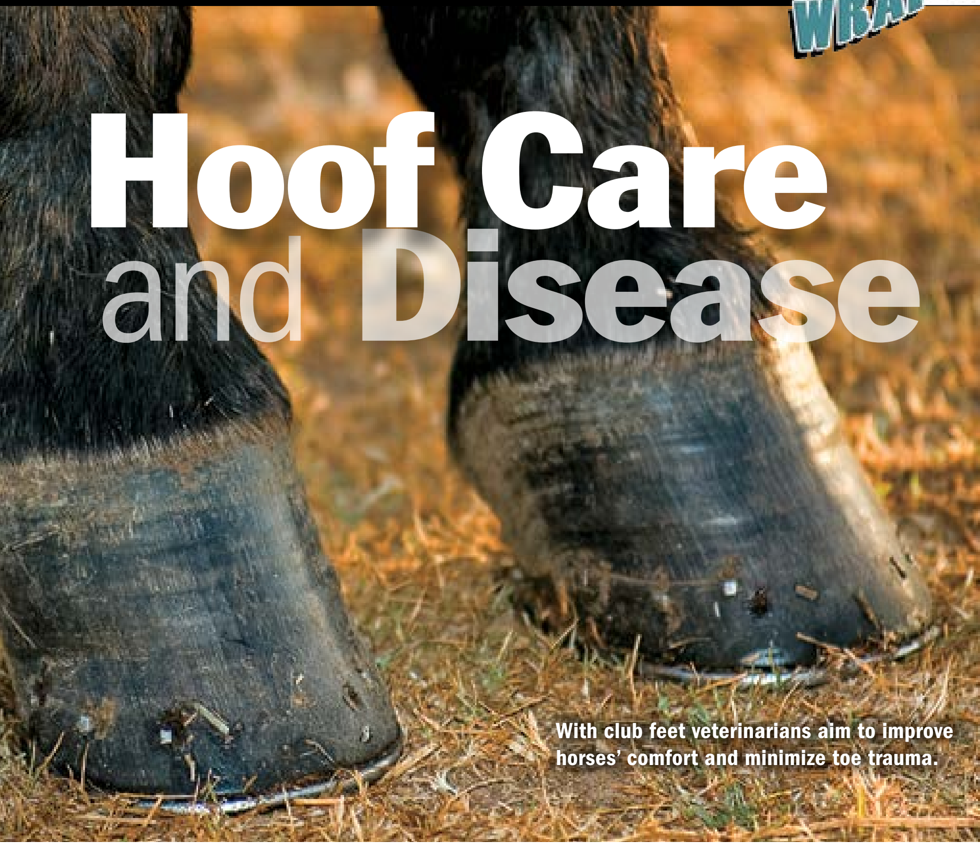
Hoof Care and Disease



With club feet veterinarians aim to improve horses' comfort and minimize toe trauma.

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NANCY LOVING, DVM

Recognizing Club Foot Cases

Not all horses have symmetrical feet, and one of the more common problems they develop is a "club foot" appearance. This problem might appear at birth or develop later in life and can be identified based on classic signs and grades of severity.

Robert Hunt, DVM, MS, Dipl. ACVS, of Hagyard Equine Medical Institute, in Lexington, Ky., defined a club foot as having an angle greater than 60° (the angle the dorsal hoof wall makes with the ground). Usually there is at least a five-degree discrepancy between the affected foot and its opposite.

"Initially, an owner may recognize a space between the heel and the ground that develops slowly over two to three hoof trims," Hunt explained. "The second sign is that the coronary band appears square and full. Then, the foot appears boxy with a dish in the front of the hoof wall. And eventually, the frog becomes quite recessed, the hoof contracts, and the horse appears 'back at the knee.' "

With this change in biomechanics, Hunt said, "The foot is prone to injury since loading on the foot moves forward, altered from its normal, heel-first landing."

A more accurate description of a club foot is a flexural limb deformity of the coffin joint. In most cases, shortening of the musculotendinous unit (which runs down the back of the leg) that shifts the load dorsally (forward) in the foot causes it.

Veterinarians have used multiple club foot classification systems: Type 1 refers to a club foot with a hoof axis less than 90°; Type 2 is greater than 90°. Or, they can use a grading system of the hoof axis relative to the opposite limb to define severity: Grade 1 is 3-5°; Grade 2 is 5-8°; Grade 3 has a broken-forward hoof-pastern axis (HPA)—in which the hoof wall angle is steeper than that of the pastern, hoof wall dishing, and irregular growth rings; Grade 4 has a hoof angle greater than 80°, a severely broken-forward HPA, marked concavity to the dorsal hoof wall, and the coronary band height at the heel is the same as at the toe.

