

Health and Disease of the Equine Frog

Part One: What Does a Healthy Frog Look Like and Why Does it Matter?

by Candace Platz DVM and Heike Bean

PROPERTIES OF A HEALTHY FROG

A healthy frog is essential to the optimal physiological and mechanical function of the horse's foot. Unhealthy frogs can significantly reduce a horse's athletic performance by causing pain, impaired function, inflammation, and by becoming a source of chronic infection. Yet the structure, function and appearance of a truly healthy frog is poorly understood by many hoof care professionals.

Veterinarians, farriers and barefoot trimmers are often taught using texts depicting "normal" frogs which are, in fact, atrophied, contracted or diseased. Therefore, what is taught as "normal" is not necessarily healthy. Understandably, with this image in mind, hoof care professionals too often fail to consider the unhealthy frog as an underlying cause of foot pain and lameness. The black malodorous discharge of classic thrush is often the only frog disease taught to veterinary students and farriers. But if we are to do justice to our roles as equine health care providers, it is essential to learn to recognize, treat and prevent the full spectrum of frog disease that affects domestic horses.

The healthy frog is made of very dense, firm and resilient tissue, strong enough to resist indentation by a sharp object. Its appearance is generally smooth, free of flaps, holes, fissures or undermining layers. It is divided by a central sulcus that is dry and solid. The central sulcus should be wide and shallow enough to be easily visualized, cleaned and probed throughout its entire length and depth without discomfort. There should be no slits, pockets or fissures on the side walls of the grooves or sulcus. Caudally it should widen and blend smoothly and strongly to form a solid connection with the heel bulbs.

Similarly, the depths of the collateral grooves where the frog horn joins the horn of the sole should be dry and firm. The collateral grooves should be available for cleaning, probing and inspecting throughout their entire length, including the deepest parts. They should be free of snags, rough spots or sensitivity. The junction of frog and sole horn should be tight, without any soft, discolored or punky areas. The frog should not "mushroom" laterally over the grooves, which obscures visualization and provides a haven for microbes. The frog should be tall enough to make ground contact throughout most, if not all, of its length, most importantly toward the back of the foot. It should not be so tall that it is forced to the side or split on weight bearing.

The frog should not be compressible by digital pressure, not even toward the rear of the central sulcus and near the heel bulbs. When palpated, the caudal frog should feel at least as solid as the soles of running shoes, in contrast to the heel bulbs which are much softer

The color and texture of the horn should be consistent throughout the structure, except for pigmented areas of light colored hooves. With this exception, dark areas are usually associated with underlying infection and loss of structural integrity.

EXAMPLES OF HEALTHY FROGS

Fig. 1: The dark area on this beautifully healthy horn is clearly pigmentation of a mark extending from the skin of the heel bulb into the horn of the frog and not evidence of disease.



Fig. 2: In contrast, the darkened areas in the frog of this light colored hoof are associated with compromised tissue, due to infection in the central sulcus and collateral grooves.

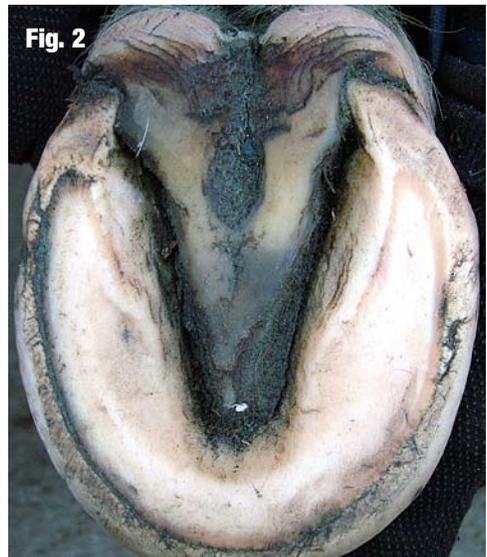


Fig. 3: Below is an exemplary clean, robust, pristine frog. The central sulcus and collateral grooves are wide, clean, and completely free of any sign of infection. What looks like it might be a layer is actually a mark left by trimming.



