

Take a Tour of the

Part I

EQUINE JOINT

BY DOUG HERTHEL, DVM

PHOTOS AND
ILLUSTRATIONS
COURTESY OF
ALAMO PINTADO
EQUINE MEDICAL
CENTER AND
PLATINUM
PERFORMANCE





YOUR HORSE'S JOINTS ARE ESSENTIAL TO HIS LONG AND USEFUL LIFE. HERE'S HOW TO KEEP THEM HEALTHY, PAIN-FREE AND PROTECTED FROM DISEASE AND INJURY.

The equine joint withstands many forces of nature—compression, strain, shear and concussion. Your trail horse relies upon his joints to support him as he takes you down the trail—over mountains, through rivers and all types of footing—while keeping you safe. In this exclusive three-part series, you'll gain a basic understanding of joint anatomy and learn valuable tips for optimal equine joint health. We'll explore the equine joint's remarkable interior design, learn how to spot the early warning signs of joints "going bad," tell you which of your horse's joints are most at risk, and give you the tools and skills you need to keep them sound and, if needed, restore them to health.

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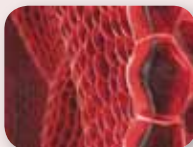




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FIVE MAJOR CONTRIBUTORS to the

There are at least five contributors to the development of equine joint disease. Fortunately with nutrition, we can influence and slow down each of these five contributors.

UNHEALTHY JOINT

CONDITION	CONTRIBUTOR
CHRONIC INFLAMMATION	 <p>Inflammation</p> <p>Inflammation is a necessary response for healing and survival. However, continual exposure to the inflammatory response is a primary cause of joint disease.</p>
FREE RADICAL DAMAGE	 <p>Enzymatic Activity</p> <p>Free radicals can degrade the hyaluronic acid in synovial fluid, which results in loss of viscosity and can impair the joint's ability to move smoothly without friction.</p>
DEGRADATIVE ENZYME ACTIVITY	 <p>Free Radical Damage</p> <p>The hallmark of osteoarthritis is deterioration of articular cartilage, generally by enzymatic degradation of type II collagen and aggrecan by enzymes known as aggrecanase enzymes.</p>
TRAUMATIC INJURY OR OVERUSE	 <p>Traumatic Injury or Overuse</p> <p>Although exercise is important for the growth and maintenance of healthy joints, overuse and exercise-related injuries are often contributors to the development of joint disease.</p>
NATURAL AGING PROCESS	 <p>Low-Grade Damage</p> <p>Everyday activity and exercise contributes to normal wear and tear on the joints. Chronic exposure to free radicals and inflammation also speeds the aging process.</p>

DEVELOPMENT of JOINT DISEASE

Early detection and proactive care of joint problems is extremely important because the structures within the joint—especially joint cartilage—do not have the ability to heal and regenerate as well as many other tissues in the body.

HEALTHY JOINT

SOLUTION

Various nutrients have been shown to decrease the inflammatory response, including: Omega-3 fatty acids, Glucosamine, Avocado/Soybean Unsaponifiables (ASU), Cetyl-Myristoleate, Antioxidants such as Vitamin C and Vitamin E. Botanical compounds such as boswellia serrata and turmeric.



Normal Synovial Membrane

Antioxidants help protect the joint against degeneration caused by free radical damage. Supplemental hyaluronic acid can augment free radical-damaged hyaluronic acid molecules which helps maintain synovial fluid viscosity and normal joint function.



Intact Collagen

Omega-3 fatty acids decrease the activity of aggrecanase enzymes in the joint and, therefore, reduce cartilage breakdown.



Synovial Fluid

Omega-3 fatty acids, antioxidants, silicon, ASU, MSM, and other cartilage building nutrients help slow the degenerative process, and aid in recovery by stimulating the growth and repair of cartilage components. Silicon supplementation helps support healthy bone density, cartilage synthesis and tendon and ligament strength.



Normal Cartilage

Omega-3 fatty acids, antioxidants, and cartilage building nutrients protect against degeneration, which naturally occurs with age.



Normal Cartilage



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Veterinary Study of Back on Track

In only two weeks of using Back on Track's therapeutic Welltex blanket, inflammation is greatly reduced.

