



HEALTH ZONE

Hoof Care

Hoof Anatomy, Outer Structures

BY CHRISTY WEST

Many horse owners go their whole lives caring for horses' hooves with little knowledge of the hoof capsules' inner workings—the interaction of the bones, tendons, ligaments, and other parts that lie beneath. They might be aware of how the hoof's outer condition reflects its external health, but the hoof's appearance also provides a wealth of information on its internal well-being. It's much more than just a covering for the end of the limb or the equine equivalent of the human fingernail.

Long-term hoof imbalances put excess strain on the bones and soft tissues, potentially compromising the structures' shape and sturdiness long-term. Conversely, damaged or misshapen internal structures can effect congruent changes in hoof shape.

External Hoof Anatomy

When you look at the hoof as the horse stands, you are seeing the hoof wall. It grows down from the coronary band, the junction between the hoof and the skin. The toe is closest to the horse's nose, the heels are closer to his tail, and the quarters are between.

If you pick up the hoof to look at the bottom, you will see the wall wrapping around the outer edge and the white line just inside of it (easier to see in a freshly

The hoof's external health affects the bones and soft tissues within, and vice versa



ALEXANDRA BECKSTETT PHOTOS

The outer look of a hoof wall, which grows down from the coronary band, the junction between the hoof and the skin; inset, view from the bottom

trimmed foot). Moving rearward from the toe, you'll find the sole that covers the majority of the hoof's bottom. There is also a triangular elastic structure pointing forward from the heels called the frog (which aids in shock absorption). In the center of the frog and on either side are grooves called the central and lateral sulci. Lastly, we have the heels directly behind the frog and the bars at the rearward ends of the hoof wall, where the wall turns inward and then forward away from the heels.

Most healthy hooves have the following characteristics, according to Dr. Amy Rucker, owner of Midwest Equine, in Columbia, Mo.

- Heavy (thick) hoof wall with wide, even growth rings from toe to heel.
- Significantly shorter heels than toes.
- A white line that is tight and uniformly wide through the toe, then slightly narrower in the quarters.
- A heavy/thick (not flexible or overly sensitive) sole with some cup (not flat).
- A frog that is neither recessed up into the foot, with deep sulci, nor protruding down past the sole.
- Heel bulbs that are not contracted (narrow with a deep groove running into the central sulcus of the frog).

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Also consider the following signs of hoof health:

■ When viewing the foot from the side, drop an imaginary vertical line down from the front of the coronary band to the ground. Two-thirds of the foot’s ground surface should be behind that line. Draw another imaginary line up

from the rear edge of the heels where they touch the ground; it should intersect in the rear third of the coronary band (weak heels run farther forward).

■ When viewed from the front, the coronary band should be parallel to the ground from left to right, sloping gently and evenly down from toe to heels.

■ Hoof wall tubules (the “grain”) should go straight down the wall to the ground, not diverting left or right.

■ The angle the heel makes with the ground should be similar to that of the toe, but it is often a few degrees less.

■ The hoof should be roughly as wide as it is long.

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Deep quarter cracks can be painful and problematic

■ The frog's width should be 60-70% of its length, adds Dr. Stephen O'Grady of Northern Virginia Equine.

Hoof Evaluation

Aside from looking for obvious injury, "Visual examination of the foot—its growth pattern, shape, and external characteristics—hints at internal areas of the foot that bear more 'load' or stress (and, thus, need unloading)," explained Rucker.

- Increased stresses on parts of the hoof can have three results:
1. Wall deviation or bending (flaring outward or rolling/running under);
 2. Pushing up of the coronary band; and/or
 3. Decreased hoof wall growth, evidenced by growth rings that are closer together in a stressed area, O'Grady said.

The hoof doesn't exist in a vacuum, however—O'Grady encourages owners to consider limb conformation, which can change how forces are distributed within the hoof capsule, leading to hoof wall deformation.

Common Hoof Problems

Let's start with the problems that involve damage and disease of outer structures; then we'll move on to problems related to hoof balance.

With puncture wounds from stepping on a nail or similar sharp object, the real risk isn't the hole, but the expressway it provides for bacteria to get deep inside the body and cause infection. Rucker strongly recommends leaving the object in place if possible until the veterinarian can radiograph (X ray) the foot to see what internal structures are affected.

Scarring from coronary band damage can cause altered hoof growth below the injured area for the rest of the horse's life.

"These injuries need to be bandaged and treated to restore alignment of hoof tubules for healthy future growth," Rucker advised.

