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# Vet Candy Guide to Osteoarthritis

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# OSTEOARTHRITIS: WHAT YOU NEED TO KNOW

Dr. Sarah Love

One of the most common problems diagnosed in dogs—and likely underdiagnosed in cats—is osteoarthritis. Inflammation in a joint can cause healthy cartilage to deteriorate, thereby decreasing its ability to act as a cushion for the joint. Following inflammation and cartilage deterioration comes pain, decreased use of the joint and range of motion, and osteophyte formation. This initial inflammation may be due to joint instability, a primary joint disease, congenital cartilage defects, historical trauma, or repetitive use injury. Osteoarthritis, commonly referred to as OA, can affect any joint in the body. The most commonly seen joints with OA include the stifles, shoulders, and elbows. However, try not to forget those overlooked joints such as toes, vertebral facet joints, and sacroiliac joints.

Any dog or cat is at risk for developing osteoarthritis as they age. At greater risk are large-breed dogs, those with chronic injuries or disease of the musculoskeletal system, and those with poor conformation. Obesity and poor nutrition are also risk factors for OA, but fortunately, veterinary professionals can educate owners to reduce the risk. Canine athletes and working dogs that perform repetitive exercises or skills are also at greater risk for OA. Finally, joint diseases that directly affect one or more joints increase the risk. Examples of these are cranial cruciate ligament disease and infectious or non-infectious diseases causing immune-mediated polyarthritis or septic arthritis. Dogs with congenital abnormalities such as hip dysplasia and osteochondrosis are some of the highest-risk patients.

Classic clinical signs of osteoarthritis that owners see are the ones that will prompt them to bring their pets in for an exam. These might be lameness, stiffness on rising from lying or sitting, difficulty getting up from sleeping, and a decrease in activity. Diving further into a history with an owner may uncover more changes in their pet beyond those classic signs, such as difficulty posturing to defecate or urinate, reluctance to jump into a vehicle, changes in behavior such as being “cranky,” or changes in their appetite.

Looking for changes in gait and posture are a great place to start when evaluating a patient. Even a subtle shifting of their weight off one leg can signify a problem, prompting a more detailed exam of that limb. Evaluating a dog's gait appropriately requires some help, and having trained technicians and assistants can make a world of difference. Have an assistant walk the dog for your gait exam, taking the burden off the owner. The assistant should walk and trot the dog, ideally with a loose lead and no pit stops. Watch the dog walk towards you, away from you, and from each side at both a walk and trot to get a complete picture. Additionally, observing the dog walking in a circle (in both directions), sitting, and standing can offer up valuable information. This may be more difficult in cats as they tend to be fairly timid or less willing to walk at the clinic. Luring kitties with treats or toys may get them up and moving, especially towards a door or back to their crate.

Changes to look for on your physical exam are muscle atrophy that may be asymmetrical between limbs, thickening or crepitus of a joint when performing range of motion, joint effusion, or decreased range of motion of a joint. Some tips for finding these things that you may not do in everyday examinations are the following:

- To find crepitus, place or cup one hand completely over a joint while performing range of motion of the joint with the other hand; feel and listen for cracking and grating sounds coming from the joint.
- To find joint thickening or effusion, feel two joints with both of your hands at the same time, gently palpating the joint capsule for the presence of extra fluid.
- To evaluate for atrophy, look for asymmetry in bony protuberances or changes in the appearance between a muscle or muscle group on one limb versus another, such as the quadriceps or triceps.

Diagnostics available to diagnose osteoarthritis are radiograph, CT scan, and an MRI. An additional method to help complete an overall picture of OA are joint taps (arthrocentesis) with cytology and bacterial culture. The joint fluid will help distinguish between an infection and an immune-mediated disorder. A CT scan, MRI, and musculoskeletal ultrasound are tools to help determine any underlying causes of OA and evaluate the surrounding tissues. Each modality has its place in evaluating particular tissues and sites in the body.

# WHAT YOU NEED TO KNOW ABOUT JOINT HEALTH.

Joint health and mobility issues are common problems for dogs. On this episode,  Dr. Jen and Dr. Jason Chatfield speak with veterinary surgeon, Dr. Courtney Campbell about joint health. The trio talk all about common issues, including treatments and supportive care.