Fig. 4: This frog is from a wet terrain front hoof. Note the clearly defined sulci, the robust size and width, and the clean uniform appearance of the horn. The strength in this frog allows for broad, plump and strong heel bulbs, with an ideal distance between the lateral cartilages.



(photos on next page)

Fig. 5: This picture of the same hoof illustrates a strong solid disease-free connection between the frog and the heel bulbs. Also evident are the height and strength of the heels that is created by a fully-functioning frog.

Fig. 6: Here is another example of a healthy wet terrain forelimb frog. Notice the consistent light color throughout the entire structure.

All photos courtesy Candace Platz DVM and Heike Bean



Fig. 7: This is an excellent example of a strong healthy hind foot frog living in damp conditions. There are no “secrets” in these collateral grooves or central sulcus.



Fig. 8a and 8b: Below are pictures of the left fore and left hind, respectively, of a sixteen year old horse, shod for most of his life, who has been barefoot for less than a year. A strong disease-free frog such as this in a deshod horse

All photos courtesy Candace Platz DVM and Heike Bean

contributes to correct, pain-free hoof function, soundness and improved quality of gait. The heels will continue to expand in the front hooves if the frog is maintained in this condition of pristine health. Too often horses “flunk out” of deshoeing programs because unhealthy frogs are not recognized as the culprit in causing persistent soreness. Notice the clean, solid dry depths to the central sulci and collateral grooves, as well as the robust structure with uniform color and texture throughout.



Fig. 9a and 9b: The horse belonging to this strong healthy frog lives in a dry area. Although the collateral grooves were not thoroughly cleaned for this picture, and theoretically could harbor infection, the robust appearance of frog and heel bulbs make this unlikely. The second view of the same foot illustrates a solid connection between caudal frog and the strong heels that can develop in the absence of disease.



WHAT DOES A HEALTHY FROG DO?

Mirroring the shape of the underlying digital cushion, the frog determines the width of the foot across the heels by creating a wedge between the flexible heels of the hoof capsule. A healthy frog maximizes the ideal mechanical and energy absorbing capacity of the digital cushion by serving as its functional extension, transmitting concussive and weight bearing forces from the ground to the digital cushion, while protecting it from trauma.

The digital cushions of domestic horses, particularly those stabled during the first two years of life, typically have less fibrous connective tissue than those of wild horses, and so do not have the same supportive strength. The relative flabbiness of domestic digital cushions makes the frog’s role in maintaining correct hoof mechanics even more important in this population. Bearing in mind that the heel of the horse’s hoof is so flexible it can be manipulated with bare hands, it is easy to see that the width of the back half of the foot as well as its resistance to horizontal distortion and torque depends on the size, quality and pain-free function of the frog.

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Frogs are also apparently important to sole concavity, since flat feet do not regain concavity without the support of healthy frogs. No matter how good the trim, without adequate frog support, concavity cannot be reestablished.

Figure 10: Cheryl Henderson's superb collage from ABC Hoofcare illustrates how the wedge shape of the frog is ideally designed to perform these functions. For further detail please refer to www.abchoofcare.com anatomy studies.

The frog provides mechanical support to the joints of the distal limb. Because the frog and digital cushion are important factors in limiting the descent of the coffin joint upon impact and during weight bearing, inadequate support from these structures can allow the coffin joint to over-extend. When this occurs, the result can be inappropriate stresses on multiple structures in the distal limb, including joint capsules, cartilage, tendons and ligaments. Especially vulnerable are small ligaments associated with the navicular bone. It is interesting, but hardly surprising, that increasingly sensitive imaging studies using MRI technology are

revealing degenerative and inflammatory lesions in this ligament and other structures deep within the hoof capsule, and that these are now being implicated in chronic lameness.