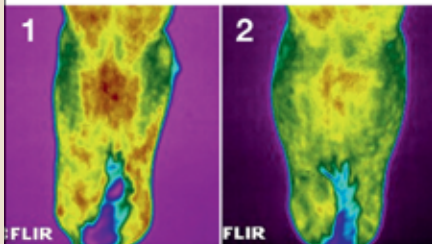


Image 1 is prior to using our blankets. Image 2 is taken two weeks after using our blankets.

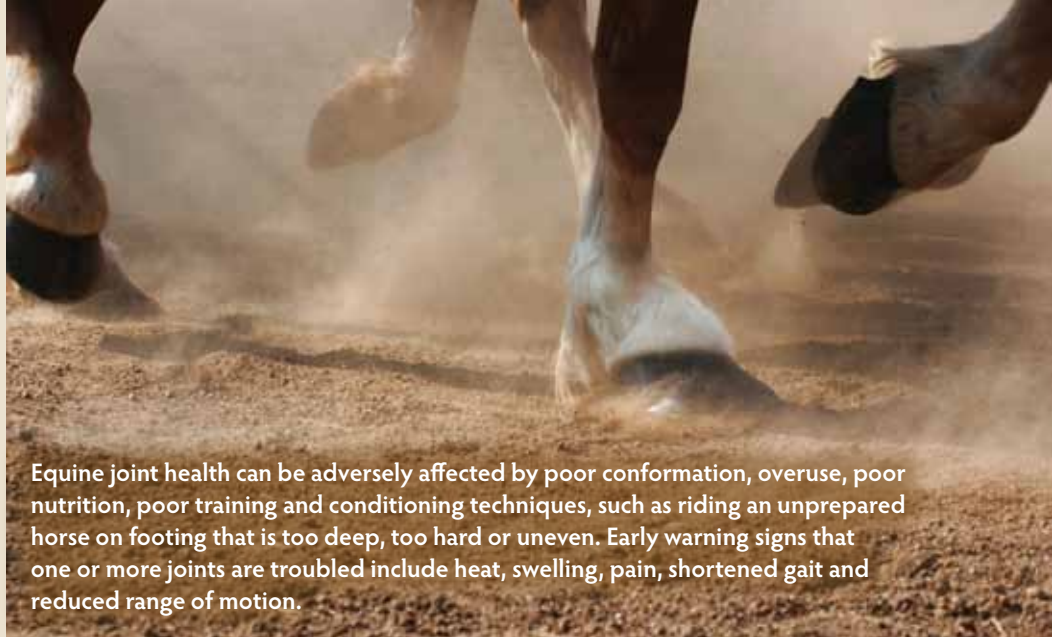
The red seen in the pictures above reflect inflammation. The images above show an 11 year-old Irish Sport Horse used for eventing that presented with severe back pain. These thermographic images show remarkable improvement after 2 weeks of using the Back on Track Blanket.

Laura A. Werner,
DVM, MS, DACVS
The Equine Center, CA



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Equine joint health can be adversely affected by poor conformation, overuse, poor nutrition, poor training and conditioning techniques, such as riding an unprepared horse on footing that is too deep, too hard or uneven. Early warning signs that one or more joints are troubled include heat, swelling, pain, shortened gait and reduced range of motion.

WHY ARE JOINTS CRITICAL TO THE HEALTH AND USEFUL LIFE OF THE HORSE?

PART I: HOW THEY WORK

Preventing joint injury and promoting optimum joint health are two of the most important things a horse owner, trainer or rider can do for their horse. These skills require an educated eye when observing your horse and his anatomy in motion. You need to know what your horse's joints look like, feel like and flex like, so if a change occurs you can detect it early. You become your horse's advocate by familiarizing yourself with what is "normal" for your particular horse. In general, a sound horse is able to stand, walk, trot and gallop evenly on all four legs (with or without a rider) and without short striding or head bobbing. Thus, you are able to recognize some of the signs of joint trouble brewing.

You must be aware of increased temperature changes in the joint regions, joint distension, joint pain, decreased flexion or lameness. If any one or more of these signs appear, you need to know when to call your veterinarian for help.