LISTEN AND LEARN

# OSTEOARTHRITIS: MEDICAL MANAGEMENT, TRADITIONAL THERAPIES

Dr. Nina R. Kieves

Joint disease (arthropathy) is a general term that encompasses many diseases with different etiologies ranging from trauma to infection and neoplasia to developmental conditions. Degenerative joint disease (DJD), also called osteoarthritis (OA), is the most common arthropathy in people and animals and is one of the most common reasons pets present to their veterinarian for care.

While there are many etiologies that can lead to joint disease, presentation and physical exam findings are often remarkably similar. Detecting which specific joint is causing problems (or if there are actually several joints involved) and utilizing a variety of diagnostic tools should help you to determine the underlying cause for your patient's joint disease.

Medical management of OA consists of the four major components including weight management, activity modification, pain management, and joint supplements/injections. Maintaining a lean and fit weight is very important and should be a lifelong goal for management. It is well documented in the human and veterinary literature that weight management helps relieve symptoms associated with osteoarthritis.[1,2]

Formal physical rehabilitation programs will help maintain muscle and range of motion, which are key factors contributing to patients' mobility. In addition to pain associated with chronic OA, loss of range of motion contributes significantly to decreased quality of life in these patients. The majority of exercise should be low-impact activities like long walks and swimming, as they are more likely to be comfortable for the pet. High-impact activity will not worsen the disease process itself but will result in more discomfort. Pets with OA are often obese and in pain, thus it can be challenging to increase activity or modify it without fully addressing both pain and weight concurrently.

Drugs for OA treatment are classified as symptom-modifying or structure-modifying. Symptom-modifying agents are designed to manage the pain associated with OA and include non-steroidal anti-inflammatory drugs (NSAIDs) and other oral pain relievers. For a patient to remain mobile and have quality of life, pain management is essential. Multimodal pain management is often utilized to maximize comfort for patients, particularly as disease progresses.

-*NSAIDs:* These are the mainstay of OA pain management if a patient is a candidate for them.[3] As many patients who develop OA are geriatric, it is imperative to know whether they are systemically able to tolerate the treatment; performing a CBC and chemistry panel along with a urinalysis will give you information regarding the patient and enable you to select appropriate medications. At minimum, a chemistry panel should be repeated every six months to re-evaluate the patient. NSAIDs can be used to alleviate the discomfort associated with joint inflammation.

NSAIDs work by inhibiting the cyclooxygenase (COX) pathway. All NSAIDs inhibit COX-1 and 2, though some are deemed COX-2 selective and inhibit primarily COX-2. COX-1 is responsible for normal body functions and when blocked leads to a reduced mucosal blood flow, mucus production, and bicarb secretion, as well as impaired platelet aggregation, which means there is impaired mucosal defense, increasing risk of GI mucosal injury that can lead to bleeding, ulceration, and full thickness intestinal erosions, ultimately risking sepsis if ulcers perforate. COX-2 is primarily increased in response to inflammation and is the target of pain management with NSAIDs, but it also has important regulatory functions, including regulation of renal blood flow via prostaglandins. Therefore, renal injury can occur with the use of NSAIDs. If clients notice any vomiting, diarrhea, lethargy, or inappetence while their dog is taking these products, they should be instructed to discontinue the medication and contact a veterinarian immediately. In addition to having GI and renal side effects, NSAIDs can cause hepatic dysfunction including fulminant hepatic failure, though this is very rare. NSAIDs should be avoided in dogs with known GI, liver, or kidney disease.

-*Amantadine:* Initially designed as an antiviral medication, amantadine acts as an NMDA inhibitor. This is the author's second choice for pain management in chronic OA patients who cannot tolerate an NSAID or require additional pain relief. The NMDA receptor is a nervous system receptor that can bind to neurotransmitters such as aspartate (or more specifically to N-methyl-D-aspartate) or glutamate to create the sensation of chronic pain. Amantadine has been shown to be effective in managing pain associated with OA.[4] As it can have hepatic side effects, this drug should not be given to dogs with elevated liver values or history of liver disease. It can also cause GI upset and agitation. The starting dose is 3-5 mg/kg once daily, and it can be increased to twice daily if tolerated.

-*Gabapentin:* Gabapentin structurally mimics GABA but has no effect on GABA uptake, binding, or degradation. Rather, it inhibits voltage-activated calcium flow to halt the release of excitatory neurotransmitters. The full mechanism of action is unknown. Initially designed as an anti-seizure medication, it is now frequently used for pain management both neurologic and orthopedic. Adverse effects include sedation, ataxia, and GI upset. Initial dose is ~10 mg/kg and likely needs to be given q 8 hours to maximize efficacy.[5] The dose can be increased over time. If given for a lengthy period of time, the dose should be tapered to take dogs off the medication as they can show rebound hyperesthesia.