Fig. 11: The cross section below shows the relationship between the frog and the digital cushion above it. Although there is plenty of frog mass to support the digital cushion in this specimen, it is easy to see how the coffin joint could descend too far on weight bearing if the frog is not adequate. The

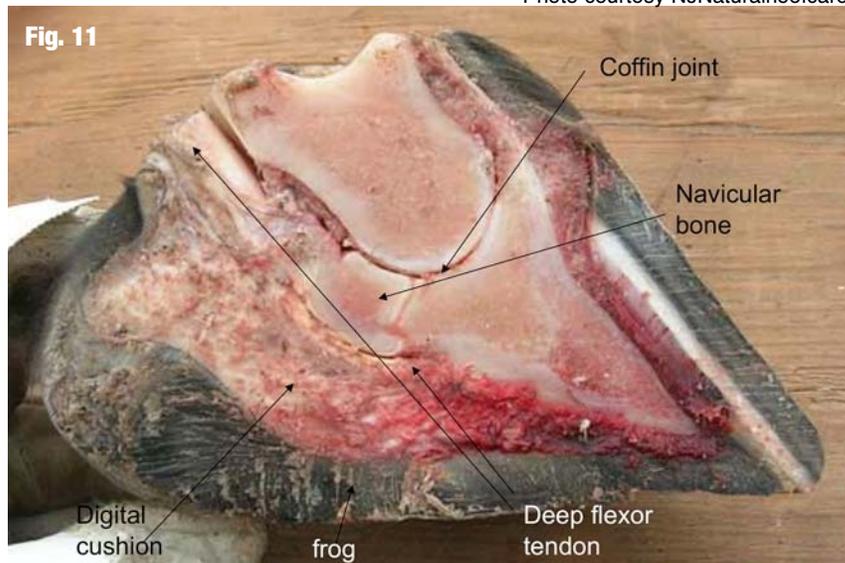
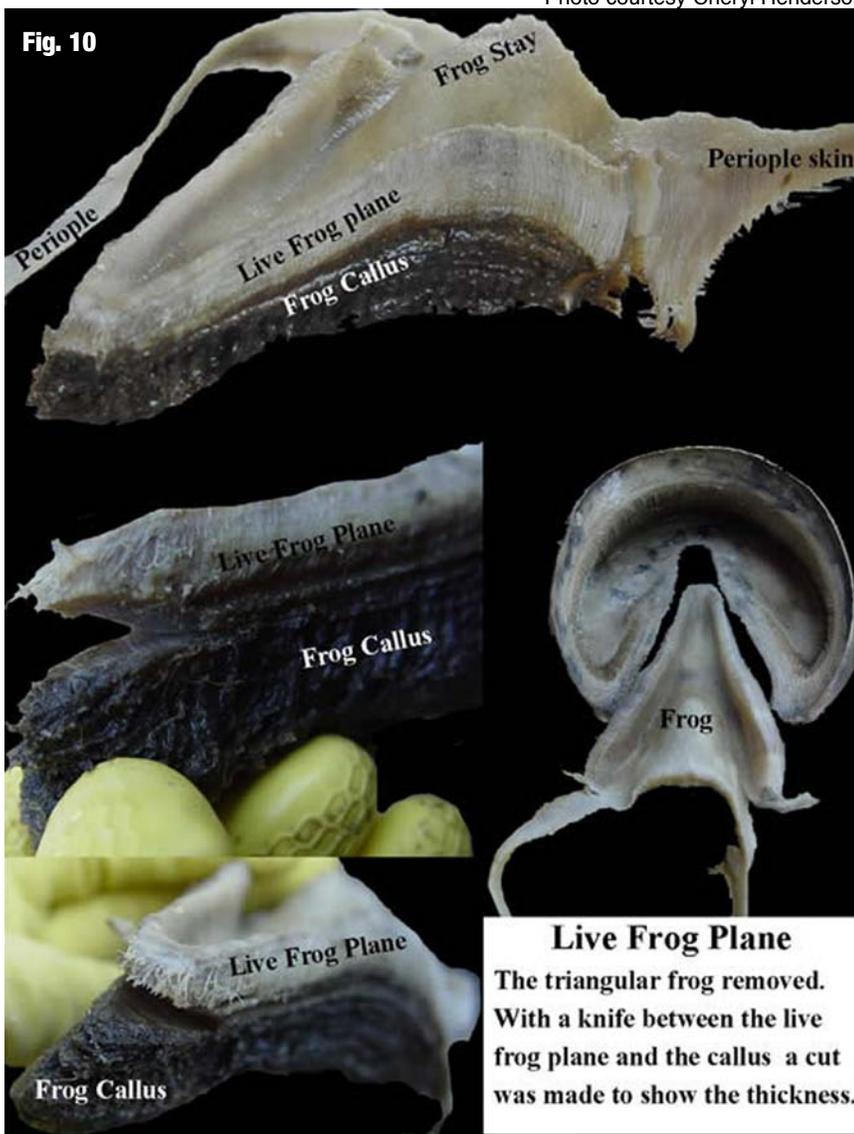


