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HOOF DEHYDRATION: Strategies & Solutions for RE-HYDRATION

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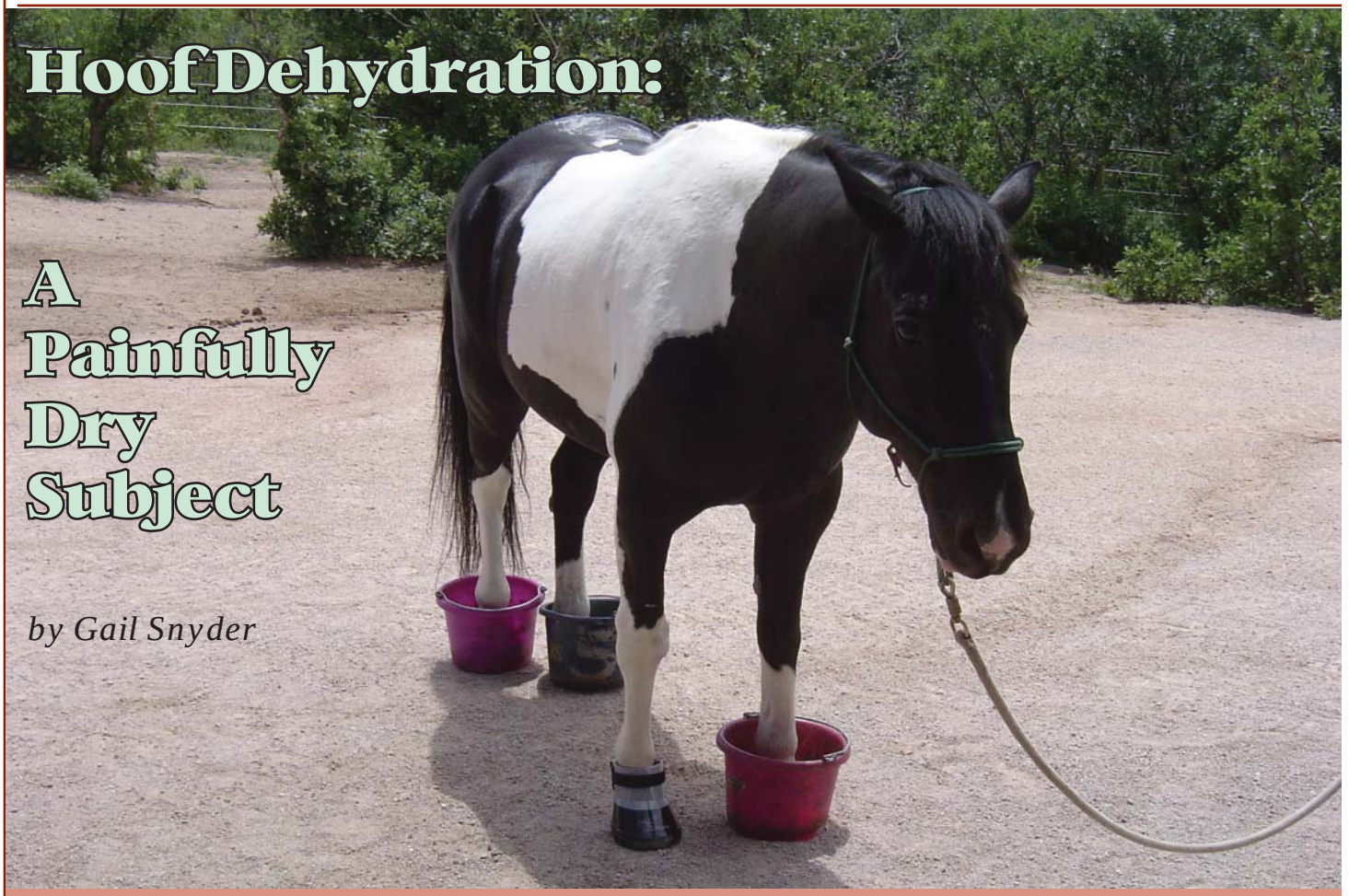
Hoof Dehydration: A Painfully Dry Subject

by Gail Snyder



As horse caregivers, we've discovered creative ways to bring badly needed moisture to the hooves. Most horses are not as cooperative as Stormy and hoof soaking can be a real pain. You may be surprised to learn that repetitive soaking may not actually solve the problem of hoof dehydration.