-*Tramadol:* Thought to be a good pain reliever in the past, newer studies show a limited efficacy of tramadol in dogs due to first-pass metabolism. Very few dogs metabolize the parent molecule to the M1 molecule that is actually the active component that acts at μ-opiate receptors. The most recent clinical trials have shown it to have the same effect as a

placebo pill in comparison to an NSAID.[6] In addition to its weak μ-opioid action if metabolized to M1, it also acts on the noradrenergic and serotonergic systems and thus may have some mild synergistic pain relief when used in conjunction with other pain relievers such as NSAIDs. It should not be the sole pain reliever relied upon for severe pain. Common side effects include sedation, constipation, excitation, tremors, and rarely, seizures. Starting dose is 2-5 mg/kg PO q 8-12 hours. As it is commonly abused by people, this should be considered when prescribing the medication long term.


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# OSTEOARTHRITIS: MEDICAL MANAGEMENT, TRADITIONAL THERAPIES

Dr. Nina R. Kieves

In addition to weight management, exercise modification, and more traditional pain relievers, there are several supplements and additional treatments that should be considered for medical management of osteoarthritis (OA).

New joint health supplements are available every day, most with little or no objective evidence regarding their effectiveness, so critical evaluation is necessary prior to recommending any product to your client. Structure-modifying agents are designed to retard, stop, or reverse the pathologic changes in the articular tissues. Many are not considered drugs and are thus not regulated by the FDA.

# RETROSPECTIVE STUDY ON OSTEOARTHRITIS

SCIENCE CORNER

- Vet Candy Staff

A retrospective study was performed to characterize the severity and distribution of osteoarthritis (OA) within the joint and to identify differences among dogs. Radiographs of 240 stifles from 51 boxers, 66 German shepherds, 100 Labrador retrievers, and 23 Siberian huskies with confirmed CCL rupture were included. Radiographs of the stifle joint were evaluated, and OA severity was graded at 33 sites.

Results indicated that dogs weighing greater than 35 kg had a higher total OA score than those weighing less than 35 kg. Osteoarthritis scores were highest at the apical patella, proximolateral tibia, and sesamoid bones, corresponding to the proximal, lateral, and caudal aspects of the joint, respectively. Boxers had a higher total OA score than other breeds.

Read more by clicking on the link below:
**Stifle joint osteoarthritis at the time of diagnosis of cranial cruciate ligament injury is higher in Boxers and in dogs weighing more than 35 kilograms**

# SUPPLEMENTS

- *Polysulfated glycosaminoglycan:* Its exact mechanism of action is unknown, but it is thought to inhibit cartilage oligomeric matrix protein degradation and thus help maintain chondrocyte viability and decrease extracellular matrix degradation.

- *Pentosan polysulfate:* It is a semisynthetic glycosaminoglycan made from beech hemicellulose. In vitro it has been shown to slow articular cartilage degradation and stimulate the synthesis of hyaluronan by synovial cells and proteoglycans by chondrocytes. While available in Europe and other countries as Cartrophen Vet, there is currently no licensed formulation available in the US. Evidence of its efficacy is similar to that of polysulfated glycosaminoglycan.[1,2]

# Nutraceuticals

Nutraceuticals are any substance that is a food or a part of food that provides medical or health benefits. They can also be incorporated into functional foods and be fed in diets. Supplements can take up to six weeks to have an effect and must be given regularly to be efficacious, not on an as-needed basis.

- *Chondroitin sulfate:* In vitro chondroitin sulfate has been shown to stimulate human chondrocytes, but it has poor bioavailability in the dog, only 5% after a single dose.[3] It is typically not given as a lone supplement but rather in combination with others as a "joint supplement."

