Preventing Injury

When Horses Switch Surfaces
COVER STORY

BENEATH THE SURFACE
Dr. Sheila Lyons discusses managing muscle soreness as horses switch back and forth between dirt and synthetic surfaces.

FEATURES

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New Jersey couple figure things out, then find the winner’s circle.

4710 September Sale
As the world’s largest yearling sale continues, horsemen discuss the down market, where to go from here.

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Switched On
“Change the surface, change the winner,” the saying goes. Change the surface, change the dynamic tissue tension all over the horse’s body—that is what’s being discovered when examining horses that have made the switch from dirt to a synthetic surface for training and racing. Yes, it does have an effect on the horse’s body. It is not a negative effect per se, but one that reminds us that all tissue must adapt when the nature of the stress on it changes, and the horse can benefit from our understanding and assistance during this necessary physical process.

We are all learning as we go on this important subject, and the safety of the horse is paramount. The information herein hopefully will prove useful in the evaluation and management of horses. It is not offered as a controlled scientific study, although the goal is to contribute to one in the near future that will be submitted for peer-reviewed publication. What we are looking at here are the typical physical examination findings on horses that have made the surface change, and insight on how we can help horses’ bodies as they adjust.

Racehorse patients over the last few years have changed more definitively in regular physical examination findings than at any time over the past two decades. In summary, the horses that train and race on dirt, and then make the switch to synthetic, reveal a clear and typical pattern of abnormal muscle tension and dysfunction on testing. Secondary to this muscle pathology, horses that have not previously suffered from traumatic fetlock arthritis and other critical soft tissue damage are presenting with these conditions if their large skeletal muscle problems are not addressed. This is where the risk of catastrophic injury enters, and it can persist after the horse switches back to dirt. Managing the integration of significantly different racing and training surfaces through frequent, proactive, whole-body musculoskeletal physical examination may be a key in protecting these horses while optimizing racing performance.

The sometimes startling abnormal findings in these equine patients were revealed through a standard examination practice that is employed proactively to optimize their safety and athletic preparation. The horses were not lame. Sport horses are frequently and strategically exam-
Switched On

ined to be sure that as training demands increase, the horse’s body is optimally sound and available to respond and improve in fitness and strength. That is why it is with confidence that it can be reported that a sudden change in these horses’ bodies has immediate ramifications—because a baseline on many horses was established before they switched surfaces. Their bodies tell this story.

RESULTS FROM SURFACE SWITCHES

The pattern of abnormally increased muscle tension (hypertension or spasm) that is routinely found when a horse makes a switch from dirt to a synthetic surface is predictable. Typically, the first muscle region to develop signs of a problem is the lumbar region of the longissimus dorsi muscle. Spasms can be found in this muscle after just a few days of galloping on the synthetic surface. This creates a functional block between the hindquarters and the forelimbs. If this muscle pathology is not resolved, the next area to develop hypertension and spasm is the gluteal muscle group and the proximal portion of the biceps femoris muscle. If this is not corrected and training or racing occurs, the gastrocnemius muscle becomes affected in the outwardly spreading chain of muscle dysfunction. This muscle can become quite painful to palpate, and horses with spasm in this muscle lack power. (The gastrocnemius muscle’s function is to extend the hock and flex the stifle.)

If the spasm affects one branch more than the other, the hoof can turn slightly in or outwardly. Such a dynamic imbalance than a reflection of a relative overload when the disconnection occurs through the muscle spasm in the horse’s back and hindquarters, coupled with the demands of the sport.

On neuromuscular stimulation testing, an abnormal firing pattern may occur that is identified as absent, diminished, or irregular contraction of the muscle. Horses that have developed abnormal muscle tension in response to the change in surface from dirt to synthetic demonstrate all of these abnormalities on neuromuscular stimulation (NMS) testing. Research in human medicine has shown that there is a delay in firing of motor nerves in muscles that are hypertensive. In the simplest terms, it can be seen as a complex system

Musculoskeletal Examination Methods

The standard approach consists of the frequent assessment of racehorses while “sound” and in training, and includes a thorough evaluation through palpation of every muscle accessible to this examination. Beginning at the head, we systematically palpate each muscle for abnormal tension and development status. An experienced clinician can discern a wide range of abnormal tissue tension through this careful and detailed palpation examination, and it may take many forms—hypertensive; hypotensive; focal or generalized spasm; tension bands within muscles; and irregular temperature pattern. Increased tension in a large muscle can be the result of direct strain or it may be from overuse because of compensation due to some other physical or biomechanical problem.

Next, the motor nerve response is qualitatively assessed through neuromuscular stimulation, which tests both the nerve and the skeletal muscle. NMS equipment consists of a small, portable device that sends an electrical impulse through the tissue by way of paired electrodes. The neutral electrode remains in place at the withers, and the working electrode is moved from muscle to muscle. Electrical impulses are generated that mimic the character of a normal motor nerve impulse, and when the working electrode is placed over motor points, the muscle contracts. Abnormal findings include a total absence of contraction; an abnormal firing pattern that causes inconsistent muscle tremor; weak muscle contraction; spasm in the muscle tested or spasm in surrounding muscles; varying degrees of pain in the muscle; neural quality at the motorpoint and throughout the muscle belly; or a combination of these abnormal reactions, depending on the motor point tested.

Other tests include neurologic reflex responses; range of motion in all planes; stretching range and quality; standard gait evaluation in hand and under tack; posture; ability to maintain square stance; proprioception; static and dynamic biomechanics; and general physical development and musculoskeletal symmetry. These findings are recorded on standardized forms that facilitate comparison to identify change, whether it reflects physical and athletic improvement or identifies the development of subclinical abnormality.

