Tendons and ligaments in the horse are the “belts” and “cables” that hold bones in place and allow the muscles to do their jobs in creating propulsion—forward, backward, sideways, and up and down. Because of the workload often put upon them, tendons and ligaments are frequent sites of injury and disease.

What are tendons and ligaments?

Dorland’s Illustrated Medical Dictionary:

Tendon—A fibrous cord by which muscle is attached to bone.

Ligament—A band of fibrous tissue that connects bones or cartilages, serving to support and strengthen joints.

Many athletic horses suffer tendon and ligament injuries, which can end a competitive life if not handled quickly and effectively.

To go into detail about every tendon and ligament would fill several textbooks, which is something that’s already been done. Instead, we will concentrate on the tendons and ligaments in the limbs, especially the forelimbs, which often are the sites of injury and disease. We will examine their construction, how they function, and what can happen when something goes awry.

Once again, we have utilized multiple sources, including textbooks, but one source has been most helpful: Nathaniel White II, DVM, MS, Dipl. ACVS, director of the Marion duPont Scott Equine Medical Center, part of Virginia Tech in Leesburg, Va.

Injury and Performance

The importance of maintaining healthy tendons and ligaments is borne from the fact that injuries to that part of the anatomy can quickly end a performance horse’s career, and has done so in a number of instances.

One British researcher has estimated that more than 30% of horses involved in racing and other forms of competition throughout Europe suffer from some sort
of tendon injury or problem as the result of the vigorous exercise involved in running, jumping, and dressage.

White has stated that he doubts the percentage would be quite that high in the United States, but feels it could very well be that high in the United Kingdom because racehorses there usually compete on turf. The soft, yielding turf places substantial stress on the tendons and ligaments.

American horses, on the other hand, tend to sustain more joint and bone injuries than their European counterparts because American horses often race on harder dirt surfaces.

The wonder isn’t that tendons and ligaments sustain injury, but rather that they aren’t injured more often. With a Grand Prix jumper, for example, the tendons of the foreleg are asked to do the near-impossible. The tendons often are stretched to the limit and beyond when a horse lands after clearing a six-foot jump.

**Cases in Point**

Deep digital flexor tendons and the superficial flexor tendons play important roles in the horse’s movement. As does the suspensory ligament, which originates at the upper end of the third metacarpal bone and the lower edges of the distal row of carpal bones.

Tendons and ligaments are similar in structure, but, generally speaking, tendons are more flexible and have more stretching capability. Both are made up of collagen fibers that are arranged lengthwise so that they are capable of stretching.

Collagen is the tough protein substance found in skin, tendons, bone, cartilage, ligaments, and all other connective tissues, including fascia (flat layers of fibrous tissue that separate different tissue layers). Collagen allows tendons and ligaments to stretch and contract and also gives them their toughness.

The superficial flexor tendon is most readily visible because it runs down the back of the cannon bone close to the skin. It originates at the superficial flexor muscle just behind the elbow in the front legs and just behind the stifle in the rear limbs. It travels downward, splitting after it passes over the sesamoid bones, and attaches to the short pastern bone (P2). Along the way, the superior check ligament connects the superficial flexor tendon to the radius just above the knee.

The deep flexor tendon originates with the deep flexor muscle, also located behind the elbow. It runs between the superficial flexor tendon and the cannon bone and ultimately attaches to the coffin bone (P3). The inferior check ligament connects the deep flexor tendon with the cannon bone just below the knee. The role of the check ligament is to limit or “check” the movement of the tendon so it isn’t over stressed.
The digital extensor tendon begins with the digital extensor muscle in the same general area as the two flexor tendons, only on the forward (cranial) portion of the leg rather than the rearward (caudal) side. It continues downward along the front of the cannon bone all the way past the pastern, ultimately attaching to the coffin bone.

The flexor tendons are designed to move—or flex, as the term implies—the leg and hoof in a rearward motion, and the extensor tendons allow the limbs to be brought forward, or extended. A greater stress is placed on the flexor tendons than on the extensors.

As the horse’s weight descends, the knee joint is straight or even overextended (bent backward), stretching the flexor tendons, but putting less pressure on the extensors. Most tendon injuries and disease involve the two flexor tendons, with the superficial flexor tendon being the one most apt to “bow” or suffer inflammation.

The reason the word “bow” is used is that when the fibers tear, inflammation and swelling cause the tendon to bulge or bow outward.

Another important part of the leg apparatus is the suspensory ligament. It attaches to the cannon bone just below the knee and passes downward (distally), attaching at the sesamoid bones at the rear of the fetlock joint. At the bottom of the sesamoids the ligament splits into extensor or sesamoidean ligaments that wrap around to the front of the long pastern bone (P1).

The suspensory ligament is vital for supporting the fetlock. When abnormalities or injuries occur that weaken the suspensory ligament, there often is a dropping of the fetlock as the horse stands or moves.

At the fetlock, another ligament—the volar annular ligament—wraps around the entire joint and attaches to the tendons and ligaments of the antebrachium (forearm) and manus (hand).

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lower end of the third metacarpal bone and the upper edges of P1. One of its prime functions is to keep the tendons in place. (When the deep flexor tendon is injured, it quite often is at this point. Many practitioners say that this is the most difficult tendon injury to deal with because it’s encased in a strong tendon sheath.)

While the digital muscles provide the power to raise, lower, and bend the legs at the knee, ankle, or hock, the tendons are the real workhorses. Each time a horse takes a step, the tendons and ligaments come into play.

In addition to providing flexion, they serve as part of the stay apparatus that allows a horse to stand and even sleep on its feet.