- *Glucosamine sulfate:* Data has shown glucosamine may influence chondrocyte metabolism; it is 90% absorbed and diffuses into articular tissue.[4] It has been shown to stimulate proteoglycan synthesis in vitro. In human literature, meta-analyses of glucosamine show mixed results with a high placebo effect.[5]

- *Fatty acids:* Essential fatty acids are a type of polyunsaturated fatty acids. In the dog, linoleic acid (18 : 2 n-6 LA) and α-linolenic acid (18 : 3 n-3 LnA), are the two principal essential fatty acids. From these, additional fatty acids can be derived, including the better-known arachidonic acid (an n-6 fatty acid) and eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) (both n-3 fatty acids). Essential fatty acids play several rolls at a cellular level, including regulation of the inflammatory processes via the eicosanoid hormone family.[6] Studies in dogs have shown that essential fatty acids (derived from fish oils) in a functional food (prescription diet) were able to influence synovial fluid MMPs and tissue inhibitors of MMP concentrations. Additional studies showed this diet to have improved function for dogs with OA.[7,8]

- *Boswellia serrata:* Boswellia, also called frankincense, is a 5-lipoxygenase inhibitor that has anti-inflammatory effects. One study in humans found it to improve physical function in patients with knee pain.[9] As with many nutraceuticals, there is only one published report in the veterinary literature, of a non-controlled study that showed improvements in dogs with OA when given Boswellia.[10] It is currently an additive in many joint health supplements. Much is still unknown about bioavailability of Boswellia. In humans, there are significant changes in bioavailability dependent upon whether the extract is taken while fasted or with a fatty meal.[11] Side effects are primarily gastrointestinal[12] in nature and should be monitored in patients taking Boswellia. Such information is key in understanding the efficacy of nutraceuticals and further research is warranted.

- *Curcumin:* Curcumin is the active ingredient in turmeric that is thought to be anti-inflammatory. It blocks the NF κß pathway, which has an anti-catabolic effect by blocking IL-1ß proteoglycan degradation.[13] Additionally, it downregulates TNF-α, inhibits TBF-ß, and inhibits synovial cell proliferation by downregulating the expression of MMP-3. Its oral bioavailability may be poor, but further studies are needed to fully understand its role as an anti-inflammatory modulator in dogs and humans.

Other commonly utilized nutraceuticals include MSM, avocado, soybean extract, green lipped mussel extract, and eggshell membrane. Most “joint health” supplements, have a combination of these items in them in varying amounts. No doses are available to calculate for these supplements aside from omega fatty acids.

# Injections

Intra-articular joint injections can be performed with corticosteroids, hyaluronic acid, and other nutraceuticals, and various biologics such as platelet-rich plasma (PRP), autologous conditions plasma (ACP), and stem cells. What should be injected is variable and based upon the individual patient's needs. At this time, there is evidence to support the use of hyaluronic acid, platelet-rich plasma, and corticosteroids (in end-stage chronic disease). Triamcinolone is the recommended corticosteroid to use, as it has been shown to be the least damaging to chondrocytes (dose is 5 mg/joint). This is often given in conjunction with hyaluronic acid. Stem cell therapy is still in its infancy with no prospective blinded studies showing objective efficacy, and thus it cannot be routinely recommended.

In addition to the above supplements and intra-articular joint therapies, other modalities, including acupuncture, extracorporeal shock wave therapy, chiropractic adjustment, pulsed electromagnetic field therapy, and photobiomodulation therapy can play a role in treating patients with OA.


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# SURGICAL MANAGEMENT OF OSTEOARTHRITIS

Dr. Nina R. Kieves

Although most dogs and cats with osteoarthritis (OA) are managed with medical management outlined in previous articles, those with severe functional effects of osteoarthritis may be candidates for surgical management. This may include salvage procedures such as femoral head and neck osteotomy (for hip OA), or total joint arthroplasty (available for the hip, elbow, knee, and hock).

Arthrodesis is the promotion of fusion of a joint to eliminate discomfort associated with osteoarthritis. This is better tolerated in dogs than cats, due to their variability in function, particularly in the pelvic limb as compared to the thoracic limb. Dogs will tolerate arthrodesis of the distal extremity joints such as the carpus and tarsus quite well. While arthrodesis of the elbow and stifle are possible, they are less well tolerated than other joints. Additional salvage procedures include femoral head and neck ostectomy (FHO) for the treatment of refractory coxofemoral OA and glenoid excision for shoulder OA. Both are reasonably well tolerated, particularly in smaller breed dogs, with post-operative rehabilitation to maintain/rebuild muscle mass and obtain as much range of motion as possible.

# LOW-LEVEL LASER THERAPY

SCIENCE CORNER

- Vet Candy Staff

Researchers evaluated seventeen client-owned dogs diagnosed with confirmed osteoarthritis and associated pain. The low-level laser therapy was performed weekly in each study dog for a total period of six weeks.

