

Racehorses' joints bear the brunt of wear and tear due to the nature of their high-speed training and racing

AI Enters the Picture

ARTIFICIAL INTELLIGENCE AND DIAGNOSING **JOINT INJURIES**

By **AMANDA DUCKWORTH**

DUE TO THE very nature of the sport of horse racing, when it comes to health and well-being, few areas are in the spotlight as much as joints. Galloping at full speed puts wear and tear on joints in a way that walking does not. The heavy impact and repetitiveness of the motion can make joints susceptible to issues.

Keeping a horse sound is important both from a general care perspective and from a productivity standpoint. Research is expanding knowledge about joint health and also looking toward the future for even more clarity. From surgery success rates, to diagnostics, to using artificial intelligence, researchers are routinely delving into the topic.

Osteochondrosis (OC) and its more advanced form, osteochondrosis dissecans (OCD), can lead to osteoarthritis in horses. Although studies have shown many lesions heal on their own, not all do, and those can lead to serious problems. Osteoarthritis and its related issues are considered the most common joint problems in Thoroughbreds, with studies showing they account for more than 60% of all lameness cases.

In August 2026, Veterinary and Comparative Orthopaedics and Traumatology (VCOT) published "Race Performance Following Arthroscopic Surgery for Femoropatellar and Tarsocrural Osteochondrosis in Juvenile Thoroughbreds." The objective of the study was to evaluate racing performance of Thoroughbred yearlings following arthroscopic surgery for OC of the femoropatellar (FP) and tarsocrural (TC) joints.

The retrospective study used surgery data from 2010-22, and for each case, two age- and sex-matched controls from the same stud farm were also selected. A total of 27 horses were included in the FP group, while 22 were in the TC group. Racing outcomes were compared between the groups.

"In the FP group, the lateral trochlear ridge was most often affected; 14 were bilateral, two had OC lesions in another joint," researchers concluded. "In the TC group, the distal intermediate ridge of the tibia was mainly affected; five were bilateral and one had OC lesion in another joint.

"No significant differences were found between cases and controls in number of starts, wins, places, podiums, and prize money earned at 2nd, 3rd, and ≥4-year-old racing careers or career duration for either group. In both groups, no significant performance differences were found between unilateral and bilateral cases. Racing performance after FP or TC OC surgery was comparable to that of unaffected controls."

In April 2026, Veterinary Journal published "Machine learning-based prediction and quantification of OCD surgery and pedigree effects on racehorse performance."

"Osteochondritis dissecans (OCD) is a common developmental orthopedic condition in Thoroughbred racehorses and although arthroscopic surgery is widely used for treatment, its long-

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term effects on race performance remain unclear," explained researchers. "This retrospective study evaluated the effect of OCD surgery on race performance, compared the predictive power of pedigree and management variables and applied interpretable machine learning methods for forecasting race performance outcomes."

For the study, information was collected from 75 Thoroughbreds that underwent OCD surgery between 2015-17 as well as 257 maternal siblings without recorded OCD surgery, who served as the controls. Variables included biometric, pedigree, surgical, and race performance measures.

"Variables related to surgical history, including age at surgery, showed limited predictive value and lesion severity did not rank among the dominant predictors," concluded researchers. "In contrast, pedigree, particularly the group-mean encoded family identifier 'h_family', ranked highest. These results indicate that OCD surgery does not significantly impair long-term race performance, while pedigree is the strongest predictor in this cohort.

"Although this observational study is limited by its regional scope and by unmeasured factors that may influence both surgery status and performance, the findings provide objective context for breeding, treatment and sales decisions involving Thoroughbreds with a history of OCD surgery. Our machine learning analysis revealed that a Thoroughbred's pedigree is a stronger determinant of racing performance than a history of OCD surgery."

Arthritis is a well-known potential problem for Thoroughbreds, and research continues on the best way to diagnose it. In October 2026, Research in Veterinary Science published "Synovial fluid oxidative stress index as a biomarker for arthritis severity in Thoroughbred racehorses."

"Arthritis is a major cause of lameness in racehorses," explained researchers. "Even when lameness improves, it may recur after training resumes, making it difficult to determine the disease state and when to





One study utilized a databank of radiographs from a cross-section of species for a deep-learning model on fractures

end treatment. This retrospective observational study examined whether oxidative stress in synovial fluid could assess arthritis status in racehorses."

