



# The Live Frog

by Cheryl Henderson

A hoof care provider will attempt to solve heel pain with a balanced trim to the hoof. However, sometimes a balanced trim will not result in a pain-free foot, because damage caused by disease in the live frog cannot always be repaired by trimming alone. When disease affects the health of the sensitive frog, it also compromises the ability of the back of the hoof to function without pain. Thus, hoof care providers must include in their trimming protocols, a strategy for determining the health of the live frog, and for creating conditions that encourage healthy growth in this important area of the hoof.

The hypothesis of this article is that disease in the live frog changes the support of the digital cushion and strength in the back of the hoof. The article also attempts to establish that there may be one common debilitating cause of pain in the hooves of horses exhibiting the signs of “navicular syndrome.” It is possible that movement difficulties, toe-first landings, short strides, and common hoof contraction are all caused by disease in the live frog. The goal of this article, then, is to inspire hoof care professionals to consider disease on the inside of the hoof when treating lameness.

## The Live Frog and Digital Cushion

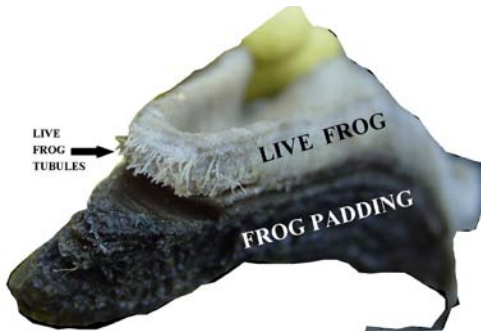
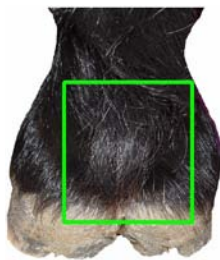


Photo 1: The live frog.

What is this live frog? What makes it different than the visible frog? And where is it in perspective to the sole? First, let's distinguish the live frog from the callused padding clearly visible on the bottom of the foot (Photo 1), separating the upper growing structure of live frog, made of intertubular and soft keratinized tubule horn with a thickness of 3/8 to 1/2 inch. This structure provides a unique base covering, supporting and protecting the digital cushion and the structures above it in the hoof and limb. Providing heel comfort, energy distribution, and support for the back of the foot, a healthy live frog has enough firm elastic strength within its growing tubules to endure the



All photos courtesy Cheryl Henderson

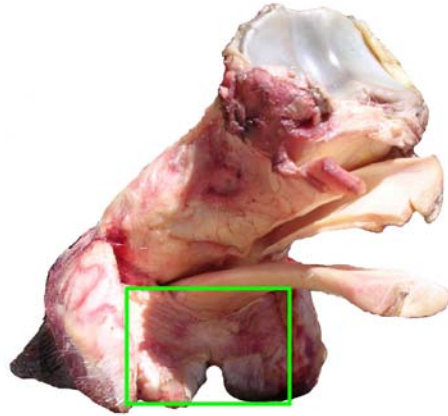


Photo 2: Dissection with the internal hoof intact, without the capsule.

loading and unloading of the hoof, and to support the pastern as it pushes down into the protection of the digital cushion. When the health of the live frog is compromised by disease, it sags under the weight of the horse, causing pain, and frequently lameness, in the back of the hoof.

Before further expanding a description of the live frog, some discussion of its relationship to the digital cushion is necessary. Triangular in shape and located between the lateral cartilages, the digital cushion functions as an expansion joint and the hoof's shock absorber. This dense cushion, made of fibro cartilage and micro vessels, acts as a thick gel pad, cradling the upper structures from strain and concussive damage. Its presence affects all structures that make up the so-called “hoof mechanism”: the deep digital flexor tendon (DDFT), the pastern bones, and the parts of the hoof in the navicular area within the capsule. (Photo 2)

The lining over the back of the digital cushion is a tough unique periople skin, while hide covers the top. (Photo 3)

The underside of the digital cushion's triangular shape consists of a thin skin-like covering of papillae corium called the “sensitive frog.” These hair-like projections are the roots of the soft, keratinized frog horn. (Photo 4) Healthy frog padding to the outside of this structure protects it and prevents damage to the thin “sensitive frog” corium. Bruising is frequently seen in this area when the frog's external padding is unhealthy or pared too thin during trimming, exposing this vascular

### Locating the Digital Cushion

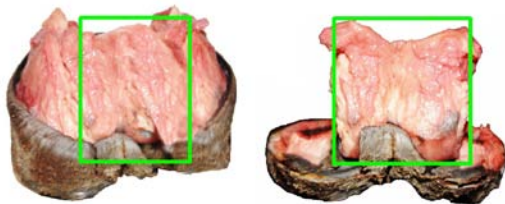


Photo 3: The digital cushion is highlighted in green.

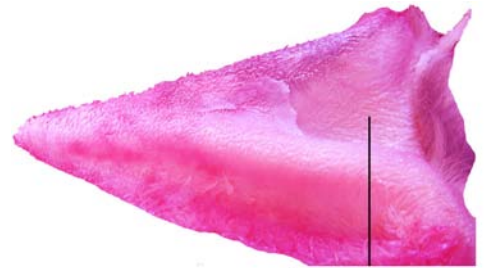


Photo 4: The belly of the digital cushion lined by the sensitive frog's papillae corium. Note the natural deep cleft of the sulcus.

region to damage. The strong, healthy, and undamaged frog tubules begin to fold into consistent and natural layers. The unhealthy frog produces an outer padding of easily stained, disorganized clumps, which provide only weak protection to the upper area of the limb.