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> DR. ROBERT HUNT

Usually, congenital cases (present at birth) "are self-correcting with minimal treatment other than toe protection," Hunt said. Veterinarians can also administer systemic oxytetracycline, but he says too much oxytetracycline treatment can cause excessive joint laxity.

An acquired flexural deformity usually appears when a foal is 4-6 months old. "It may result as a primary problem possibly due to a genetic predisposition," he said. But "it is often secondary to other lameness … such as pain elsewhere in the limb that alters weight-bearing on that leg.

"Treatment varies depending on age of horse, severity, and client expectations," he stressed. "The guiding principle is to improve comfort and minimize toe trauma while trying to reestablish load bearing on the heels."

He cautioned against using external shoe devices that improve the 'look' but don't achieve a long-term solution. In assessing an adult horse with a club foot, Hunt urged veterinarians to carefully consider the horse's intended use and to pay close attention to current management, including farrier care and nutrition.

Localizing Pain in the Feet

Practitioners must hone skills and strategies for pinpointing equine foot pain so they can detect the slightest aberration with sharp eyes and deft hands. Debra Taylor, DVM, MS, Dipl. ACVIM, and John Schumacher, DVM, MS, of Auburn University's College of Veterinary Medicine, described methods for pain localization.

Veterinarians should examine all aspects of a lame foot, noting any abnormal biomechanics that could contribute to pain. Taylor said, "The coronary band normally is straight or slightly arched, running at an angle about 20-25° from the ground plane. Hairs should lie flat against the coronary band, and the coronary band should feel full and spongy without a ledge."

Hoof wall "tubules … should be straight without flares or bends," she added. "The white line should be tight and about ¼ inch wide (not stretched/separated). Normal frog width is 50-60% of its length. Its depth should reach the bearing surface with no relative space under the rear of the foot. The central sulcus should be wide enough to fit an index finger." Contraction indicates possible pain. Collateral grooves at the frog sulci apex should be about 11 mm deep; depth might indicate sole depth and coffin bone orientation.

The heel should feel like a tennis ball on palpation, added Taylor, and there should be at least three- to four-fingers' width between the bulbs. Collateral cartilages should feel flexible with finger pressure, and the digital cushion should fill to the top of the cartilages. Always compare each foot to its opposite, and use hoof testers to assess for specific pain areas.

Changing gears, Schumacher described using digital anesthesia (nerve blocks) to localize lameness, suggesting that mepivacaine is the least irritating drug to use for regional or joint anesthesia. Historically, clinicians thought palmar digital nerve (PDN or heel) blocks numbed the back ⅓ to ½ of the foot. However, researchers have shown this block can also anesthetize the coffin joint, entire foot, and even the pastern joint, potentially interfering with lameness assessment.

"Blocking of the coffin joint is known to also numb the sole and even the heel if sufficient volume is placed into the joint," he reported. "Blocking the coffin joint also blocks the navicular apparatus with incidental anesthesia of the palmar digital nerves (which feed the navicular region). However, anesthesia of the navicular bursa only has an effect on sole pain at the toe but does not desensitize the heel."

In summary, practitioners must conduct a thorough physical exam and use hoof testers and flexion tests to reach an accurate foot pain diagnosis. He or she can use digital anesthesia to rule out problems in higher limb structures, but this method has limited value in localizing an area of distal limb pain. "Consequently," stressed Schumacher, "Results from digital anesthesia must be interpreted with caution."

Biomechanics and Hoof Problems/ Treatment

Lameness caused by foot problems is common in the horse, and it can significantly impact performance. Hoof bruising, heel soreness, and hoof cracks all create discomfort that alters a horse's gait and prevents him from giving his utmost to an athletic task. Nearly all equine foot diseases have their root in biomechanics, noted Andrew Parks, MA, VetMB, MRCVS, Dipl. ACVS, professor of Large Animal Medicine at the University of Georgia School of Veterinary Medicine, and veterinarians and farriers must take a biomechanical approach to treating these problems.

Parks reviewed important elements of equine foot anatomy during his session.

He started with a bit of biomechanical anatomy review: While the long bones of the skeletal system, such as the radius (forearm) or the cannon bone, effectively transmit force from one end to the other, the distal phalanx (coffin bone, a short bone), acts as a shock absorber, transferring weight-bearing forces from the hoof to the skeletal system. This bone is also well-adapted for attachment to soft tissues (tendons and ligaments) that aid or resist movement.

"The principle forces acting on the foot are the weight of the horse, the ground reaction force (GRF), and the tension in the deep digital flexor tendon (DDFT, which runs from the underside of the coffin bone to the flexor muscles higher in the leg)," Parks explained.

The GRF matches the weight the limb bears, but it is exerted in the opposite direction. When a horse's foot stands on a flat, firm surface, the GRF distributes around the perimeter of the hoof capsule. But when standing on a conformable surface such as sand, the GRF distributes broadly across the bottom of the horse's foot. In both cases GRF pressure is greatest approximately in the center of the foot, just in front of the coffin joint.