Photo courtesy Cheryl Henderson



bones of the loaded coffin joint would not articulate properly, the deep digital flexor would be overstretched, and there would be excess strain on the navicular bone and its attachments.

View also this video clip: <http://www.youtube.com/watch?v=fd77zwRRYL> M&feature=related

WHAT ARE THE CONSEQUENCES OF FROG DISEASE?

Many chronic cases of “caudal heel pain” and “navicular syndrome” are likely manifestations of this proposed vicious cycle:

- 1) Infected, incompetent frogs create impaired internal and external hoof/foot/leg mechanics, due to either frog structural inadequacy, frog soreness or both.
- 2) Ongoing inappropriate loading or stress on one or more internal structures, such as the impar ligament, results in inflammatory, then degenerative changes.
- 3) Pain from these changes causes further alteration in gait mechanics.
- 4) Altered gait mechanics contribute to structural changes such as contracted heels and frog atrophy, which add to mechanical stress and inflammation within the foot.
- 5) Because of these alterations in morphology, circulation within the foot is compromised, impairing the horse's ability to heal mechanical and inflammatory damage, as well as infection. Infection can persist, becoming chronic and deep seated.
- 6) Because of his chronically sore feet, the horse may be thought to require shoeing, often therapeutic shoes, which may provide some immediate relief but also may further compromise function and healing by limiting frog contact, heel expansion, and circulation. Without treatment of occult infection, heel pain persists, and the horse becomes increasingly dependent on the external support of shoes. This “proves” to owners and practitioners that the horse cannot be sound without corrective shoes...

Eventually the horse may become a candidate for pain medication, injections, surgery, or nerveing. Alternatively, the horse could reach a long term equilibrium between inflammation, degenerative changes, chronic infection and level of dysfunction. The weakened foot may only be able to function with the external support of shoeing. If the horse's discomfort is relatively symmetrical, he may not be considered lame, and his loss of athleticism attributed

to aging, bad riding, poor training, improper shoeing/trimming, or the demands of his job, depending on who is giving an opinion (some of these factors could be contributing to the problem, complicating the picture). Many professionals are so accustomed to the appearance of compromised frogs that they consider them normal, and thus overlook frog disease as a possible initiating cause of loss of performance leading to lameness.

Frog disease and its negative consequences can be subtle and insidious in onset and progression. Decreasing fluidity, power, suppleness and suspension in the gait may continue unnoticed until there is overt lameness. Like the frog (pun intended, sort of) who stays in a pot of water until he boils to death if the heat is turned up slowly, the horse owner may not be aware of a gradual decline in the horse's performance. The same owner would be quite alarmed if this deterioration happened overnight, just as the frog would immediately jump out if plopped into a pot of hot water. By the time the problem is recognized, degenerative changes secondary to the initiating frog disease may be evident, and the frog disease is overlooked.