Both the canine brief pain inventory and visual analog scale were significantly reduced after the first laser session compared to pre-treatment values and continued to decrease over time until the end of the therapy. Based on these results and improved function, as assessed by the orthopedic surgeon, the analgesic therapy given to the dogs was reduced by the clinician at week two in thirteen of the seventeen dogs. Laser-related side effects were not observed.

Read more at the link below:
**Low-level laser therapy for canine osteoarthritis pain**

Total joint arthroplasty provides a superior functional outcome to arthrodesis or excision (such as FHO) and has been performed in dogs since the 1970s, with significant improvements in outcome and with a progression of implants and systems available since that time. Total Hip Replacement (THR) is most commonly performed for the treatment of hip OA, typically secondary to hip dysplasia, but it can also be performed as a treatment for chronic fractures or malunions of coxofemoral fractures, Legg-Calve-Perthes disease, or traumatic hip luxation that cannot be treated with closed or open reduction. Given the current systems on the market, dogs and cats of almost all sizes are now candidates for THR. Successful outcome is reported in 95% of cases, with a complication rate of 5-22%.[1-4] This is a procedure that should be done by a board-certified surgeon with substantial experience in the procedure and appropriate mentorship, as the learning curve for THR is greater than forty cases.[5]

Total elbow replacement became available in the 1990s and continues to be a source of develo--pment for improved systems. There is little in the literature documenting outcome in patients, and replacement of the elbow joint is challenged by the joint's complexity. One retrospective study evaluated thirty-three cases and found 24% to have unacceptable outcome, with only 24% having fully functional outcomes.[6] In addition to full elbow replacement, partial resurfacing is now available with promising results.

# LIVING WITH A DOG WITH OSTEOARTHRITIS

SCIENCE CORNER

- Vet Candy Staff

Researchers interviewed forty owners of thirty-five dogs of a range of breeds and ages. Pet owners described the impacts of osteoarthritis on physical, mental, and financial health. Few had any prior experience of canine osteoarthritis, and owners of young dogs appeared to be particularly affected by the diagnosis.

Owners detailed increasing worry over time about their pet's condition, frequently combined with a growing need to physically assist their dog. The dog's reduced mobility and need for medications progressively limited their own lifestyles and ability to have time away from their pet. Owners typically described a strong bond with their dog as a motivator to provide ongoing care.

The negative aspects of caring for an osteoarthritic dog appear multi-faceted and may be sustained over many years, particularly if the dog is young at diagnosis. Owners may be highly motivated to improve their dog's mobility and to reduce the impact the condition has on their own lives, yet they may be unsure how to achieve this.

Read more by clicking on the link below:
**The Impact on Owners of Living with a Dog with Osteoarthritis**

An initial assessment of 103 clinical cases of Canine Unicompartmental Elbow (CUE) Arthroplasty System® (Arthrex) found an 11% major complication rate, with 48% of dogs returning to full function and 44% to acceptable function.[7] This initial report has been followed up by a second case series showing a similar complication rate of 21%, with 15% being major and 6% minor. Overall, 73% of dogs returned to acceptable function with 25% having full function.[8]

Total Knee Replacement (TKR) has been evaluated retrospectively and in research settings. Only one study has been published on six clinical cases, with all dogs being improved in regards to function one year post-operatively.[9] TKR is considered an option for end-stage OA in the knee and is functionally better tolerated than arthrodesis of the stifle. Appropriate case selection is imperative.

Most recently, a total ankle replacement system has become available with short-term results being reported as good, but no long-term outcome is yet available. This could become the standard of care for tarsal OA treatment (most commonly secondary to osteochondrosis) rather than pantarsal arthrodesis, which eliminates a high motion joint. All of these surgical options should be considered after medical management has failed to improve quality of life significantly in patients with OA.


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SCIENCE CORNER

# CORRELATION BETWEEN SYNOVIAL FLUID CONCENTRATIONS AND OSTEOARTHRITIS

- Vet Candy Staff

Researchers evaluated the relationship between synovial biomarker concentrations and severity of lameness and assessed the ability to differentiate normal from osteoarthritic joints. The study examined twelve dogs with no evidence of osteoarthritis and twenty-seven client-owned dogs with unilateral lameness and joint pain in a single joint from naturally occurring osteoarthritis.