The hoof is unique in that it is comprised of many different types of integument that

RADIOGRAPHS' ROLE IN FARRIERY

Radiographs are an often overlooked but indispensible tool for assessing a horse's feet and developing a hoof care plan that will maximize his soundness. Randy Eggleston, DVM, of the University of Georgia's School of Veterinary Medicine, explained that radiography allows the veterinarian to measure sole depth, solar angles, and foot balance, as well as evaluate the health of the coffin bone and then formulate advice for the farrier.

Because the hoof can conform to the stresses it incurs on impact with each footfall, a visual exam helps the practitioner evaluate it for distortions and abnormalities that might develop over time due to hoof imbalances. Eggleston recommended using radiography if the veterinarian observes abnormal hoof and/or distal limb conformation, abnormal growth patterns, or hoof distortions; and/or when distal (lower) limb anesthesia blocks out lameness.

To achieve good-quality images, the handler should square the horse up as best as possible on a firm surface, with his head and neck aligned straight; any twisting will distribute weight unequally between the feet. Eggleston recommended placing positioning blocks of similar height beneath each hoof.

ERICA LARSON

To achieve good-quality images, place positioning blocks of similar height beneath each foot.

Hoof hygiene is another key element to getting quality films, and Eggleston noted that the hoof wall and frog sulci (the grooves next to and in the middle of the frog), in particular, should be cleaned well. Applying radio-opaque markers to the dorsal hoof wall and the bottom of the hoof allows the veterinarian to see these surfaces and angles on the radiographs and make accurate measurements and assessments. For images that require the frog sulci to be packed, he highly recommended placing the horse's foot in a water bath since this technique helps remove artifacts that can make X rays difficult to read.

Eggleston suggested that in addition to radiographing the hoof using a lateral-medial (side to side) view, the veterinarian should also obtain a horizontal dorsal-palmar (front to back) view aiming the X ray beam parallel to the bottom of the foot. With these multiple radiographic views, the veterinarian can obtain quantitative measurements to best plan trimming and shoeing strategies for the individual horse and facilitate good communication with the farrier to execute these recommendations.

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> DR. ANDREW PARKS

continually grow, yet it functions as an extension of the musculoskeletal system. Parks said the hoof wall responds differently to forces depending on the rate at which they're applied.

"For example," he says, "a force applied rapidly and immediately removed, such as the foot landing on the ground at speed, causes elastic change of foot shape that then immediately returns to its prior shape. In contrast, a prolonged and slow force applied to the foot deforms the tissue but when this force is removed, it takes much longer to return to its normal shape."

When biomechanics go wrong Prolonged abnormal loading or force on the foot, as occurs with improper hoof growth, trimming, or shoeing, has consequences—it might deform the hoof wall, causing flaring and the coronary band to move proximally (upward). Hoof growth slows as the body attempts to restore the hoof to a normal shape, resulting in growth ring spacing irregularities.

Parks commented, "The coffin bone is suspended in the hoof by the lamellae on three sides with the deep digital flexor tendon taking up tension on the fourth side. Interestingly, if the horse is lacking a functional hoof wall, he can't walk because of painful pressure between the sole and coffin bone. However, if lacking a functional sole, he walks tolerably well if sensitive tissues are protected from pressure because the lamellae and DDFT support the coffin bone off the ground."

Biomechanics and treatment As the horse begins each stride, associated shock waves can cause foot injuries. "Normally," Parks reports, "there is natural damping of concussion by many structures such as the inner lamellae of the hoof wall, the digital cushion, collateral cartilages, the vascular plexus, and thick articular cartilage."

Convention Tweets

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As the equine industry always evolves, core values of equine veterinary medicine remain the same. "Place welfare of horse first"

Applying a plain steel shoe to the hoof increases frequency of impact vibrations and maximum acceleration of the foot. In addition, he said, a steel shoe increases pressure on the navicular bone (which acts as a fulcrum around which the DDFT passes), restricts hoof expansion, and causes the heels to wear more rapidly than the toes.

To reduce impact shock waves, Parks recommended that veterinarians and farriers, "change the concussion of impact via a plastic shoe or a viscoelastic pad." He suggested other biomechanical modifications for improving foot function: Use a pad to distribute the force evenly, move the GRF's center of pressure, and move the point of breakover back. In the latter case, rolling the toe shortens the moment arm around which the coffin joint rotates and eases breakover.

In all cases, Parks urged, "A proper diagnosis of abnormal forces on the foot must be achieved in order to apply appropriate therapeutic shoeing strategies. This doesn't mean that horses shouldn't be shod, just that clinicians should be aware that adverse effects occur (with certain shoeing practices) and there may be a need to mitigate these effects."

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