Based upon your veterinarian's physical exam of your horse, he or she may recommend one or more of the following: decrease work or change footing, rider, shoeing, tack, nutrition or training schedule. It is possible that before a definite diagnosis or recommendations can be made, further joint and lameness evaluation may require medical technologies such as x rays, ultrasound, nuclear scintigraphy, nerve or joint blocks and even MRI of the area or areas. Your veterinarian can then properly diagnose exactly what to do for the problem area.

Remember, early detection and proactive care of joint problems is extremely important because the structures within the joint—especially joint cartilage—do not have the ability to heal and regenerate as well as many other tissues in the body. Once full thickness damage occurs to the hyaline (articular) joint cartilage it may be too late to initiate treatment to repair

continued page 24

“Healthy cartilage is able to act as a shock absorber, as it absorbs and dissipates energy and hydraulic pressure during the millions of cycles that each joint travels annually.”



He Needs You To Get Rotation Right

Over-using dewormer compounds can lessen their efficacy. Recent studies* show how parasite resistance may be better controlled utilizing a rotational deworming program.

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	Pyrantel Pamoate B		Pyrantel Pamoate B



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Your veterinarian can help design a parasite prevention program tailored to your individual horse's needs with consideration given to age, geographic location, environmental conditions, fecal egg counts, housing conditions, and number of horses on your premises.

* M. Blaneck, H. A. Brady, W. T. Nichols, D. P. Hutcheson, S. P. Jackson, K. R. Pond and K. R. Wilson. Investigation of anthelmintic and deworming regimens in horses. Professional Animal Scientist. 22(2006): 346-353. M. Edmonds and J. Edmonds. Efficacy of an Equine Rotation Deworming Program. Data on File. (2006).



the cartilage degeneration. The goal and wish of every horse owner and rider is that their horse will have a very sound and healthy life and career.

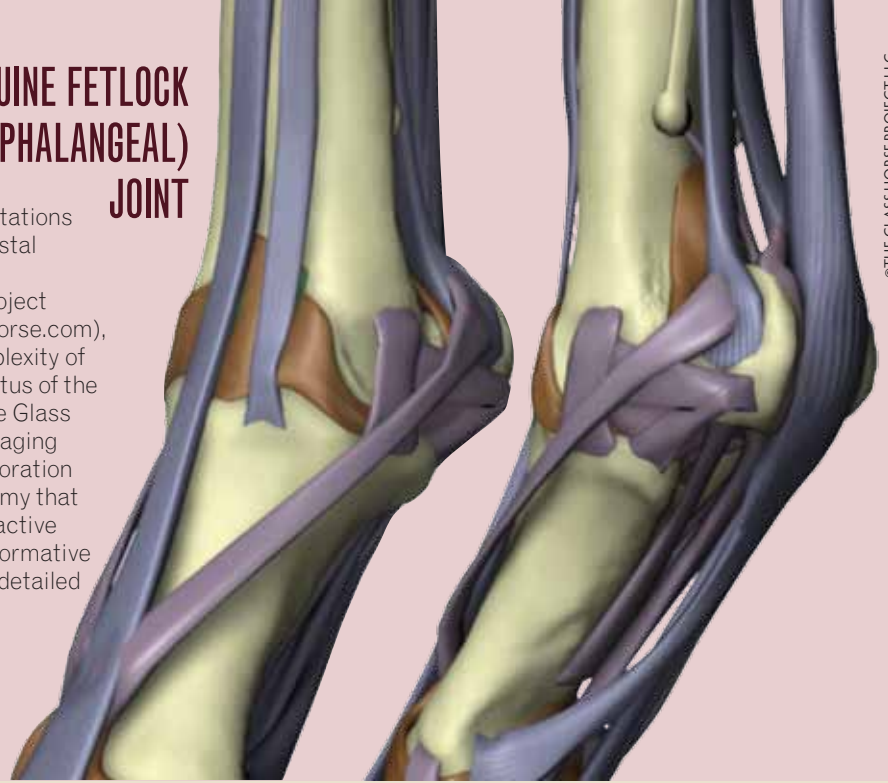
JOINTS STRUCTURE AND FUNCTION: THINGS TO KNOW MORE ABOUT

There are three types of joints: Fibrous, cartilaginous and synovial. Fibrous joints are located in the skull region and are the least likely to be injured because they are relatively immobile. Cartilaginous joints are also less likely to become arthritic or injured because they also move very little and are located in the vertebrae and the growth plates of long bones. Synovial joints are the hinge joints and ball joints that endure the most movement and are the most prone to arthritis and injury due to overuse and trauma.