The study found that concentrations of monocyte chemoattractant protein (MCP)-1, substance P, interleukin (IL)-6, IL-8, KC-like, matrix metalloproteinase (MMP)-1, and MMP-3 were greater in dogs with osteoarthritis than those with normal joints. In addition, the concentrations of bradykinin and tissue inhibitors of metalloproteinase-4 were decreased in osteoarthritic dogs.

There was no correlation between any biomarker and severity of gait asymmetry.

Read more by clicking on the link below:

**Correlation between synovial fluid cytokine concentrations and limb function in normal dogs and in dogs with lameness from spontaneous osteoarthritis.**

# RISKS AND PREDISPOSITIONS FOR CANINE OSTEOARTHRITIS

-Vet Candy Staff

SCIENCE CORNER

Researchers evaluated sixty-two papers reporting risk factors for canine osteoarthritis.

The results of this review suggest six key risk factors associated with canine joint diseases.

## Genetics

Genetics is seemingly the most influential risk factor, with twenty-one papers discussing genetics having a significant relationship with specific joint diseases.

## Conformation

Ten studies highlighted that joint disease is affected by conformation, particularly relating to body and leg size and joint angles required by breed standards.

Traits such as low pelvic muscle mass were reported to increase risk of hip dysplasia and osteoarthritis, whilst tibial tuberosity width and angle were associated with increased risk for cruciate ligament disease.

Breeding to reach desired breed conformational appearances and possible inadvertent co-selection of undesirable musculoskeletal conformations can have detrimental effects.

## Breed

Breed was consistently identified as a common risk factor for joint disease, reported as a risk factor by seventeen papers. Certain breeds have particular predisposition and risk of joint diseases as a result of both conformation related to breed standards and genetic/heritability components increasing the likelihood of the development of joint disease.

Breeds including Rottweiler, golden retriever, and Labrador retriever were found to have increased risk of cruciate ligament rupture; smaller breeds generally have decreased risk.

Higher hip and elbow dysplasia prevalence was apparent in larger breeds such as mastiffs, boxers, Cane Corsos, German shepherds, golden and Labrador retrievers, and Bernese Mountain dogs.

Smaller breeds such as Pomeranians, chihuahuas, Yorkshire terriers, and French bulldogs had higher odds of developing patellar luxation compared to crossbreeds.

## Body weight

Body weight was another important risk factor associated with joint disease development identified here. Overweight dogs were significantly more likely to develop cruciate ligament disorders, with obesity almost quadrupling the risk. Having higher body weight related to size or body condition increased the risk of developing elbow arthrosis.

No significant association between type of diet and elbow and hip diseases was found, but high fat intake was positively associated with both hip and elbow disease.

Non-restricted feeding during growth and development has also been identified as a risk for developing both hip dysplasia and secondary hip osteoarthritis, potentially a result of increased mechanical load in weight-bearing joints.

## Sex and neuter status

Neutered individuals were significantly more likely to have a joint disease compared to intact animals in all studies.

## Age

The incidence may not be higher in older dogs, but the prevalence would be expected to be higher in older dogs. Although osteoarthritis may begin at any age, it might not be recognized until it is clinically fulminant and reaches a more advanced stage.

## Other factors

Other notable risk factors reported by the literature include month of birth and early life factors such exercise levels and type. Those born in months that offer more favorable weather for exercise opportunities had increased risk of joint disease development. This is further supported through findings that identify exercise levels and types (such as chasing balls and toys and regularly playing with other dogs) throughout life but particularly when young are risk factors for joint disease, due to over-use of and damage to developing joints.

Read more on this article below:
**Risks and predispositions for canine osteoarthritis**

# CORNELL STUDY UPENDS UNDERSTANDING ABOUT JOINT INJURIES

An injury to the anterior cruciate ligament (ACL) can lead to severe osteoarthritis in both animal and human patients. Now, a new interdisciplinary study on the protein that lubricates our joints says that lubricant may actually be a precursor of joint disease.

The paper, **published Oct. 7 in *Scientific Reports***, is the first that investigates the role of a protein, known as lubricin, in ACL-type injuries in dogs. It may also have larger implications for similar injuries in humans as well as the potential for treatments and therapeutics.

“Lubricin is crucial for normal joint function and the lubrication of cartilage,” said Heidi Reesink, the Harry M. Zweig Assistant Professor in Equine Health at the Cornell University College of Veterinary Medicine (CVM) and senior author on the paper. “We know that if a person or animal doesn’t make that protein, they will develop devastating joint disease affecting all the major weight-bearing joints.”

