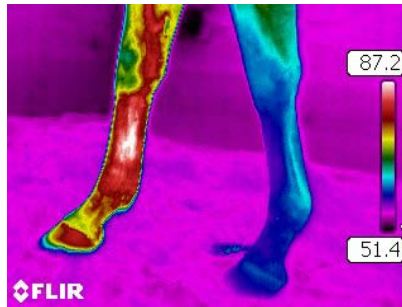
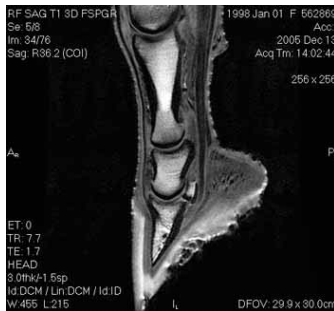


2010-233-Robson

Coat of Many Colors: Cases in Equine Thermal Imaging

Abstract: Thermal imaging in the equine industry has been utilized for over 40 years. However, the technology only recently gained the recognition it deserves, as the cameras have improved, standardization is introduced, and veterinarians become familiar with interpretation of the images. Thermal imaging finds its niche in diagnosing mystery lamenesses, scanning horses at pre-purchase evaluations, aiding farriers with hoof pathology and imbalances, addressing saddle-fitting problems, and providing both baselines and serial documentation of equine health and lameness. A case-based approach to the technology provides evidence of its vast uses and tremendous sensitivity in equine medicine.

One of the most common questions overheard regarding thermal imaging, or infrared thermography (IRT) in the equine industry is, “What do you use it for?” The answer relies on the individual’s understanding of how thermal imaging works in a biological system. Diagnostic imaging modalities are divided into categories of *anatomic* and *physiologic*. Thermal imaging is a physiologic



MRI and CT are anatomic imaging modalities, showing exactly which structures are affected. Thermal images show changes in circulation.

imaging modality, therefore it detects changes in bloodflow and metabolism, but it cannot necessarily tell you which exact anatomic structure is affected. The only other physiologic imaging modality is nuclear scintigraphy, or a “bone scan,” which involves injecting a radiopaque isotope that highlights areas of inflammation. Anatomic imaging modalities include traditional radiographs (“x-rays”), ultrasound, Computed Tomography (CT) and Magnetic Resonance Imaging (MRI). These modalities

pinpoint the structures affected with pathology, but only give a static image of disease processes. Thermal imaging detects surface heat directly correlated to circulation, or a lack thereof. Therefore, anything that requires a tool to identify inflammation, reduced circulation, potential nerve damage, or serial patterns, falls under the thermal imaging umbrella.

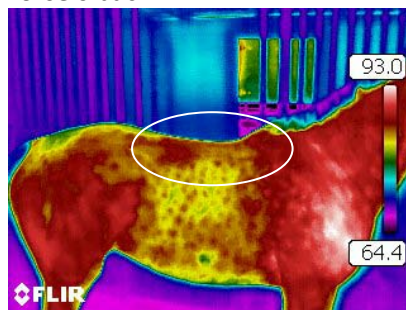
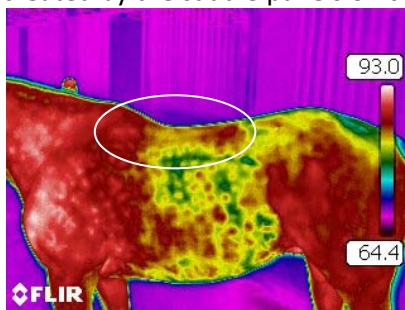
When evaluating individual patients and case studies, it is imperative to remember that the images are only as good as the technician’s skill in obtaining them, and the standardization of patient and environmental preparation. Equally necessary for a positive outcome, is the experience of the veterinarian in evaluating the images. Only when these conditions are met, can the most successful interpretation be made. Thermal imaging’s historical failure in the equine industry was due to the lack of understanding of how and where to prepare and place the horse, and how to read the images once they were obtained. As interest in this technology grows, it will continue to come under fire as a useful technology as lesser skilled and untrained technicians and veterinarians attempt to add it to their businesses without a complete understanding of its proper implementation. Thermal imaging is safe, cost-effective for the client and practitioner, is quick to perform, and is reliable in experienced hands. These advantages of thermography will aid its acceptance, as skilled practitioners recognize these inherent benefits and seek to use the tool correctly. From pre-purchase examinations, to saddle-fitting,

pre- and post-competition or race screening, identifying mystery lamenesses, and as a tool to maintain ethics in equine sport, there is no diagnostic tool more convenient and effective than thermal imaging. The following presented cases demonstrate thermography's role in optimizing equine health and performance.