Synovial joints are made up of two bones with hyaline cartilage on the ends, plus a fibrous joint capsule, synovial membrane, collateral ligaments, subchondral bone, and synovial fluid.

EQUINE FETLOCK (METACARPOPHALANGEAL) JOINT

These representations of the equine distal limb, from the Glass Horse Project (www.3dglasshorse.com), reveal the complexity of the stay apparatus of the equine limb. The Glass Horse is an engaging interactive exploration of equine anatomy that combines interactive models with informative narrations and detailed animations.



©THE GLASS HORSE PROJECT LLC

The amount of movement and range of motion of the synovial joints is critical for normal gait and soundness. The pain-free motion of synovial joints depends upon normal synovial fluid production and healthy hyaline (articular) joint cartilage, which is made up mainly of collagen and proteoglycans, hyaluronic acid, chondroitin sulfate and water.




This hyalin cartilage and normal synovial fluid allows for the near frictionless, vibration-free sliding between the two opposing cartilage surfaces.

If the synovial fluid is not normal (low viscosity) due to inflammation, trauma or excessive joint use, then the articular cartilage will become softened or fibrillated—one of the first degenerative changes leading to osteoarthritis. As a result, it will no longer able to hold enough water, resulting in too much friction when the joint is actively flexing and extending. This friction and vibration leads to more cartilage damage and fibrillation, which in turn leads to progressive degeneration of the cartilage and joint.

The most common cause of cartilage damage is trauma or overuse injury to the joint capsule, synovial membrane or cartilage. The repetitive or acute trauma causes pro-inflammatory cytokines, degradative enzymes and free radicals (the “bad guys”) to be released into the joint fluid, which leads to a down-regulation of the production of hyaluron and lubricin by the synoviocytes of the synovial membrane (the “good guys”).

These two cell-protecting glycoproteins are critical to providing a very low friction coefficient between the interface of both cartilage surfaces. Low friction levels keep the articular cartilage healthy and able to ex-


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pand and compress as it absorbs and releases water with each step. Healthy cartilage is able to act as a shock absorber as it absorbs and dissipates energy and hydraulic pressure during the millions of cycles that each joint travels annually.

One factor often overlooked is that to have a strong, healthy joint with good articular cartilage requires strong, healthy elastic bone (subchondral bone) that must be structurally sound in order to solidly support the joint cartilage.

The major equine joints most subject to injury are the synovial hinge joints of the forelimb and hindlimb. The propensity to injury depends upon the breed and size of horse, conformation of the horse and type of discipline the horse is involved in. Training techniques and quality of footing have a lot to do with how much risk there is to joint health. Performance horses commonly exhibit problems in the fetlocks (high motion), coffin joints, pastern joints, hocks, carpi (knee), stifle, shoulder, elbow and hip in this relative order of frequency of injury.

A CLOSER LOOK AT HEALTHY JOINTS

The synovial joints of the horse are made up of hyaline cartilage, synovial fluid, fibrous joint capsule, synovial joint capsule and collateral ligaments. Let's take a closer look at three key joint cartilage components.

Glucosamine, an amino sugar, is a precursor to the compression-resistant components of cartilage called glycosaminoglycans. Glucosamine decreases the activity of collagen-degrading enzymes and increases cartilage protein synthesis.^{1,2} Long-term supplementation studies in humans indicate that glucosamine slows the progression of osteoarthritis³ and may be as efficacious as ibuprofen in relieving arthritic pain⁴.

The results of similar studies in animals indicate that glucosamine supplementation reduces the ill effects of osteoarthritis on cartilage and subchondral bone^{5,6} and treatment of equine cartilage harvested tissue (explants) with glucosamine reduces the destructive

FACTORS CONTRIBUTING TO LAMENESS

While not all of these factors can be attributed to loss of normal joint function, be aware that any chronic imbalance in a horse's lifestyle can contribute to lameness.

