, trainer, rider, custodian, or seller, as applicable. In addition, if the owner allowed any activity listed in this paragraph, the owner must be suspended as well.

(2) Any person who is responsible for the shipping, moving, delivering, or receiving of any horse that is found to be bilaterally sore or unilaterally sore as defined in paragraph (c) of this section, in violation of the scar rule in §11.3, or in violation of the prohibition against the use of foreign substances in §11.2(c), with reason to believe that such horse was to be shown, exhibited, entered for the purpose of being shown or exhibited, sold, auctioned, or offered for sale in any horse show, horse exhibition, or horse sale or auction, must be suspended; *Provided,* that this requirement does not apply if the horse was transported by a common or contract carrier or an employee thereof in the usual course of the carrier's business or the employee's employment, unless the carrier or employee had reason to believe that the horse was sore.

(3) A person who is suspended must not be permitted to show or exhibit any horse or judge or manage any horse show, horse exhibition, or horse sale or auction for the duration of the suspension.

(4) Any person with multiple suspensions must serve them consecutively, not concurrently.

(c) *Minimum penalties*—(1) *Bilateral sore.* A horse is found to be sore in both its forelimbs or hindlimbs. The horse must be dismissed from the remainder of the horse show, exhibition, sale, or auction. First offense: Suspension for 1 year. Second offense: Suspension for 2 years. Third offense and any subsequent offenses: Suspension for 4 years.

(2) *Unilateral sore.* A horse is found to be sore in one of its forelimbs or hindlimbs. The horse must be dismissed from the remainder of the horse show, exhibition, sale, or auction. First offense: Suspension for 60 days. Second offense: Suspension for 120 days. Third offense and any subsequent offenses: Suspension for 1 year.

(3) *Scar rule violation.* A horse is found to be in violation of the scar rule in §11.3. The horse must be dismissed from the remainder of the horse show, exhibition, sale, or auction. First offense: Suspension for 2 weeks (14 days). Second offense: Suspension for 60 days. Third offense and any subsequent offenses: Suspension for 1 year.

(4) *Foreign substance violations.* Violations of the prohibition against the use of foreign substances in §11.2(c).

A Review of Methods for Detecting Soreness in Horses

(i) *Before or during the show, exhibition, sale, or auction.* The horse must be dismissed from the remainder of the horse show, exhibition, sale, or auction.

(ii) *After the show, exhibition, sale, or auction.* Suspension for 2 weeks (14 days). The horse must be dismissed from the remainder of the horse show, exhibition, sale, or auction.

(5) *Equipment violation.* Violations of the equipment-related prohibitions in §11.2(b)(1) through (b)(10) and (b)(12) through (b)(17).

(i) *Before or during the show, exhibition, sale, or auction.* The horse must be dismissed from the remainder of the horse show, exhibition, sale, or auction.

(ii) *After the show, exhibition, sale, or auction.* Suspension for 2 weeks (14 days). The horse must be dismissed from the remainder of the horse show, exhibition, sale, or auction.

(6) *Shoeing violation.* Violation of the shoeing-related prohibitions in §11.2(b)(18) and (b)(19). The horse must be dismissed from the remainder of the horse show, exhibition, sale, or auction.

(7) *Heel-toe ratio.* Violation of the heel-toe ratio requirement in §11.2(b)(11). The horse must be dismissed from the remainder of the horse show, exhibition, sale, or auction.

(8) *Suspension violation.* A violation of any suspension penalty previously issued. Suspension for an additional 6 months (180 days) for each occurrence.

(d) *Unruly or fractious horse.* A horse that cannot be inspected in accordance with §11.21. The horse must be dismissed from the individual class for which it was to be inspected.

(e) *Appeals.* The HIO must provide a process in its rulebook for alleged violators to appeal penalties. The process must be approved by the Department. For all appeals, the appeal must be granted and the case heard and decided by the HIO or the violator must begin serving the penalty within 60 days of the date of the violation. The HIO must submit to the Department all decisions on penalty appeals within 30 days of the completion of the appeal. When a penalty is overturned on appeal, the HIO must also submit evidence composing the record of the HIO's decision on the appeal.

(f) *Departmental prosecution.* The Department retains the authority to initiate enforcement proceedings with respect to any violation of the Act, including violations for which penalties are assessed in accordance with this section, and to impose the penalties authorized by the Act if the Department determines that such actions are necessary to fulfill the purpose of the Act and this part. In addition, the Department reserves the right to inform the Attorney General of any violation of the Act or of this part, including violations for which penalties are assessed in accordance with this section.

[77 FR 33618, June 7, 2012, as amended at 79 FR 3071, Jan. 17, 2014]

§11.40 Prohibitions and requirements concerning persons involved in transportation of certain horses.

(a) Each person who ships, transports, or otherwise moves, or delivers or receives for movement, any horse with reason to believe such horse may be shown, exhibited, sold or auctioned at any horse show, horse exhibition, or horse sale or auction, shall allow and assist in the inspection of such horse at any such show, exhibition, sale, or auction to determine compliance with the Act as provided in §11.4 of the regulations and shall furnish to any APHIS representatives upon his request the following information:

(1) Name and address (including street address, post office box, and ZIP code) of the horse owner and of the shipper, if different from the owner or trainer.

(2) Name and address (including street address, post office box, and ZIP code) of the horse trainer.

(3) Name and address (including street address, post office box, and ZIP code) of the carrier transporting the horse, and of the driver of the means of conveyance used.

(4) Origin of the shipment and date thereof, and,

(5) Destination of shipment.

(b) [Reserved]

(Approved by the Office of Management and Budget under control number 0579-0056)

[44 FR 25179, Apr. 27, 1979, as amended at 48 FR 57471, Dec. 30, 1983; 56 FR 13750, Apr. 4, 1991]

§11.41 Reporting required of horse industry organizations or associations.

Each horse industry organization or association which sponsors, or which sanctions any horse show, horse exhibition, or horse sale or auction, shall furnish the Department[6] by March 1 of each year with all such organization or association rulebooks, and disciplinary procedures for the previous year pertaining to violations of the Horse Protection Act or regulations, applicable to such horse show, horse exhibition, or horse sale or auction. Rulebooks and information relating to disciplinary procedures for violations of the Horse Protection Act or regulations should be readily available to all exhibitors, trainers, and owners of horses at such show, exhibition, sale, or auction. Each horse industry organization or association shall furnish the Department[6] with a quarterly report of all disciplinary actions taken against the management or any horse show, horse exhibition, horse sale, or horse auction, any exhibitor, or any licensed DQP, for violation of the Horse Protection Act or regulations, and the results thereof.

[6]See footnote 6 to §11.7.

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[44 FR 25179, Apr. 27, 1979, as amended at 48 FR 57471, Dec. 30, 1983]