Case One: The Equine Back

Evaluation of the equine back is typically limited to the veterinarian's skill in palpation. Sadly, there is little to zero saddle-fitting education provided to veterinary students or post-graduates unless they seek this information out as individuals. Equine back pain is often mistaken for other lamenesses. As the horse protects its spine and paraspinal muscles, it changes its way of going, soon leading to breakdown of other joints such as the hocks, stifles, and sacroiliacs. Soft-tissue injuries such as suspensory ligament tears and tendon tears also occur from loading and torque when the body isn't balanced. Equine veterinary chiropractic care has gained widespread acceptance by horse-owners, but is still viewed as voodoo by many veterinary practitioners. Thus, horses are left to suffer sore backs, or be subjected to steroid injections and other band-aid treatments without addressing the underlying causes of their diseases. Thermal imaging provides evidence of the pathology in the equine back. Radiographs of the equine spine are also available to aid in determining more exact disease processes, but these necessitate a visit to an equine hospital with a machine large enough to accomplish these views. Thermal imaging, however, can quickly identify areas of inflammation, pressure points, and saddle-fitting problems at the owner's home facility and for less cost and logistical upset than traditional modalities.

"Pony" is an 8 year-old Warmblood gelding with a history of teeth grinding, tail swishing, uneven gait, and problems with lead changes. His history is consistent with saddle-fitting problems, but his owner has had her saddle evaluated twice by a certified saddle-fitter and was told the saddle fit well and was not the problem. When the saddle tree spontaneously broke, new measurements were made and the owner paid to replace the tree only 2 months before these images were obtained. She was clearly under the impression that her saddle could not be the problem, though she had doubts about the fitter's abilities. Pony is so difficult to work with as a patient that the referring veterinarian is unable to administer traditional care or palpation without being in danger of being kicked or bitten. The horse's problems continue, so Pony's owner presents him for a baseline thermal imaging scan. His images quickly show areas of focal inflammation in his back, as well as a possible bilateral tarsitis (inflammation in the hocks). When asked about his history, the owner reported that she hadn't ridden him for 3 days prior to his scan due to her being out of town. The images, however, clearly show pressure points created by the saddle panels on the horse's back.



In the images at left, the white circles highlight pressure points created by the saddle. The saddle panels can almost be visualized along the patient's back, though he wasn't ridden for 3 days prior to imaging. Dorsal views were not obtained due to his behavior.

These thermal imaging findings quickly prompted the owner to seek a second opinion on her saddle-fit. A Certified Master Saddler was able to evaluate the fit and determine that the current saddle was pinching the horse's shoulders, was too long for his back, tipped, and was falling to the side. A new saddle was ordered, and appropriate therapy was recommended, including rest, massage by the owner,

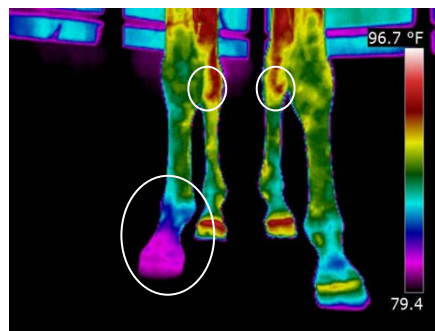
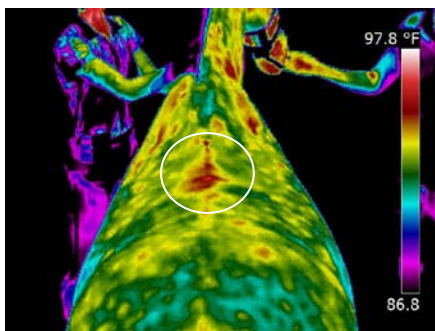
anti-inflammatories, stretching, and ground work. In this case, thermal imaging was able to pinpoint the horse's problem where a traditional work-up may have been difficult or dangerous, and images showed objective evidence of pressure and pain created by ill-fitting tack. The owner was able to return to riding her horse in appropriate equipment and the horse's demeanor quickly improved.

Case Two: Helping an owner to decide a horse's Fate

In the case of this 10 year-old Thoroughbred mare, thermal imaging was used as a general screening tool to help an owner decide if she should continue with more expensive diagnostics and treatments to address her horse's lameness, or if retirement or euthanasia was a more appropriate choice.

"Lady" had been used as a racehorse and then retired to work as a children's lesson horse and low hunter. She always took a long time to warm-up, had a history of a club foot and badly rotated limb, and was more recently treated for a suspected suspensory ligament injury. Her owner requested a scan to determine if there were other issues present that would prevent the horse from returning to full soundness, or whether the horse would require ongoing care that she might not be able to provide.

A full horse scan was provided, and numerous problems were noted on thermal images.