For the study, researchers analyzed both synovial fluid samples obtained during routine clinical practice from horses with arthritis and control samples obtained from horses without clinical or radiographic evidence of carpal joint disease. In all, 72 Thoroughbreds in Japan were included. Of those, 52 had arthritis and 20 served as controls.

Researchers classified arthritic horses as acute (AC), subacute (SA), or chronic (CH) based on clinical stage, and as with or without radiographic lesions. They then measured diacron-reactive oxygen metabolites (d-ROMs) and biological antioxidant potential (BAP) to calculate the oxidative stress index (OSI).

"OSI was significantly lower in SA, CH, and control groups than in AC horses, and lower in horses without than with radiographic lesions," researchers concluded. "These findings suggest that OSI in synovial fluid may serve as a quantitative biomarker for arthritis severity and could aid clinical decision-making regarding treatment duration and return to training, particularly in cases without radiographic lesions."

ARTHRITIS IS A MAJOR CAUSE OF LAMENESS IN RACEHORSES. EVEN WHEN LAMENESS IMPROVES, IT MAY RECUR AFTER TRAINING RESUMES, MAKING IT DIFFICULT TO DETERMINE THE DISEASE STATE AND WHEN TO END TREATMENT. THIS RETROSPECTIVE OBSERVATIONAL STUDY EXAMINED WHETHER OXIDATIVE STRESS IN SYNOVIAL FLUID COULD ASSESS ARTHRITIS STATUS IN RACEHORSES.

– OCTOBER 2026 RESEARCH IN VETERINARY SCIENCE

Diagnosing issues faster is the goal of a great deal of research surrounding joint issues. In September 2026, Veterinary Radiology & Ultrasound published "Correlation of 2D Linear and 3D Volumetric Measurement Techniques for Subchondral Bone Sclerosis in the Equine Distal Limb Using Standing Computed Tomography." Subchondral bone sclerosis is the abnormal hardening and thickening of the layer of bone just beneath the cartilage inside a joint.

"Subchondral bone sclerosis of the distal third palmar/plantar metacarpal/metatarsal condyles is a common radiographic finding in Thoroughbred racehorses," explained researchers. "Traditionally, assessment has relied on two-dimensional (2D) linear measurements; however, advances in imaging software now allow three-dimensional (3D) volumetric quantification of subchondral bone.

"This study aimed to assess the relationship and agreement between computed tomography (CT)-derived 2D linear and volumetric measurements of condylar sclerosis and computer-generated 3D volumetric measurements and determine whether 2D measurements could provide a practical alternative to 3D analysis."

For the study, 62 Thoroughbreds underwent standing fan-beam CT (FBCT). Data was included for a total of 96 fetlock joints, 59 forelimbs, and 37 hindlimbs, and retrospective image analysis was performed.

"Estimated sclerosis volume derived from 2D measurements showed a strong positive correlation with 3D sclerosis volume," researchers concluded. "Dorsopalmar/Plantar

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[1]Denison G, et al. Resveratrol supplementation improves uterine immune resolution in mares susceptible to persistent breeding-induced endometritis. Frontiers in Veterinary Science. 2026;13:1760273.

sclerosis was strongly correlated with condylar 3D sclerosis volume. Interobserver and intraobserver agreement was excellent. Although 2D measurements may provide a practical alternative when 3D software is unavailable, the methods are not directly interchangeable, particularly with greater sclerosis volume."

One of the main concerns regarding joint issues is that they are closely linked to the development of fractures in racehorses. In October 2026, The Royal Society Open Science published "Balancing training load, rest and musculoskeletal injury risk: a mathematical modelling study in Thoroughbred racehorses."

"Musculoskeletal injuries (MSI) in Thoroughbred racehorses are a leading cause of death and premature retirement, and are heavily influenced by training practices," researchers explained. "Greater distances of high-speed galloping accumulated during racing campaigns are associated with MSI. Bone injury is the most common MSI, and understanding how training practices influence bone damage accumulation is critical for improving both horse welfare and racing outcomes."

For the study, researchers built upon an existing mathematical model of bone adaptation and damage to investigate the impact of different training programs on bone injury risk. A variety of training plans were constructed to reflect representative practices undertaken by professional trainers in Australia. The programs featured different periods of rest, pre-training, progressive training, and race-fit training.

