

Health and Disease of the Equine Frog, P. 2

Part 2: What Exactly is Frog Disease and What does it look like?

by Candace Platz DVM and Heike Bean

Frog disease occurs when the frog tissue is invaded by bacteria and/or fungus, which cause damage to the tissue and loss of structural integrity. Commonly referred to as “thrush,” disease in frog is most obvious when it presents with a black malodorous discharge, as illustrated below in **Fig. 12**:



Fig. 12

But this is only one manifestation of frog disease. Any change in the frog which compromises its proper form and function may be viewed as pathological. Alterations in the normal architecture, color or tissue strength of the frog, that is not traumatic in nature, should be considered possible evidence of underlying disease.

Fig. 13: In the example below, fissures, flaps, discoloration and loss of frog structure are evident and obvious. Although common, this is not the appearance of a healthy frog.



Fig. 13

Diseased frogs sometimes manifest as puny, narrow and weak structures, without obvious evidence of disease, as in the two examples that follow. (**Fig. 14 and Fig. 15**) But a careful examination shows that the central sulcus in the first picture has punky material in its depths, with a hole in the back that probably harbors infection.

All photos courtesy Candace Platz DVM and Heike Bean



Fig. 14

Fig. 15: Close inspection of this frog reveals a slit-like central sulcus that may harbor disease. The collateral grooves are not open enough to be evaluated, and are suspiciously irregular and dark.



Fig. 15

Infection is often accompanied by a peculiar rotten onion smell, but there may be no odor at all. In most cases, there is no discharge. The frog horn may have regions of soft punky tissue, or be riddled with holes. The entire frog may be yellow and cheesy looking, like in the picture below (**Fig. 16**) or the cheesy areas limited to pockets and layers encountered during trimming, as in the central sulcus of the hoof two pictures above (**Fig. 14**)



Fig. 16

Fig. 17: Very often, diseased horn is dark and discolored as in the image below. Notice the crack extending from the infected central sulcus into the heel bulb and the ragged appearance of the body of

the frog, as well as the extensive discoloration.



Fig. 17

Dissecting layers coated in a light powdery substance are pathological, as are fissures, flaps, holes, and other defects in the structure. Undermining tracks and layers may or may not be fluid filled, and may or may not lead to cavities within the frog.

Defects may be obvious but often nothing is visible at all unless the frog is carefully trimmed and then scrutinized, using appropriate tools and good light.

Fig. 18: The frog shown below looked overall quite healthy but there was one small area near the heel on the side of the frog that was discolored and irregular.

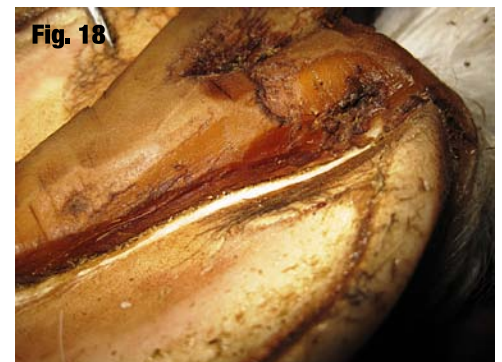


Fig. 18

Fig. 19: Probing deeper in this area revealed a soft spot.



Fig. 19

Fig. 20: Careful trimming released this odorless milky fluid, most likely necrotic debris.



Fig. 21: After the milky material was removed, this cavity was left. This horse was not lame, but if left untreated, such lesions provide access to pathogens and ongoing damage. Later we will discuss how to treat this defect.



This example demonstrates the importance of meticulous examination of the entire frog, including the ground surface, body, heels, and the depths of the central sulcus and collateral grooves. Any pockets, slits, flaps, holes or other defects should be probed and evaluated. The entire structure of the frog should be of uniform color and resistance to digital pressure, with no soft spots. A healthy frog does not decrease in strength from toe to heel, or soften and darken toward the back of the central sulcus, as is too often the case. There should be no slit continuing from the central sulcus into the area between the heel bulbs or necrotic tissue in the collateral grooves. There should be no unpleasant odors associated with the clean equine foot.

Fig. 22: The frog shown below is severely pitted and undermined, with dissecting layers of infection causing sloughing of chunks of tissue superficial to the diseased areas. Horses in New England who periodically “shed their frogs” as part of the



“normal growth cycle” stopped doing so after their frogs were treated for infection and appropriately maintained, even during the mud season. Frog shedding in chunks or thick layers that significantly changes the shape and mass of the frog may, in fact, represent sloughing of tissue due to undermining infection.