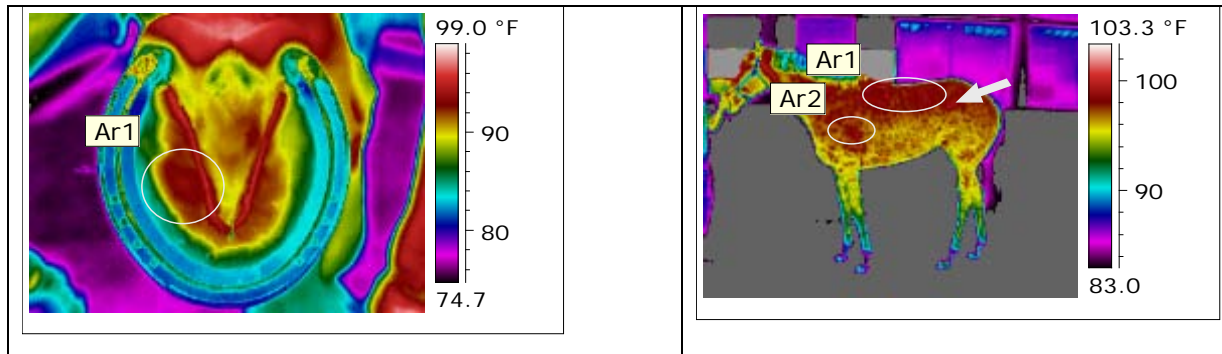


Thermal images provided useful information to an owner unsure of how to proceed with diagnostic tests. Multiple issues were found on the whole horse scan, supporting thermal imaging's role as a quick, inexpensive, and safe whole-horse imaging modality.

Lady's images showed focal hotspots in her spine consistent with spinal arthritis or ligament inflammation, and paraspinal muscle inflammation. These areas would require further diagnostics to evaluate, but would explain her slow warm-up and crooked gait. She also shows decreased circulation in the right front foot (the club-foot), and bilateral tarsitis (inflammation in both hocks). These findings suggest that even after healing from her current injury, Lady will require ongoing maintenance to be performance sound. While the owner will ultimately have to decide what she wants to invest emotionally and financially into the patient, there is simply no other modality available that would so quickly and inexpensively provide this whole-horse information for the owner.

Case Three: The performance racehorse

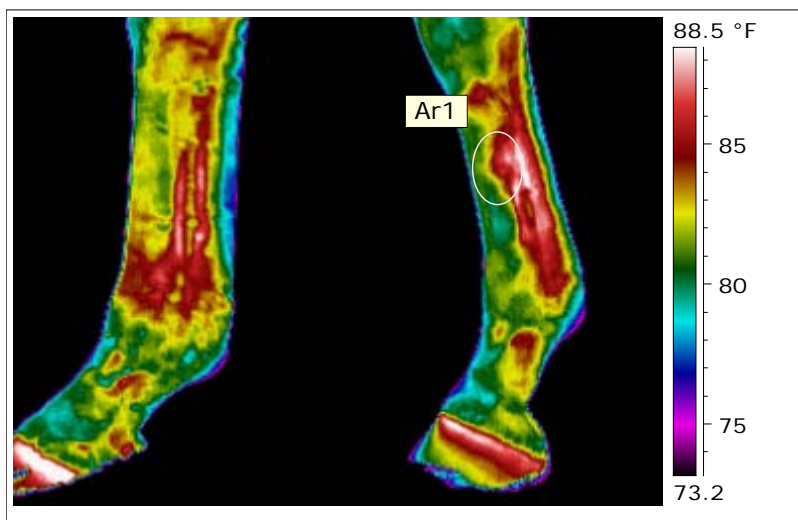
Most racehorses and upper level showhorses are financial commodities, and not pets. When their performance decreases, their value also drops; having a quick and effective diagnostic evaluation tool is imperative to keeping these horses sound and performing maximally. Performance horses present with many different lesions on thermal imaging scans – from tendon and ligament tears (confirmed with anatomic imaging), to bone inflammation, muscle inflammation or atrophy, splints, and other performance limiting injuries. This particular patient was presented due to lethargy and toe-stabbing.