The goal as a sports medicine clinician is to be on constant watch for subclinical signs of dysfunction. It is generally accepted that most catastrophic injuries seem to occur accidentally and without warning, but experience and science suggest that regular physical examinations can reveal the precursors to some of these tragedies and potentially prevent them. By Dr. Sheila Lyons

Lyons keeps meticulous records on muscle and soft tissue changes
comprised of muscle groups that must each function optimally in order to optimize power and efficiency, and in horses with pathologic muscle tension, both the timing and the strength are affected. The system that ideally works in perfect concert now functions poorly, inefficiently, and experiences regional overload, fatigue, and loss of power that decreases speed. When the muscles fail to work synergistically, the load on individual parts increases substantially. This perpetuates the cycle of further diminished function and additional loss of strength, efficiency, and power.

Surprisingly, these horses are usually not lame. If they were balanced to begin with, the effect is largely symmetric in pattern and simple “poor performance” can be expected. The real risk to the horse comes from the fact they will now overload the front limbs due to the hind end “engine” malfunction and the loss of elastic and neuromuscular connection through the back. If one hindquarter is more affected than the other, the overuse injury is usually found in the diagonal front fetlock. Fatigue occurs more quickly and power diminishes when muscles are hypertensive due to restricted blood supply, which, in turn, delivers less oxygen. Muscle fatigue increases the risk of catastrophic injury.

The muscle-tension pattern will also reflect other pre-existing problems, such as biomechanical imbalances that typically originate at the hoof capsule, and generalized muscle strain that may have been present when a horse first arrives at a trainer’s stable due to stress that occurred during breaking or schooling from the gate. It can be said with confidence that the patterns described in the patients referred to are clearly associated with a change of surface because these patients receive regular evaluations and treatment so that they remain clear of these problems as they train and race.

Similar patterns, although less severe, have been discovered in horses that have switched from dirt to turf for racing and training. My experience is more limited in this, so it cannot be reported with the same confidence what the physical effects are. The other factor is that in North America, grass horses typically train on dirt as well, so the change in surface is rarely complete.

Horses that train on synthetic and switch to dirt seem to make the transition more easily than those going from dirt to synthetic, at least as far as their large muscles are concerned, although they do go through a period of adjustment. This adjustment seems related to the increased concussion of the harder dirt surface, and, therefore, the hooves, bones, and joints are most vulnerable, especially the fetlock.

Any horse with a weak foot will require a period of adjustment going back to dirt (although there are additional options for improving weak, easily traumatized hooves that should also be explored). Depending on the signs shown by the horse, the period of adjustment could last as little as a few weeks of training, or as much as a couple of months.

As far as switching back and forth repeatedly from one surface to the other, all horses would benefit from a proactive examination and physical medicine treatment process, whether you are treating the soft-tissue problems most likely to arise when you switch to synthetics, or the joint, bone, and hoof problems more likely developed to release the chronic tension and to restore neuromuscular physiology. Treating the full body takes approximately 1½ hours. This may be required every other day for two or three weeks, depending on the initial degree of hypertension.

Once the primary problems are resolved, and range of motion testing, posture, gait, reflexes, etc. have normalized, an individualized program for physiotherapists to carry out neuromuscular stimulation therapy on an ongoing basis to stay ahead of the muscle tension that normally develops from training and racing should be

Horses racing on synthetic surfaces tend to develop abnormal muscle tension

found on dirt. If you stay on top of discovering and addressing any of the above, and then condition the horse properly, there is no reason why an otherwise sound horse couldn’t make multiple switches back and forth between surfaces.

STAYING PROACTIVE

All horses develop some increased muscle tension in response to training and racing. It is the way muscle is provoked to develop in size, strength, and athletic ability as fitness improves. In general, it is a normal process. But the development of a body to reach levels of elite racing ability is not normal. We are asking for unnatural extremes, and so assisting the body as it develops should be a goal of sports medicine.

The first step is for the veterinarian to perform a thorough physical examination and record all findings. Neuromuscular stimulation is a method most effective in restoring physiology and function to each muscle. This technique utilizes the application of an electrical impulse that mimics the motor nerve pattern that normally causes a muscle to contract. Different pulse rates have been shown to stimulate different muscle fiber types, commonly referred to as the fast and slow twitch muscles.

Other pulse rates cause endorphin release and assist in pain relief, relaxation, and mobility. Depending on how each muscle responds, they should be treated as need-developed. This therapy can also be used to optimize athletic performance in racehorses, as it can improve muscle-fatigue resistance, increase muscle strength and elasticity, and help development of muscle bulk to aid musculoskeletal symmetry and power.

Only veterinarians or experienced and licensed physiotherapists should perform this service. It is too easy to cross the line from therapy to harm when using neuromuscular stimulation. We should seek to develop licensing and educational guidelines in North America soon so that this critical service is widely available to all of our horses.

So how long does it take for physical adaptation to occur when horses switch from dirt to synthetic? We must measure that in weeks to months, not days to weeks. But the key seems to be knowing your horse’s large muscle and general physical status at all times, staying on top of tension as it develops, and not assuming that if a horse is not lame, it is not affected. In my practice, a “sound” horse is an emergency call because it is our responsibility to keep horses that way, make them stronger, and keep them safer. The best sports medicine should deliver a service through special expertise that carefully optimizes athletic performance and improves safety through proactive service—preventing injury instead of reacting to injury.