Fig. 23: Look how deep a screw driver could penetrate painlessly into the back of this frog. A small slit near the bulb caused by frozen ground allowed access to pathogens, which excavated a huge cavern in the frog tissue. Eventually, a large portion of this frog “shed” due to dissecting of the disease process into the body of the frog.



Fig. 24: This frog has multiple deep pockets and fissures. The central sulcus is reduced to an infected slit, and the collateral groove is also diseased. Notice the darkening of tissue toward the more damaged rear of the frog. The toe area has more normal light coloration, except in the area of the defect, which is probably infected.



Fig. 25: Despite some effort to clean up the collateral grooves, the trimmer of this foot ignored the necrotic tissue in the central sulcus, and the almost complete destruction of the caudal portion of half



the frog due to disease. This horse was not thought to be lame, though he was persistently “ouchy” on hard footing. Colleagues considered this an exemplary trim and did not comment on the frog disease. The horse’s lack of forwardness was thought to be due to a poor attitude and his sensitivity attributed to lamellar pain. Once his frog infection was controlled, the horse moved happily forward on soft footing, as well as hard going.

Fig. 26: The central sulcus on this hoof is too deep and narrow, providing an ideal site for infection to persist. The decay in the caudal collateral grooves communicates through the quarters with the white lines, which are also diseased. The flared tissue over the collateral grooves toward the back of the foot is too flabby to provide significant support. By leaving this tissue to “protect” the foot, the trimmer has, in fact, provided protection and nourishment for the disease process. Removing these flaps to treat the infection revealed how atrophied and inadequate the frog truly was. This contracted hoof de-contracted with treatment for frog disease. As the frog healed, so did the hoof.



Fig. 27: Careful probing of the central sulcus below showed that the infection extended high and deep into the sensitive tissue between heel bulbs. The caudal half of this discolored frog was severely undermined by infection, and there was a dissecting layer of infection extending all the way to the tip of the frog.



(cont. on page 14)

(cont. from page 13)

Fig. 28: Many cases of frog disease are less obvious. This frog looked healthy and solid when first examined, but the collateral grooves were overlain by horn, so that prior to trimming, it was not possible to evaluate them. However, the telltale sour onion smell suggested infection. With the excess horn removed as shown here, diseased tissue was visible at the depths of the collateral grooves, which were tender. The darker tissue toward the heel and the collapsed heel bulbs were evidence of disease in the back of the foot, probably spreading from the slit-like central sulcus. With treatment, the tenderness resolved, the odor disappeared and the heel bulbs strengthened.



Fig. 28

Fig. 29: Occasionally, the opposite is true. Frogs can be superficially tattered and dirty, but a careful trim reveals a robust healthy structure, such as in this example below. Notice the clean collateral grooves and strong connection between caudal frog and heel bulbs. The central sulcus will ideally become shallower with time, but some horses have deep clefts without any problems, as long as they are kept clean and free of infection. The “floor” of the central sulcus should be firm, dry and free of fissures or holes, as in this example. The sulcus should not be sensitive to probing.

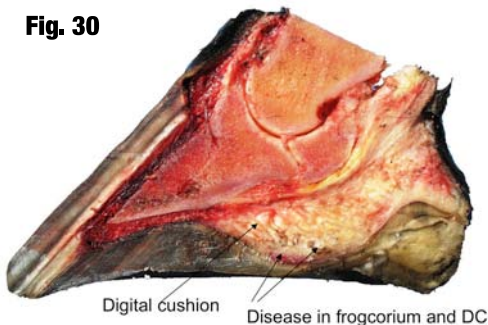


Fig. 29

Fig. 30: The illustration below underscores the significance of infections in the frog horn. It is obvious from this cross-section that disease in the frog horn can and does readily invade the frog corium and digital cushion. Since the frog corium is the source of frog horn, disease in this

tissue compromises the ability to grow horn and repair the damaged frog.

Fig. 30



Digital cushion Disease in frogcorium and DC

Why Do Horses Get Frog Disease?

Pathogens are ubiquitous in the horse's environment. Those that prefer anaerobic living conditions probably cause most frog infections, but the great variety in how the disease presents, progresses and responds to treatment suggests that a number of different organisms, as well as mixed infections, may invade the foot. Because of their tiny size, pathogens do not need a visible defect to gain access, but colonization is facilitated by flaps, layers, slits and cavities, which provide a moist anaerobic environment. Persisting deep in the tissue, disease can be difficult to detect, both in the early stages, and after superficial areas appear healed. Signs may not be apparent until the infection is well established or re-established.

