

Equine Joints, Muscles & Connective Tissues

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One can appreciate the athleticism and performance capabilities of horses as they gallop across the finish line, race around barrels, piaffe in place, or jump over high fences. Despite the fact that the horse and rider make it look effortless, the truth of the matter is that the horse's body parts are hard at work and most likely under some sort of joint strain.

The horse's body is comprised of 205 skeletal bones⁹ and over 700 skeletal muscles⁴. With the combinations of bones that create joints and a network of cartilage, tendons and ligaments to support joints and attach muscles, the horse is able to move in various disciplines and achieve acrobat-like feats. It should come as no surprise that the horses suffer from injuries when one considers the vital parts of the equine anatomy and stress upon them⁸. When an injury does occur to a joint, muscle, tendon or ligament, it can unfortunately be career threatening or even life-threatening. So understanding the relationship between the different types of joint and muscle structures is an important first step in keeping your horse healthy

JOINTS & CARTILAGE

Bones do not work independently; it is the alignment with one or more other bones that forms a joint. It is the joint that permits a horse to move their limbs to travel across a terrain while absorbing concussion⁹. In the horse's legs alone there are 80 bones – 20 in each foreleg and hindleg⁹ all of which are jointed to allow the horse to lift, bend and flex its leg.

There are three classifications of the equine joint;

Fibrous joint – these are immovable joints where the bones are bound by fibrous tissue that hardens into bone (ossifies) as the horse matures. For example: the joints within the equine skull⁹.

Cartilaginous joint – these are slightly moveable joints and are united by fibrocartilage (collagen fibers), hyaline cartilage or both. An example would be the connective tissue between vertebrae⁹.

Synovial joint – these are the moveable joints and the ones that tend to sustain injury or become afflicted with disease. This type of joint consists of two bone ends that are both covered by articular cartilage. This cartilage is both smooth and resilient, allowing frictionless movement. In each joint lies a capsule that contains the inner lining called the synovial membrane. It is here that synovial fluid is secreted to lubricate the joints. Fluid is stored in the supporting cartilage of the joint and when weight bearing occurs, it is squeezed out onto the bone surface and is reabsorbed by the cartilage when the weight is lifted. Examples would be the knee and fetlock⁹.

An important component of synovial fluid is hyaluronic acid – also known as sodium hyaluronate and hyaluronan. It is responsible for giving the synovial fluid its lubricating capability and is often depleted when injury or disease occurs within the joint. When cartilage in the joint disappears, it leaves bone rubbing on bone which compromises joint function, causes pain and an increased probability of developing osteoarthritis, and is overall detrimental to the horse's athletic career².



MUSCLES

The musculoskeletal system is a complex network of various tissues that function in coordinated fashion so the horse can move in an organized, fluid and purposeful fashion⁷. Equine athletes have proportionally greater muscle mass than comparable athletic species with muscle tissue comprising approximately 45% -60% of body weight^(3,5). What we call muscles are actually bundles of long muscle fibers that are held together by a coating of connective tissues. These long fibers are made up of hundreds to thousands of myofibrils which are comprised of protein molecules known as actin and myosin, and both exist in a functional unit called a sarcomere. It is these long actin and myosin molecules lying next to one another inside the myofibrils that give the "banding pattern" we observe of skeletal muscles and are responsible for muscle contraction. Muscles are considered "contractile organs" as they create movement once activated⁷.

TENDONS & LIGAMENTS

Tendons and ligaments are the horse's "belts" and "cables" that hold bones in place and allow muscles to do their jobs in creating propulsion forward, backwards, sideways and up and down¹⁰. They are also the target of frequent injury and disease because of the workload that is often put upon them. Tendons and ligaments differ from one another not only in



their anatomical location but also in the composition.

A tendon is a strong, fibrous band of soft connective tissue that attaches skeletal muscle to bones^(7,8,10). Its basic function is to transmit the muscle's force to the bone to produce a movement⁷ such as lifting, extending and flexing of the equine limb¹. Tendons are enclosed in a sheath which is lubricated with synovial fluid to eliminate friction as the tendon moves¹⁰. They also play a role in shock absorption and dissipate concussion that would otherwise be borne by joints, bones and muscles¹⁰. Most serious tendon injuries occur to the front limbs as 60-65%

of the horse's weight is carried there¹⁰.

Ligaments are tough bands of fibrous tissue that connect bones or cartilages, serving to support and strengthen joints^(7,8,10). A surprising number of ligaments can stabilize a single joint like the stifle which is comprised of 14 ligaments. Ligaments are often found within a joint like the meniscus, cranial and caudal cruciate ligaments, and outside the joint like the middle, medial and lateral patellar ligaments, or the medial and lateral collateral femorotibial ligaments⁷. Ligaments are not immune to injury and disease and often occur in both the front and rear limbs⁹.