### Dissection to Reveal the Live Frog:



A solar view, showing the frog being lifted from the sole.



The frog in the whole.



The inside top area of the newly developing live frog leaving the sensitive frog.

Testing the Strength of the Live Frog

A pressure squeeze test is one way to judge the health, resilience, elasticity, and support of the live frog beneath the digital cushion and above the frog padding. It will also reveal if there is damage to the live frog. The test, which can establish the resilience of the digital cushion and strength of the live frog, can be done by placing the fingers on the top of the digital cushion above the heel bulbs and behind the pastern while at the same time, placing the thumb under the frog at the heel and squeezing (Photo 5). The area between the thumb and fingers should feel firm, with some give to pressure. It should not feel mushy, like pushing into soft fat.

When a digital cushion squeeze test is performed on a crushed, low heeled hoof, the condition is often misdiagnosed as an atrophied, underdeveloped, and weak digital cushion caused by lack of proper stimulus. Many trimmers finding these results will avoid repositioning the heels to the natural baseline of the internal structures. Some will recommend shoeing and padding until strength returns. These are both erroneous, as they will not structurally improve quality of the digital cushion. The problem is with the live frog.



Photo 5: The digital cushion squeeze test.

A better approach is to understand that the loss of strength is not in the digital cushion, but in the unhealthy live frog. Commonly, a diseased frog doesn't readily reveal the extent of weakness beneath its visible outer padding. Occasionally, however, at the base of the collateral groove exit, diseased frog tubules will swell and turn gray, as rot and moisture weaken the once strongly growing tubules. Disease diminishes the live frog's strong, taught, sling-like support of the upper structures, which begin to sag between the lateral cartilages. Think of a new trampoline that gives little to the bounce, but catapults the bouncer high into the air. Then think of the over-used older trampoline which sags from the bouncer and provides little rebound off the mat. In essence, this is the same difference between what a healthy live frog provides in the back of the foot as opposed to a diseased live frog.

It is common for hoof care professionals and

All photos courtesy Cheryl Henderson



Photo 6 & 7: Sole views of hooves with a variety of disease.



veterinarians to turn a blind eye to disease within the capsule wall, sole, and frog (Photos 6 & 7), but observers may not understand what they are looking at, how damaging it is, or how to address it successfully. It is essential to change this paradigm, so practitioners begin to recognize that internal hoof structures need to be disease-free to provide the back half of the foot with shock absorption, protection to internal structures, balance, expansion, decontraction, and energy dissipation.

Findings from my own dissections of hundreds of hoof capsule shapes, ages, and pathologies over the past six years invalidate claims that poor conditioning from a lack of movement and contraction is the cause of weak digital cushions. In my study, weak heels were most likely to be accompanied by diseased frogs, creating pathology in the heel structures, including flat soles, underslung and crushed heels, and prolapsing of the frog, causing it to be unable to support the upper structures of the hoof.



Photo 8: A cadaver sagittal view, showing a diseased frog and live frog.

The aftermath of a digital cushion unsupported by a healthy live frog, or of a digital cushion that has been crushed inward by a contracted capsule, is heel pain that manifests other problems to the hoof, leg, and body. But the condition appears to have been caused by disease in the frog, rather than by lack of movement—because the collateral groove and the central sulcus hold unhealthy mud and moisture, the frog tubules become weak and rotted, allowing disease to reach up into the sensitive frog to develop inflammation and infection. (Photo 8) Thrush with its black discoloration, sour smell and grease-like appearance, begins to devour the live frog's soft tissue, opening the foot to further infection. A pain response from pressure of the hoof pick in the collateral groove and the central sulcus is often a warning that this dangerous condition exists within the hoof.

Repairing a Diseased Frog

Fortunately, the process to repair and return strength to the superstructures of the live frog is quick and easy. Products made of chlorine dioxide provide antifungal, antiviral and antibacterial treatments that do not harm healthy, live tissue. Chlorine dioxides products, such as White Lightning, Oxine AH, and a treatment called Clean Trax, kill pathogens on contact. It may take from a few weeks to months to remove the disease and allow the new frog to grow in. The lateral cartilages and digital cushion begin to lift up, and the heels become more rounded at the back of the foot. The central sulcus now can develop the normal growth, leaving an open and wider cleft in the center back of the frog. The result is a healthier live frog supporting the digital cushion and structures in the limb above.

Beneficial evidence of treating the disease in the live frog was seen in every case in my further study of live horses with heel pain. Problems treating navicular syndrome that had been an issue for years, cleared up, and chronic toe walking ceased. Results of heel expansion, stronger heel bulbs, even weightbearing in the back of the foot, not to mention improved strides and body condition, were also observed.

Chlorine dioxide may prove not only to eliminate the problems from fungus or bacteria in the foot, but also to produce the unanticipated outcome of a horse that is finally able to move without pain previously diagnosed as "navicular syndrome." ●

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