The living conditions of domestic horses encourage and sustain frog disease. Unstabled confined horses tend to cluster around water sources, feed areas and shelter, resulting in prolonged exposure of their hooves to urine and manure. Ammonia in these wastes damages hoof and frog horn, facilitating invasion by harmful organisms. Stabled horses may also suffer prolonged exposure to ammonia from bedding soiled with manure and urine. Moisture in lush pastures, damp bedding or mud softens horn, making it more friable and thus vulnerable to invasion by pathogens.

Rubber mats, especially when used without bedding, seem to promote re-infection. In many cases, the ground beneath the mats provides an ideal location for fungal growth, as is known by every groom who had to strip and disinfect a dirt stall. Fortunately these areas can be disinfected. If not scrupulously clean, bedding can also promote disease, not only by retaining moisture and ammonia, but also becoming a reservoir of organic material to support microbial growth. Classic thrush is often associated with standing in dirty stalls.

Dry conditions do not guarantee frog health. The function and physiology of the horse's hoof evolved in response to the demands of constant travel over long distances and rough terrain. Under most natural (not pasture or induced exercise) conditions, frog horn grows approximately as fast as it is worn away, so trimming is unnecessary, and excess horn is not available to provide a haven for infection. Since most domestic horses do not have the opportunity to adequately self-trim, human

intervention including trimming is necessary to accommodate the discrepancy between the lifestyle the frog was designed for and its modern circumstances.

Optimal horn growth and development are dependent on circulation of blood and lymph, which in turn is dependent on movement, i.e. repeatedly loading and unloading of the foot. Even in large pastures, domestic horses rarely approach the distances traveled by wild horses. Stabled horses with periodic or daily turnout do not even come close, especially those who have no companion with whom to play. Because most domestic horses do not get enough exercise for optimum foot health, their frog horn is not as tough and resistant to invasion as that of unconfined horses in true natural conditions.

Systemic health is intimately related to the health of the equine foot, so any factor which affects overall health including nutrition, stress, and chronic or acute disease has an effect on frog health, as well. Metabolically-challenged horses are at increased risk for infection. Cushing's disease, insulin resistance, obesity and other maladies of the modern horse can all compromise foot health. Genetics undoubtedly play a role; full siblings living in a group showed similar susceptibility to hoof problems, while herd mates responded differently to the same management conditions.

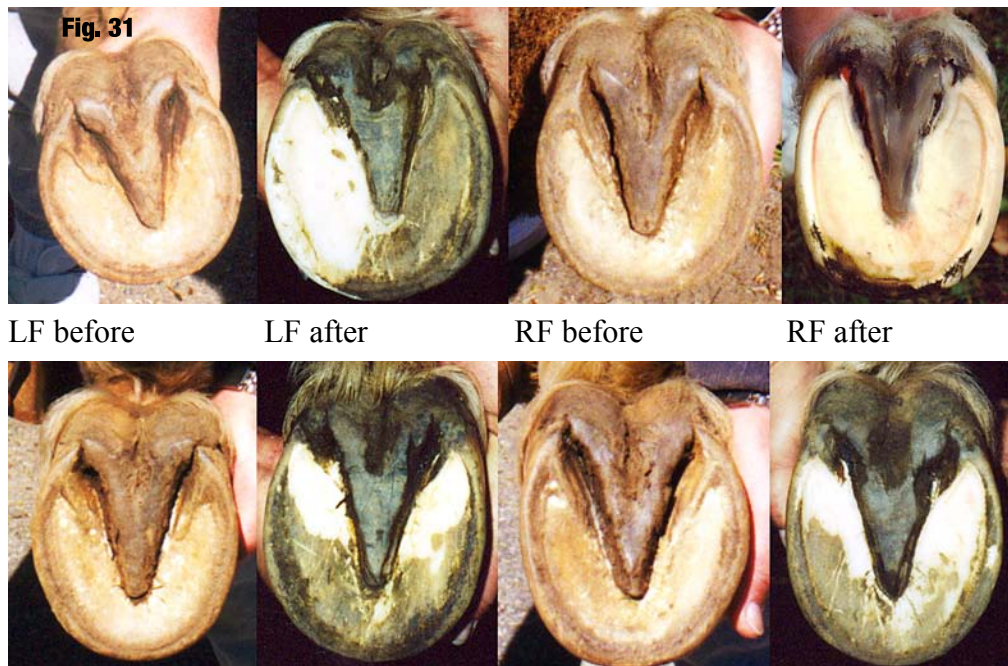
Fig. 31: Poor hoof mechanics can contribute to the development of frog disease. In this case, over-trimming the heels and ignoring proper breakover resulted in the following changes in just seven months. Note the increased discoloration, the narrowing and atrophy of the frog body, and the decay evident in central sulci and collateral grooves after only seven months of suboptimal hoof care.