INJURY, INFLAMMATION AND SUPPLEMENTATION

The wear and tear of an athletic lifestyle takes its toll on a horse's joints and corresponding structure; muscles, cartilage, tendons and ligaments. Synovial joints are subjected to injury or disease as a result of poor confirmation. Problems such as inflammation of synovial membranes (Synovitis) or fibrous joint capsules (Capsulitis), bone fragments, fractures to the joint, and osteoarthritis resulting from severe joint injuries that have not been treated adequately⁹ are all common joint conditions in horses.

Musculoskeletal injuries are the most common cause of poor performance in horses⁷ and include tears and strains⁷ of muscle groups located in the horse's back, hindquarters, shoulders and legs⁵. Signs of muscle injury include: subtle lameness, reactivity to palpation, unwillingness to engage the hind quarters, rearing, bucking, bolting, pain, heat and swelling, muscle fibrosis, ossification (mineralization) and mechanical lameness^(5,7). They may also develop muscle metabolism abnormalities such as exertional rhabdomyolysis (tying-up) or a form of it called polysaccharide storage myopathy (PSSM)^(5,7).

When an injury occurs to a joint, muscle or their components, inflammatory reactions occur, causing swelling, constriction of the local blood vessels and release of inflammatory mediators (cytokines) that break down cells and recruit other cells that play a crucial role in the healing process⁷. The structures of the lower limb are particularly injury prone, from the superficial digital flexor tendon to the suspensory ligament⁷.

The cornerstones of any joint or musculoskeletal injury treatment are controlled rest and a rehabilitation program with a gradual increase in exercise¹. It is also important to maintain healthy cartilage and synovial fluid within the joint to decrease inflammation that causes pain, swelling, and the eventual degradation of the joint's components. This is why many horse owners and trainers depend on the assistance of supplementation to support their horse's joints.

The purpose of a joint supplement is to provide building blocks for cartilage and synovial fluid, and to reduce inflammation and cartilage

degradation. The most common compounds included in joint supplements include Chondroitin sulfate and glucosamine, but even though Chondroitin sulfate is absorbed well, it does not prove effectiveness in the horse⁶. Whereas scientific studies and information suggest that glucosamine is the most logical choice for the treatment and prevention of joint disease in horses.

Another recent class of anti-inflammatory to be used in equine joint health is the addition of hyaluronic acid to the horse's diet. Hyaluronic acid plays a significant role in synovial membrane lubrication that is responsible for dissipating more than 50% of the friction within the joint⁹ and is essential when it depletes from the body due to an injury or disease within a joint. Both glucosamine and hyaluronic acid, when fed at the proper levels, have been shown to reduce the effects of performance demands by supporting the joint matrix and increasing the thickness of joint fluid. This in turn has the ability to reduce inflammation, maintain blood flow and decrease the formation of scar tissue⁹ in horses.

Overall, the goal is to prevent injury when it comes to structures such as joints, cartilage, muscles, ligaments and tendons, rather than seek a cure once the injury has occurred⁹. Proper conformation is good deterrent⁹ but injury or stress from repeated or hard exercise can cause damage to the horse's limbs. Consider tackling joint and musculoskeletal health proactively by using supplements which effectively assists in inflammatory aspects of injury⁶. Create a strategic conditioning and training program to promote progressive strengthening of musculoskeletal tissues⁹ and keep the horse in fine athletic fitness will aid in maintaining soundness^(6,8). Being wary of ground conditions and being sensible about what you ask of your horse in order to avoid pushing them beyond their capabilities⁹. Lastly, understanding what to look for and recognizing lameness sooner^(5,6) can help a horse successfully return to work. Obtain an accurate diagnosis from your veterinarian¹ and select appropriate supplementation and therapies to return a horse to optimal function⁶.

Sinew-X Plus can be used to maintain normal healthy joints, muscles, tendons, ligaments and cartilage with the benefits of anti-inflammatory herbs, D-Glucosamine sulphate (5000mg), Hyaluronic acid (100mg) but without the sensitivity to Methylsulphonylmethane (MSM) and its contra-indication due to competition rules.



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Lauren Marlborough has been an avid horsewoman for over 15 years with several years experience in many sectors of the horse industry. She carries a BSc from Lakehead University, an Honours Biological Science post-degree from Brock University, Certification as an Equine Sports Massage Therapist, has obtained the Equine Science Certificate with Distinction from the University of Guelph and has her own equine therapy business in Southern Ontario.