"Training programs varied in training volume, rest frequency, and program duration," explained researchers. "Lower-volume training programs that included high-speed training achieved sufficient bone adaptation with less accumulation of bone damage, and subsequently lower risk of bone failure. In addition, incorporating more frequent rests (minimum of two per year) and/or longer rest periods (minimum of six weeks) reduced bone damage owing to the extended opportunity to remove and repair bone damage.



The ankle and knee joints of a young Thoroughbred



A radiograph showing the fusion of the distal intertarsal joint in a horse's hock

"It is unlikely that there is one optimal training program that reduces injury risk while supporting sufficient racing frequency. Training regimens are dictated by how individual horses adapt to the race speeds and distances they will be required to compete under; therefore, the optimum program (or range of programs) may differ between individuals. Mathematical modelling hence enhances our understanding of biological processes behind bone damage and remodeling and is a more ethical means of applying this knowledge without interventions or changes to training programs that may be detrimental."

As with many different scientific areas, researchers are examining how and if AI can aid in the cause to detect problems sooner. In February 2026, Bioengineering (Basel) published "Bridging Species with AI: A Cross-Species Deep Learning Model for Fracture Detection and Beyond."

"Fractures are a leading cause of morbidity and mortality in Thoroughbred racehorses, posing a significant threat to their welfare and careers," explained researchers. "This study introduces a deep learning model specifically designed to facilitate fracture detection in equine athletes. By leveraging extensive training on human fracture data and refining the model with equine imaging, it highlights the transformative potential of transfer learning across species and medical contexts."

For the study, a comprehensive databank of radiographs, sourced from public archives and equine hospitals, was curated to encompass diverse conditions (fracture and non-fracture), ensuring robust pattern recognition.

The team-compiled data bank of images included 100 equine fracture cases from two United Kingdom equine hospitals and published literature; 70 feline cases from hospital databases; and approximately 4,000 human fracture images from a public database.

Researchers then built an AI system that works in three stages: Identify the type of scan (X-ray, CT, or MRI); recognize the image angle; and then detect and precisely locate any fractures.

THIS PAGE, TOP: ANNE M. EBERHARDT; BOTTOM: MERCK VETERINARY MANUEL; OPPOSITE PAGE, TOP: COURTESY UC DAVIS VETERINARY MEDICAL TEACHING HOSPITAL; BOTTOM: COURTESY OF ROYAL VETERINARY COLLEGE



A patient undergoes a computed tomography scan at UC Davis School of Veterinary Medicine

"The pipeline achieved 96.7% accuracy for modality classification, 97.2% accuracy for projection recognition, and fracture localization intersection over union values of 0.71–0.84 across equine datasets," explained researchers. "This work bridges advancements in human and veterinary medicine, opening pathways for AI-driven solutions that extend beyond fractures, fostering improved diagnostic precision and broader applications across species (felines, canines, etc.). By integrating advanced imaging techniques with AI, this study aims to set a foundation for more comprehensive and versatile health monitoring systems."

For its efforts, the Royal Veterinary College (RVC) was shortlisted for the prestigious STEM for Britain 2026 award in recognition of its work applying AI to improve fracture detection in animals. Led by Ruby Chang, Associate Professor of Statistics at the RVC, the study was carried out by Dr. Hanya Ahmed.

"The study revealed that the AI system was able to detect and localize fractures in horses using knowledge gained from thousands of human fracture images," explained researchers. "This approach, known as 'transfer learning,' enabled the model to be trained on a large human dataset before being adapted for veterinary use. As a result, the system achieved fracture localization accuracy of between 71 and 84% without requiring an unrealistically large number of equine images.

"The findings demonstrate the potential for AI-assisted tools to strengthen fracture diagnosis across veterinary practice. Faster and more reliable detection could help reduce uncertainty in clinical decision-making and enable earlier treatment, with clear benefits for the welfare and recovery of racehorses and companion animals."

Building on this work, the team has expanded its collaboration with the Hong Kong Jockey Club to explore whether AI can identify early bone changes in racehorses before a fracture occurs. If successful, this approach could support efforts to prevent catastrophic injuries, marking an important step toward using AI to not only diagnose, but to help prevent fractures before they happen.

Joints are not an unknown issue in Thoroughbreds, and how best to diagnose, treat, and prevent joint problems is an area of concern for caregivers, veterinarians, and researchers alike. The more knowledge and advancements that come into this area, the better it is for everyone involved. BH



A scan conducted at the Royal Veterinary College, which was shortlisted for the prestigious STEM for Britain 2026 award for its work applying AI to improve fracture detection in animals