Frog trimming is a controversial topic in hoof care circles. Recommendations range from radical excision to a complete hands-off policy. Current popular theories include “only take what would come off by itself,” “the frog has its own wisdom and is capable of self-maintenance” and “never touch the collateral grooves because they are too sensitive.”

The first two theories may be appropriate for populations of healthy free-ranging horses whose social and nutritional circumstances dictate continuous and unlimited movement over abrasive varied terrain. Since this is not the case for most domestic horses, their foot care protocol must be adjusted accordingly. Years of experience using judicious technique to address infection in collateral grooves have shown that trimming, cleaning and treating them has not been damaging. While it may be true that infected collateral grooves can be quite sensitive, eliminating disease in the collateral grooves eliminates this sensitivity. It also improves the health of the white lines by removing a constant source of infection. Several horses who suffered years of chronic, repeated and extensive foot abscesses were healed by treating occult disease in the collateral grooves after other approaches,

Photo courtesy Cheryl Henderson

All photos courtesy Candace Platz DVM and Heike Bean



including corrective shoeing and trimming by highly qualified practitioners, scrupulous diet and environmental management, rehabilitative exercise and recommendations by a regional referral clinic, all failed to help.

The following two pictures (**Fig. 32** and **Fig. 33**) are from the "Let It Be" school of frog care. Most hoof clinicians are very conscientious about hoof balance, while the diseased frog (the "elephant in the living room") may go unnoticed.



The second horse (**Fig. 33**) was referred to hoof care specialists to evaluate the correctness of the trim, since the horse was chronically sore on hard surfaces. The trim was judged to be adequate and the recommendation was to continue to force him to walk him on asphalt to toughen up his feet. The obvious frog disease was not mentioned.

Once these frogs were treated, the white line disease resolved and the horse trotted happily on paved roads.

By interfering with the natural expansion of the hoof capsule, decreasing frog/ground contact, and altering hoof mechanics, shoeing can contribute to

the development of frog disease. If the caudal extent of the collateral grooves is covered by the heel of the shoe, it cannot be adequately cleaned.



Fig. 34: Below is an example of a shoe that completely covers the caudal collateral groove on one side. If this hoof were not so terribly contracted, even more of the collateral grooves would be unavailable for inspection and cleaning. Compare the frog in this foot to the examples of healthy frogs in Part 1. Presumably, the wide web shoes are to improve soundness and movement, but why not try healing the infection in the middle of the foot first?



Fig. 35: This is the same foot, with the shoe removed. Many hallmarks of a diseased frog are obvious, including discoloration, contraction, slitting of the central sulcus, atrophy, pitting and necrotic debris in the collateral grooves.



In summary, frog disease is largely a condition of domestication. The demands of living in the human world are often in conflict with equine physiology, as it evolved over time. While the philosophy of "natural horse keeping" is admirable, caretakers must be realistic and honest with themselves about the unavoidable negative impact of modern life on the horse's health. The conscientious owner or equine professional must be responsible for taking steps to do what they can to recognize, treat and prevent the damage that horses inevitably suffer due to human management. Frog care, including management practices which discourage disease, as well as daily maintenance and treatment when infection occurs, are relatively easy and inexpensive ways to improve the quality of life for modern horses and those who care about them.

About the authors: Candace K. Platz, DVM of Maine Equine Associates in New Gloucester, Maine, is a graduate of Tufts Univ. and the NY State College of Vet. Medicine at Cornell. A life-long horsewoman, she is a certified Instructor/Trainer with the U.S. Dressage Federation, and a successful dressage competitor/trainer through the FEI levels. As an instructor, clinician, lecturer, trainer, competitor and author, she works to promote healthful ethical relationships between people and horses.

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In THH Issue 40, **Part Three** of this article series will address Frog Disease Prevention, Treatment, and Maintenance.