Introduction

Dehydrated hooves can be a real problem. From a trimming standpoint, frogs can't be cut with a hoof knife. The bars are so brittle they break off at the root like an old tooth. It is such a problem, at certain times of the year that considerable research has been performed to discover how hydration affects hoof function. This article examines the scientific findings and recommends possible solutions for horse caregivers.

Hoof Wall Mechanical Properties and Cracking

The mechanical properties of the hoof wall are highly influenced by seasonal moisture conditions and there is an inverse relationship between moisture content and hoof wall stiffness. That is, the outer wall becomes stiffer as the summer gets dryer. This can cause a structural breakdown of the hoof wall, visible as superficial cracks or deep fractures.

The outer pigmented hoof wall (stratum medium) is composed of hard keratin with hair-like tubules that possess great mechanical strength and are instrumental in supporting the weight of the horse. The inner or un-pigmented wall (stratum lamellatum) has greater elasticity. Together, these two layers provide both strength and flexibility to the hoof. One study [1] indicates the inner wall has a 36% moisture content, while the more dehydrated outer wall contains only 28% moisture.

This data supports the idea that the hoof wall is hydrated from within the body of the horse. You can observe this phenomenon by placing a dry bare hoof on a rubber mat and see the moist hoofprint when lifted. But during extreme heat, the moisture from within isn't sufficient to prevent hoof dehydration. Incidentally, **wall color** had no effect, so black and white hooves are equally stiff and are just as prone to cracking under load.

Moisture Gradient and Manipulation

A 1987 study[2] found that hoof wall dehydration is greater at the point of ground contact than it is near the coronet (moisture gradient). Give yourself a star on the forehead if you're speculating that efforts to hydrate the lower wall could pay off big (**Photo 1**).

This study also showed that hoof-wall keratin hydration levels can be manipulated to meet the functional requirements of the animal and that re-hydration improves energy absorption, which is necessary for fracture resistance. So there's hope for the shriveled hoof!

Sole/Frog Dehydration and Concussion

Compared to the hoof wall, the frog and sole are much moister, with optimal sole hydration between 40-50% moisture and frog moisture range of about 65-70%. The sole should be slightly pliable as you compress it with your thumbs. The frog, on the other

Photo 1. This outer hoof wall is dehydrated near the ground and will easily shred and chip. The upper hoof, near the hairline is much more hydrated and is less prone to cracks. Superficial cracks can be seen in the lower two-thirds of the wall. The cracks run parallel to the alignment of the wall tubules.

hand, should have the consistency of stiff rubber and you should be able to bend it a bit with strong finger pressure. If the bottom of the hoof looks like the one in **Photo 2**, it is super dehydrated.

The hoof wall works in concert with the sole and frog as a single unit, referred to as the hoof capsule. The dehydrated capsule prevents normal shock absorption and energy dissipation. Consequently, the concussive forces upon impact are transmitted directly to the bony column of the limb, creating a jarring effect that can result in discomfort, poor gait and even lameness. Severe long-term concussion can lead to conditions such as mechanical laminitis, ringbone, and sidebone.

Shoes and Hoof Damage from Heat

If your horse is shod, you have additional concerns. First, the shoe itself is a physical barrier between the hoof and available ground moisture. With shoes, the sole and frog are lifted off the ground, further exposing their surfaces. Second, the concussive forces are significantly higher for a shod horse. Elevated dehydration, combined with increased concussion, creates the worst case scenario. Third, farriers top-dress the outer wall, which removes the

Photo 2. A severely dehydrated sole is more than a superficial problem. It affects the entire sole thickness with multiple layers of sole chips that flake off on their own. The frog is also dehydrated with diminished elasticity and shock absorption.

periople – a soft, thin skin of waterproofing horn that covers the outer wall. Top-dressing (rasping) wall flares also thins the wall, making it even more prone to cracking.

Metal horse shoes are conductive, which means the ground heat is transmitted directly to the shoe, to the hoof bottom, and into the laminae via steel nails. Like a cast iron fry pan, steel is a super conductor, and therefore, the worst type of shoe to apply in hot conditions. Titanium is less conductive and aluminum is even less than that. Still, all 3 types of metal shoes will transmit and hold heat, thus elevating the dehydration level for shod horses over their barefoot counterparts.