Minor chips, cracks, and missing chunks of wall might be nothing to sweat over, but more serious damage such as deep quarter cracks and large missing pieces of hoof can be much more painful and problematic.

"If you have a large chunk of the hoof missing with bleeding, have a vet out because the horse may need a pressure wrap to keep the wall from bulging and regrowing incorrectly," said Rucker. "The vet can also radiograph quarter crack cases to help the farrier treat them," based on any internal damage that might have happened.

Abscesses are pockets of infection (like pimples) that can break open at the thinner coronary band area or rupture through the sole/white line. Once the abscess bursts, lameness improves immediately because of the reduced pressure.

"Anytime a horse is non-weight-bearing lame, I worry about a fracture or septic (infected) tendon, but it's usually an abscess," said Rucker. "They're horribly painful, and (a non-steroidal anti-inflammatory such as) phenylbutazone (Bute) won't resolve the pain."

White line disease is an opportunistic fungal or bacterial infection that strikes where the wall is already stressed or cracked, softening the inner hoof wall so it crumbles and allows outer wall layers to detach.

"You have to remove enough wall to get air to affected areas (to help kill the microbes breaking the wall down), support the remaining foot with a special shoe, and lay the horse off while the wall regrows," said Rucker.

Thrush, a bacterial infection of the frog and sulci, can be caused by a dirty/wet environment, says Rucker. But that's not always the case; other causes include anything that impairs the horse's natural hoof-cleaning mechanism—continuous changes in the hoof's inner structure, aided by movement, that keep the horse's foot clean.

"Keep affected feet dry and clean and the frog trimmed so you can get air and medications down into the sulci," she said.

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Now let's move on to hoof problems tied to the internal structures. In most mild cases, Rucker noted, the horse can return to soundness, but the more severe the problem, the greater the chances it will become long-term.

Club feet, caused by overly tight deep digital flexor tendons, have a steep toe angle and often a more horizontal coronary band when viewed from the side. The hoof-pastern axis is broken forward (hoof steeper than pastern), and the hoof might flare at the toe as a result of the tendon pulling the toe of the coffin bone down and rearward.

These features are similar to what's seen when the coffin bone has become unstable and rotated downward at the toe from chronic laminitis, O'Grady added. Both club footed and laminitis-affected horses exhibit a high palmar angle (heels of the coffin bone are significantly higher than the toe).

"If the white line is stretched at the toe, the case is more severe," Rucker noted. "If radiographs show bone damage from the increased pressure on the toe, it's harder to keep these horses sound."

Long toe/low heel is the opposite of a club foot; if the hoof-pastern angle is broken back, the horse probably has a long toe and low heel. The long toe puts a lot of leverage on the heels, crushing them even to the point that the hoof tubules are horizontal (parallel with the ground). Horses with such heel conformation typically have a poorly developed digital cushion and thin collateral cartilages, O'Grady said.

Rucker added that affected horses usually have a negative palmar angle, heel pain, and might develop navicular and coffin joint pain from the abnormal stress applied to those structures.

Sheared heels occur when the coronary band is higher in one quarter/heel area of the hoof than the other, said O'Grady. This can result from compressive stress (the wall could be too long in that area) and is frequently accompanied by narrowed growth rings. The higher heel is also more prone to vertical quarter cracks.

Contracted heels occur along with a compromised digital cushion and, therefore, reduced shock absorption.

Thin soles can be caused by genetics and/or overtrimming. Rucker explained that horses with thin-soled feet often have flat soles (no cup) and an overly thin wall.

"These feet often have nail holes and growth rings close together because

the foot just isn't growing well," she commented.

Laminitis, if severe or chronic, can alter hoof growth. O'Grady explained that chronically laminitic feet usually have wider growth rings at the heel than at the toe (because the damage tends to be worse at the toe, compromising growth there more severely than at the heels).

Rucker added that the dorsal wall and white line can widen at the toe as the attachment of the hoof to internal structures collapses and the hoof tubules begin to grow outward.

Take-Home Message

Keep your horses sound by watching their feet for small changes on the outside that could indicate problems are brewing on the inside. Prevention or early detection are far simpler, cheaper, and more effective than treating lameness or injury.

"Understand the challenges of each



limb and hoof's conformation and manage the foot for maximum soundness with that conformation rather than conforming to a 'perfect' standard," said Rucker. "Everyone tries to get their horses' feet to look pretty and perfect, when having functional feet with plenty of mass is much more important than having pretty feet. (With the latter) the owner is happy, but the horse isn't." BH

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