- » Training to fatigue is a common cause of joint problems, because the fatigued muscles no longer act as shock absorbers for the joints and the joint then endures much greater pressures.
- » Training on poor or deep footing creates fatigue and over extension of the synovial joints leading to joint inflammation and cartilage injury.
- » Horses that travel "heavy on the forehand" are more prone to joint wear and tear as are horses asked to do a lot of movements like excessive jumping, sliding, spinning or too much repetitive circle work (i.e., longeing, round-penning).
- » Chronically imbalanced feet (mediolateral or dorsopalmar imbalance)
- » Neurological dysfunction such as Wobbler's syndrome
- » Poor nutrition or mineral imbalance
- » Conformational weaknesses/a poor genetic hand, such as extreme toeing in or out, sickle or post hocks, offset or calf knees, poor loin coupling, straight pasterns/shoulder, etc.
- » Unidentified or unresolved dental issues
- » Back pain, most often from poor saddle fit or being ridden too early (spinal growth plates remain open until about age 6 or 7 in most horses)
- » Chronic body soreness or tying up
- » Laminitis
- » Thrush

effects of interleukin 1- β and synthesis of inflammatory mediators^{7,8} such as cytokines.

Hyaluronic acid is a key component of the synovial fluid that nourishes, lubricates and protects the joint. Hyaluronic acid is one of the building blocks for proteoglycans, such as aggrecan, which stimulates the formation of cartilage components from equine stem cells⁹ and has anti-inflammatory actions in the synovial fluid by inhibiting prostaglandin E, or PGE¹⁰.

Silicon is a micronutrient required for normal formation of cartilage and bones. In fact, consumption of diets deficient in silicon by growing chicks results in abnormalities in articular cartilage formation, bone development and growth of the comb¹¹.

continued next page



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“The most common cause of cartilage damage is trauma or overuse injury to the joint capsule, synovial membrane or cartilage.”

WHEN THINGS GO WRONG

Equine joint health can be adversely affected by numerous causes, such as poor conformation, overuse, poor nutrition, poor training and conditioning techniques, such as riding an unprepared horse on footing that is too deep, too hard or uneven. Early warning signs that one or more joints are troubled include heat, swelling, pain, shortened gait and reduced range of motion (“loss of use”).

ACUTE VS. CHRONIC INFLAMMATION: HOW TO TELL THE DIFFERENCE

Acute inflammation of the joint or joints usually involves recent evidence of one or more of the following: local increase in heat, excessive synovial fluid production (joint capsule distention), mild to moderate lameness, painful joint flexion and painful local palpation. Chronic inflammation can be associated with mild to moderate long-standing manifestations of any or all of the above symptoms.

Oftentimes in chronic joint inflammation though, the joint capsule will be thicker than normal, range of motion will be much less than normal and flexing the joint may cause mild to moderate pain. X rays of an acutely inflamed joint can be quite normal whereas x rays of a chronic joint may be normal or show some joint space narrowing.

Any one of these signs indicates the need for further investigation by a veterinarian to determine the cause and severity of the joint

problem. Further examination may only mean a physical exam, or it could also entail the use of x rays, ultrasound, scintigraphy or MRI. The most important factor is early detection, which can lead to early correction, timely treatment and a return to soundness.



PART TWO IN JULY 2011 ISSUE

“How to Keep Joints Healthy”

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For more information about the best products for joint care for your horse, see:

FMI

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Doug and Sue pay a visit to Well Armed, who overcame joint problems to win the world's richest horse race, the Dubai World Cup, two years ago, by a record 14 lengths.



Doug Herthel, DVM, founded the Alamo Pintado Equine Medical Center together with his wife Sue in 1972 on the central coast of California. Instrumental in bringing about a biological approach to healing, Dr. Herthel continues to advance equine surgery and the use of hyperbaric oxygen therapy, adult stem cell therapy and clinical nutrition in veterinary medicine. In 1996, he developed Platinum Performance® to speed healing in equine patients after orthopedic surgery. With an interest in endurance riding, Dr. Herthel and Sue are proud to have twice entered and finished the Tevis Cup Ride, a 100-mile one-day ride through the Sierra Nevada Mountains.