It has been argued that frog disease and lameness is a "chicken and egg" situation, where it is difficult or impossible to say if poor hoof mechanics cause frog disease or vice versa. However, it is the authors' experience that effectively treating frog infections has restored soundness to lame horses whose only options were thought to be pain medication and/or nerving, significantly improved the quality of movement in virtually every horse treated, decreased ouchiness on hard surfaces for horses with sensitive feet, and stopped longstanding bouts of hoof abscessation that had persisted for

years. With these results, the debate becomes academic at best. Considering that treating frog infections is relatively noninvasive (compared to joint injections and nerving) and inexpensive (compared to MRI's and lifelong corrective shoeing), frog disease should always be included in the differential diagnosis of performance loss and subacute or chronic lameness.

To summarize, frog infection causes impaired frog structure and function, which in turn can compromise other structures in the distal limb as well as systemic health. Because unhealthy frogs are so prevalent, diseased frogs which are not obviously "thrushy" are often considered normal and are not treated. Frog disease may be an important initiating or contributing factor in many degenerative changes in the equine digit. Since we rarely find what we aren't looking for, being able to recognize frog disease is an important skill for hoof care providers. ●

About the authors: Candace K. Platz, DVM of Maine Equine Associates in New Gloucester, Maine, is a graduate of Tufts University and the New York State College of Veterinary Medicine at Cornell. A lifelong horsewoman, she is a certified Instructor/Trainer with the United States Dressage Federation, and a successful dressage competitor/trainer with multiple regional and national championships through the FEI levels. As an instructor, clinician, lecturer, trainer, competitor and author, she works to promote healthful ethical relationships between people and horses.

Heike Bean has owned horses for close to 50 years, is a German certified riding instructor, and has been competing in riding and driving for many years. She wrote the book "Carriage Driving—A Logical Approach Through Dressage Training" together with Sarah

Blanchard. She has also written numerous articles, as well as the Guidelines for Driven Dressage, as dressage chairman of the American Driving Society. She used to teach, train and judge, but has been retired for 10 years now, and dedicates all her time to learning all she can about horses, hooves in particular.

Part Two of this article series will cover, "What Exactly is Frog Disease and What does it look like?" and "Why Do Horses Get Frog Disease?" **Part Three** will address Frog Disease Prevention, Treatment, and Maintenance.

Below, an example of classic common thrush in the hoof. Although this frog is readily identified as having "classic" thrush, this is not the appearance of most infected frogs. Part Two of this series will explain how to identify more prevalent and subtle infections. Don't miss the next THH issue for lots more examples of frog disease!

Photo courtesy Candace Platz DVM and Heike Bean



Dave Rabe Inducted into the AERC Hall of Fame

Dave Rabe is a familiar sight at many of the endurance events in the western states. And he should be: Dave has collected more than 46,000 competition miles, including a staggering 55 100-mile events. He also has managed to bring three horses over the 5,000-mile mark.

He is best known for participation at multi-day events such as the XP rides. Dave clears trail, marks trail, competes on the day of the event and will either take down the trail marker ribbons or load up his horses and drive to the next event to start all over again. He does many of the miles on foot, running next to the horse or tailing the horse along the wilderness trails. Dave is also known for his riding attire. Rain, snow, summer or winter, Dave can be seen riding his horse in a pair of jean shorts and a tank top. It's his own unique brand.

In 2009, Dave completed 3,080 miles in 56 rides.—and all of them in **Easyboot Gloves** and **Easyboot Glue-**

Ons. The nominations submitted to AERC were prolific, but their comments were consistent. Dave can ride just about any horse, especially those that others give up on; he can pick various lost tack and equipment up of the ground without even leaving the saddle; and he will never pass up the opportunity to help another rider out, no matter where he is placing in the event.

Dave has been an Easyboot user since the mid-90's and has been instrumental in helping EasyCare test and develop various boot designs. What better way to challenge the product than with a rider who consistently racks up between 2,000 and 4,000 miles annually?

When he accepted his award in February at the annual AERC convention in Reno, NV, he said, "I suppose I really like a horse that bucks and runs away with me. That's why people give me their horses." He went on to say, "I like to ride point to point because before you know it, you're crossing state lines."

Please join EasyCare in congratulating Dave. We think there is no-one more deserving of AERC's ultimate award.—Courtesy of EasyCare Inc.