

# The Equine Hind Limb

Third of a series on lameness in horses

By Mark R. Baus, DVM

If the front limbs of the horse evolved to support their mass, the hind limbs developed as the motor for running, jumping and everything else we've trained them to do. This multi-jointed limb with its impressive muscle mass is capable of propelling the horse and rider over long distances, high fences or both. It's easy to imagine that if a special horse can jump over a seven foot wall, every other horse has remarkable power from their hind limbs.

The real magic of the hind limb starts with the massive muscle mass of the upper limb. In order to control these muscles, the hock and the stifle must move in perfect unison. To do this, the horse employs a unique mechanism called the reciprocal apparatus to insure that the hock and stifle flex at the same angle during motion. The key structure of this apparatus is the peroneus tertius ligament which attaches to the femur and the cannon bone. The hind limbs also have a stay apparatus, as do the front limb, which allows the horse to remain standing with little or no muscle exertion.

Anatomically, the lower limb is similar below the knee and the hock. The suspensory apparatus of each limb gradually accepts the body's weight during motion and, like a spring, releases the energy absorbed during the landing phase by pushing the body up and forward. However, the hind limbs are additionally challenged by the propulsive forces of the powerful hind limb muscles. The suspensory apparatus of the hind limb stores and releases tremendous forces with each step.

Applying the basic laws of physics, the hind limb generates significant amounts of torque when necessary. Torque is defined as the force applied to a lever arm to rotate across a fulcrum or pivot. In the case of the horse's hind limb, the lever arms consist of the femur, tibia, cannon bone and the phalanges. The pivots consist of the joints; specifically, the hip, stifle, hock, fetlock, pastern and coffin joints. Because it is a multi-jointed limb of propulsion, the hind limb generates significant strain forces on the back of the limb as well as compression forces on the front of the limb.

Based on these laws of physics, the joints under the most strain and compression are the joints between the longest

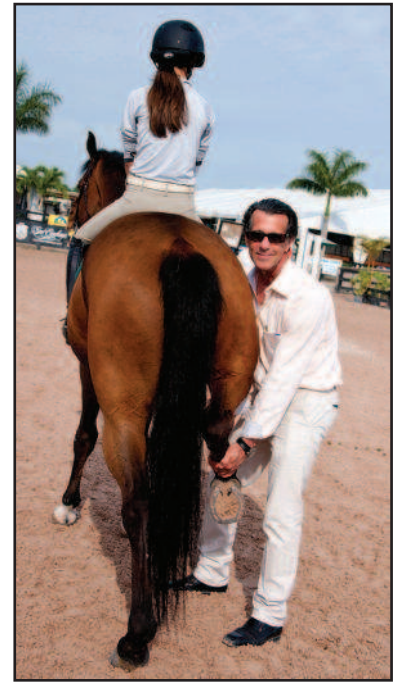
lever arms: the hock and the stifle. The stifle is a complex joint with the largest amount of synovial lining of any joint. It consists of the femur, patella, tibia along with a number of interconnecting ligaments and pair of menisci for cushioning.

The hock is an even more complex joint consisting of 5 separate joints and 7 bones (not including the tibia and cannon bone).

Early in the horse's evolution, the hock landed on the ground during locomotion, similarly to the human ankle. The numerous bones and joints of the hock served the early horse well when it was on the ground but this complex design poses a challenge as the load bearing shifted to the tip of the phalanges (toes) for greater speed and agility.

The causes of lameness in the hind limb are myriad but suffice it to say, lameness conditions are specific to the athletic pursuits of each horse. Although congenital and developmental orthopedic conditions can occur before they become athletes, horses respond predictably with lameness problems based on their discipline. If the sport is of a high impact nature (race horses, jumpers, three day eventers); these lameness problems will be different from equestrian sports of a low impact nature (dressage, gaited horses, western performance horses).

Regardless of the nature of their activity (high impact or low impact), the one predictable source of chronic pain in the equine athlete is from the lower hock joints. This is expected for several reasons. First of all, the hock is subjected to



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Flexing the right hock

## About Mark R. Baus, DVM

Dr. Baus is the son and grandson of large animal veterinarians in South Dakota. Although this experience shaped his decision to become a veterinarian, the desire and inspiration to provide care exclusively to horses occurred during veterinary school. Upon graduation from Kansas State University College of Veterinary Medicine in 1981, Dr. Baus joined a veterinary practice in Fairfield, Connecticut with Drs. Howard Raven and Rick Mitchell.

Dr. Baus and Dr. Mitchell founded Fairfield Equine Associates in 1989 where Dr. Baus worked until he started Grand Prix Equine in 2009. He has provided care to horses in the same region and for many of the same clients for over thirty years. The Fairfield and Westchester county region has a long tradition of supporting the show horse industry. Many of the finest horses, riders and trainers in the country have started their careers in this region and Dr. Baus has had the privilege to work on many of those great horses and with many great trainers and riders.

In addition to memberships in the American Veterinary Medical Association and American Association of Equine Practitioners, Dr. Baus is on the veterinary committee for the United States Equestrian Federation and the Horse and Rider Advocates Committee for the United States Hunter Jumper Association. He is the moderator for the English Sport Horse rounds with the AAEP and is a past member of the AAEP Ethics Committee.

In his off time, Dr. Baus teaches a course in life skills at a local prison. He also enjoys auto racing as a fan and a driver. Ω



repetitive forces because it is between two long bones. Secondly, the lower joints of the hock are flat-surfaced joints with a very low range of motion. Even though they have a small range of motion, the front of the lower hock joints is under significant compression with each stride.

Fortunately, lower hock joint pain is usually low-grade and highly manageable. Hock pain will usually diminish during the warm-up phase of exercise. However, due to the nature of joint related problems, the pain tends to be progressive with time and use. It is not unusual for the hock joints to require some form of therapy throughout the horse's athletic career.

Inflammation in the stifle joint, although not as common as hock problems, is not unusual in jumpers, especially at the upper levels of performance. Although the stifle is a high motion joint, the sources of inflammation tend to be synovial and therefore fairly manageable.

Hyperextension injuries of the hind suspensory ligament (suspensory desmitis), despite popular opinion, are often chronic injuries (rather than acute) due to repetitive motion and are more common in horses with long pasterns and low fetlock angles. Horses with this conformation also tend to perform well in dressage and hunter divisions so suspensory desmitis is not uncommon in these disciplines.

The key to preserving your horse's athletic well being is to understand his or her limitations based on conformation and pre-existing conditions, and then maintain a work load that is consistent with those restrictions. Needless to say, your veterinarian's involvement during the purchasing process and throughout your horse's athletic life are essential for determining performance and use levels. Ω

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