Ground Heat Concerns

My first suggestion would be to move from Arizona to Georgia, but of course that is not going to happen, is it? Thankfully, there are more practical measures to minimize ground heat effects and improve horse and hoof comfort. These include:

- Shade trees and/or well ventilated shelter that permits free movement
- Select light colored surfaces over dark because dark absorbs heat and light reflects it
- Choose footing carefully (provide grass, wood chips, good compost or soil, or pea rock rather than asphalt, concrete, and black rubber mats)
- Remove metal horse shoes and go barefoot
- Provide access to cool water (mud, river, pond)

No Need to Soak 'Em?

If you're currently soaking the hooves in water to minimize cracking, you might not be making much headway. A 2012 study[3] set out to determine the effect of environmental conditions on hoof wall hydration of feral horses and the effect of short-term hoof soaking of domestic horses. The feral horses lived in both dry desert and boggy environments. Research determined the outer hoof wall moisture content did not differ based on the environment, nor did it differ between dry and soaked hoof wall samples from domestic horses. This suggests that the inner hoof does a good job of maintaining the moisture content and, surprisingly, that adding water topically may not be the best remedy for hoof wall re-hydration.

In the field, I have observed that rapid hydration, followed by dehydration, then re-hydration can make matters worse. How can this be? Remember outer wall stiffness is inversely proportional to the moisture content. If the moisture goes up, stiffness goes down; the wall is more pliable, so some soaking is good. But fully hydrated (saturated) wall is more prone to cracking. So, too much soaking is bad. It is this cyclic back-and-forth, from one extreme to the next, that is problematic.

Hoof Re-Hydration Strategies

If hoof re-hydration is our ultimate goal, and soaking doesn't help, what can we do? In nature, horses roaming through grasses and brush have perpetually "grass stained" hooves from a transfer of plant extracts and oils to the capsule. Like the stains on our jeans, once applied, they are difficult to remove with just water.

But like putting lotion on your hands, you have to apply it to the whole hoof, top and bottom, every day. Imagine how dry your hands and face would be from on-and-off water immersion without the use of a moisturizer. Your skin would become dry and cracked to the point of discomfort. Remember, anything applied to the hoof will be absorbed into the bloodstream, so it is important to keep it natural. Avoid products that contain alcohol, glycerin, lanolin, petroleum, etc. and favor products with pure plant ingredients that you would willingly apply to your own face (See **Photos 3 & 4**).

Photo 3. During the Colorado dry months, I spray Hoof Marvel on each capsule to re-moisturize before trimming. This makes the work easier and prevents undesirable wall/bar damage. I like that it doesn't make the hoof slippery and doesn't plug up my rasp. Hoof Marvel contains plant extracts.

Photo 4. T-HOOF is thick and when applied liberally, it penetrates deep into the capsule. I like to use a pump or so to soothe my own hands. T-HOOF contains jojoba jil, tea tree oil, apricot oil, and other specialized emollients and conditioners, with no drying alcohol.

Summary

- ✓ Hoof dehydration is nothing to sneeze at. Research indicates dehydration negatively affects the mechanical properties of the hoof. The resulting increased stiffness may cause hoof cracking and discomfort.
- ✓ Black and white hooves are equally stiff and are just as prone to cracking under load.
- ✓ Hoof re-hydration improves energy absorption, which is necessary for fracture resistance.
- ✓ A severely dehydrated sole and frog diminishes hoof capsule elasticity, thus increasing concussion. This situation is even worse for shod horses.
- ✓ Metal shoes transmit and hold heat, thus elevating the dehydration level for shod horses over their barefoot counterparts.
- ✓ Some soaking is good. Too much soaking is bad. Cyclic soaking can be problematic.
- ✓ Apply natural plant oil/extract based hoof moisturizer daily.
- ✓ Dehydrated hooves are difficult to trim, so either soak them or apply a hoof moisturizer before your trimmer arrives.
- ✓

References

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About the author:
Gail Snyder is an experienced hoof care professional, clinician, author, trim instructor, and hoof rehabilitation expert. She has worked on horses with severe hoof conditions, previously deemed incurable, and was able to restore health through natural hoof care, nutrition, and the healing powers of movement. This recipe for success is proven, however, Snyder's degree in Mechanical Engineering and work in the field of dynamics, modeling, and mechanics give her unique insight into the biomechanics, form, and function of the equine hoof.
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