**Tendon Injury**

Each tendon is enclosed in a sheath. Thinner areas of the sheath, such as the area behind the cannon bone, are often sites of injuries. A thick sheath encases the tendons at the point where they pass behind the fetlock. It would appear that nature has provided additional protection for the tendon at this point because this is where there is the most friction and pressure, especially when the horse is traveling at speed. The sheath is lubricated with synovial fluid to eliminate friction as the tendon moves.

While we think of the tendons as cables that allow the muscles to function, they also serve as shock absorbers. Tendons can help dissipate concussion that otherwise would be borne by joints, bones, and muscles.

What we really have here is a rather elaborate cable and pulley system that allows the legs to move forward and rearward and, at the same time, supports the weight of the horse and absorbs concussion. All of the parts—bones, ligaments, cartilage, and tendons—are designed to interact and function efficiently. When injury or disease prevents this, the results can be dramatic. As the horse compensates for injury to one aspect of the apparatus, it might have a harmful effect on the other components, and they will be compromised as well.

Basically, there is a stress/strain relationship involved when the tendons are brought into play. Stress or load is applied when the horse bears weight on each limb, which is accommodated by an equivalent lengthening (strain) of the tendon.

During exercise, a horse's tendons might stretch and retract from one to three inches. When the tendon is pushed beyond its "strain" capacity, injury is the result. The damage normally involves rupturing of the tendon's collagen fibers when they are stretched beyond their capacity. This results in inflammation, soreness, and an inability of the limb to function normally.

Most serious tendon injuries occur to the front limbs for obvious reasons. First, 60-65% of the horse's weight is carried on the front end. Second, when a horse travels at speed, there is one point in every stride where the animal's entire weight descends on a single foreleg. This translates into extraordinary strain on the flexor tendons in that leg as well as on the entire suspensory apparatus. The same is true of Grand Prix jumpers when they land and all of the concussion is absorbed by the front legs.

When injury occurs, there often is great
variation as to severity. The rule of thumb is the more fibers that are torn, the more serious the injury and the longer the healing and recuperation period will be.

**Diagnosing Injuries**

Tendon injuries today can be examined with ultrasound. The severity of defects or lesions in the injured tendon is rated on a scale of one to four, according to how they appear on the ultrasound images. Lesions appear as an ultrasound echo termed a hyperechoic (partial loss of echoes) or an anechoic (total loss of echoes) region, usually in the center of a tendon. The greater the loss of echoes, the more severe the injury.

Following is the numerical rating:

**Type 1** Tendon enlargement with lesions appearing only slightly hyperechoic (darker) than usual. They represent minimal disruption of the fiber pattern and minimal infiltration of inflammatory fluid.

**Type 2** Lesions are approximately half echoic and half anechoic. They represent disruption of the fiber pattern and local inflammation.

**Type 3** Lesions are mostly anechoic and represent significant fiber tearing.

**Type 4** Lesions are totally anechoic. They appear as black areas within a structure and indicate almost total fiber tearing with hematoma (blood-filled) formation.

It is estimated that a tendon can stretch up to 8% before the fibers begin tearing.

Ligaments are not immune to injury and disease. When injuries occur to ligaments in horses, they often involve the suspensory ligament. Unlike tendon injuries, ligament injuries often occur in both front and rear limbs.

**Treatments**

Treatment of a tendon injury, according to White, is a combination of acute therapy and long-term rehabilitation. The goal is to reduce inflammation, maintain blood flow, and decrease the formation of scar tissue.

The initial therapy includes systemic and local anti-inflammatory therapy. Phenylbutazone therapy for five to seven

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days is indicated, and the anti-inflammatory DMSO is applied topically for seven to 10 days. Ice or cold water is applied for the first seven to 10 days, depending on the amount of swelling.

The injection of hyaluronate acid around the tendon or administered intravenously can also have beneficial anti-inflammatory effects, according to White.

Another important aspect of acute treatment, says White, involves providing support for the injured tendon in the form of wraps or bandages. But, they must be properly applied. Adequate padding is a must to avoid further injury from constriction of the already injured tendon.

Rest is the primary treatment, according to White. He says stall rest with hand walking is normally required for the first one to two months after the injury. Further increases in activity, White says, are determined by the ultrasonic appearance of the tendon. The core lesion should diminish within the first two months, followed by decrease in the cross-sectional area.

Turnout is often recommended, but in some cases, controlled exercise, including riding under saddle and swimming, can be helpful in the remodeling phase of tendon healing. White says most race-horses can start galloping after four to five months, but the tendon should be monitored regularly with ultrasound, using increased scrutiny when sprint work is initiated. Normally, he says, horses should not race before eight months after a Type 2 or greater injury. With some horses, tendons will not be ready for race-type stress until 12 to 14 months after the injury.

Research continues in an effort to find more effective treatment approaches for tendon injuries. New treatment methods include shock wave therapy and the use of hyperbaric oxygen chambers. Both approaches have produced some positive results, but more research is needed. Interest in using stem cells of bone marrow origin (not embryonic) to stimulate tendon and ligament healing is also growing.

**Take-Home Message**

Many tendon and ligament injuries can be avoided through proper conditioning and training regimens.

Research continues in an effort to find more effective treatment approaches for tendon injuries. New treatment methods include shock wave therapy and the use of hyperbaric oxygen chambers. Both approaches have produced some positive results, but more research is needed. Interest in using stem cells of bone marrow origin (not embryonic) to stimulate tendon and ligament healing is also growing.

**About the Author**

Les Sellnow is a free-lance writer based near Riverton, Wyo. He specializes in articles on equine research, and he operates a ranch where he raises horses and livestock. He has authored several fiction and non-fiction books, including Understanding Equine Lameness, Understanding The Young Horse, and The Journey of the Western Horse, published by Eclipse Press and available at www.ExclusivelyEquine.com or by calling 800/582-5604.