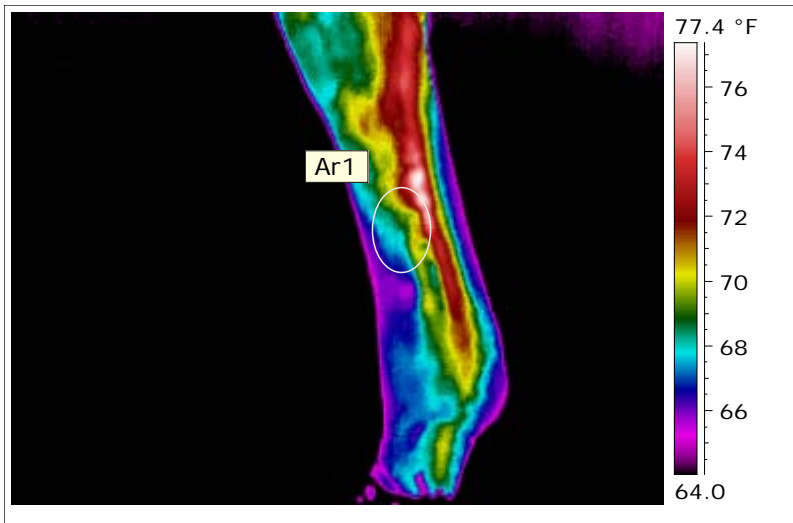


In this case, thermal imaging demonstrated general muscle inflammation, an area of muscle trauma, and an area later identified as a sole bruise. The attending veterinarian treated the horse before seeing the imaging report, and later confirmed all findings documented by thermal imaging in the horse's interpretation. Subsequently, all horses in the barn have undergone baseline thermal imaging scans.

Case Four: Serial Documentation

One of the best uses of thermal imaging is serial imaging of a lesion to monitor healing. While ultrasound is also useful for soft-tissue evaluation, the cost and small examination area involved can limit its use. Thermal Imaging can quickly monitor healing of both soft-tissue and bony lesions through serial analysis of heat signature. In the example shown, the horse presented for a hot "splint" – an inflammatory lesion on the inside of the leg created by stress or trauma. While palpation may suggest the lesion is "cold" and the horse is ready to go back to work, thermal imaging can provide a more sensitive evaluation.



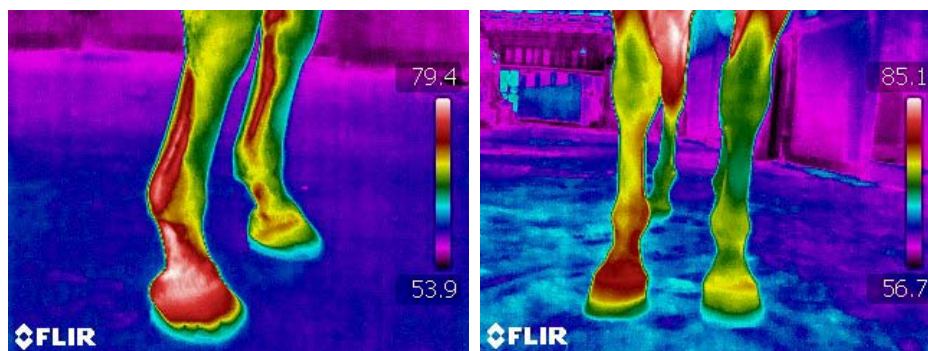


Thermal imaging should not be a replacement for a veterinary evaluation, but can help to direct therapy, and localize lesions, as well as providing evidence of healing or delayed healing of injuries.

Case Five: My aching feet!

Thermal imaging is a very useful tool for industry farriers. From hoof bruises to abscesses, imbalances and founder, it's quick and easy heat detection is invaluable for looking at hooves. In this case, thermal imaging was able to guide quick evaluation and treatment to a recently shod horse.

This 17 year-old Quarter Horse gelding had been shod in full pads after a bar shoe put excessive pressure on the heels, and the sole had become unhealthy. Though a temporary solution, the pad was applied to support the foot while medicated packing could treat the sole. When the horse was imaged two days later as part of a separate study, the obvious discrepancy in the hoof temperature called for immediate attention. The horse was found to be unsound at the trot, and quick action based on the images may have saved him from worse consequences.



The farrier was contacted and the camera demonstrated the problem. The shoe was removed and hoof testers were applied. While there was only mild reactivity, an area of weakness and diseased sole was found on the inside edge of the right front foot. The packing was putting pressure on the area as well as trapping debris. The packing was exchanged for medicated floss, and the shoe was re-applied. Radiographs were ordered to determine if there were changes involving the bone. The patient was also started on a natural medication to reduce inflammation in the hooves.

Veterinarians and farriers frequently ask if thermography is helpful for cases of laminitis or navicular syndrome. As these diseases cause changes in the circulation, they can be positively visualized.

However, for both clients and practitioners, it is important to remember that deeper anatomic structures cannot be distinctly visualized as the camera only detects surface heat.

The above cases are all real horses presented in daily practice, and there are literally thousands of other case examples. The safe, quick, whole-horse imaging obtained with the thermography camera provides valuable information for both veterinarians and farriers, and can help clients with emotional and financial decision-making regarding the welfare and continued performance of their horses. While the images may simply be viewed as an equine coat of many colors, these cases demonstrate the extreme versatility of this imaging modality when used with proper training and interpreted by skilled practitioners.