# GAIT CHANGES OBSERVED WITH PROGRESSIVE CANINE OSTEOARTHRITIS

SCIENCE CORNER

Dog-walking may have multiple physical and mental health advantages for dogs and humans alike, but the benefits diminish when canine osteoarthritis is a factor. Using qualitative methodology, this study explores the impact of canine osteoarthritis on dog-walking activity. It also looks at the impact of owners’ health problems on reducing daily activities.

Owners of dogs with osteoarthritis living in the UK were recruited through veterinary practices for interviews about their osteoarthritic dogs. They were asked to reflect on walks that they had taken with their dog before he/she developed osteoarthritis and to describe how those walks had changed.

Forty owners of thirty-five osteoarthritic dogs were interviewed. Prior to their dog's development of osteoarthritis, dog-walking distance, speed, and location were usually decided by the owner to satisfy the needs and enjoyment of dog and walker. Once their dog received the diagnosis of osteoarthritis, walks became slower, shorter, and of easier terrain.

Most owners described feelings of guilt with less walking, and they also noticed negative impacts on their own health with the reduced activity.

Research suggests that osteoarthritic dogs may reduce the walking exercise their owners are able or willing to undertake. It is an important finding for those advocating dog ownership as a positive public health intervention, and future studies should take into account impacts of osteoarthritis on both dog and owner health.

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**Gait changes observed with progressive canine osteoarthritis**

Reesink said increased lubricin could consequently be a signal for clinicians to intervene or try a different treatment approach.

Reesink and her collaborators laid the groundwork for this new study by completing a systematic review of the literature surrounding lubricin in both human and veterinary medicine. **The review** was published this summer in the journal Osteoarthritis and Cartilage.

The overall finding of the review: There is no unified consensus on how lubricin is altered in other domestic veterinary species and in human joint injury, demonstrating the need for further study, which Reesink's new paper has done.

"In looking at horses and dogs, we're seeing the same pattern," she said. "The strongest piece of data would be to show it in humans as well." Reesink and her collaborators worked with the Cornell Veterinary Biobank to obtain samples. The biobank supports CVM researchers as well as scientists across the globe, using biological samples collected from both ill and healthy animals at the Cornell University Hospital for Animals (CUHA). The samples are processed, catalogued, and provided to researchers, which accelerates biomedical research.

Among the motivators for this study, said Reesink, is that a large number of cases in the small animal orthopedic section at CUHA is knee ligament injury, which is common in dogs.

"We can help both animals and humans by potentially coming up with better diagnostics, by more fully understanding how these molecules work and designing therapies beneficial to both, by taking advantage of these naturally occurring cases and improving orthopedic care," Reesink said.

In the veterinary realm, Reesink's team plans to do a follow-up longitudinal study in dogs, examining multiple time points in a patient's injury, treatment, and recovery process. They also hope to draw similar connections in human ACL and other orthopedic injuries.

# Author biographies

## Dr. Sarah Love

Dr. Sarah Love earned her Doctor of Veterinary Medicine degree in 2000 from the University of Minnesota College of Veterinary Medicine. She went on to complete a rotating internship at Georgia Veterinary Specialists in Atlanta, Georgia and returned for a residency in small animal internal medicine to the University of Minnesota. She is a double boarded specialist in the American College of Veterinary Internal Medicine and the American College of Veterinary Sports Medicine and Rehabilitation.

## Dr. Nina Kieves

Dr. Nina Kieves is an Assistant Professor of Small Animal Orthopedic Surgery at The Ohio State University and Director of the Small Animal Physical Rehabilitation Service. She completed her veterinary degree at the University of Minnesota and is a board-certified Diplomate of both the American College of Veterinary Surgeons and American College of Veterinary Sports Medicine & Rehabilitation. Her research interests lie in sports medicine and rehabilitation and surgical treatment with minimally invasive techniques.

# CONTINUING EDUCATION INFORMATION

This program 20-799562 is approved by the AAVSB RACE to offer a total of 1.0 CE Credits, with a maximum of 1.0 CE Credits being available to any individual veterinarian or veterinary technician/technologist. This RACE approval is for the subject matter categories of medical using the delivery method of anytime/on demand. This approval is valid in jurisdictions which recognize AAVSB RACE; however, participants are responsible for ascertaining each board's CE requirements. This program is also approved in the State of New York for 1.0 CE Credits.

The American Association of Veterinary State Boards RACE committee has reviewed and approved the program referenced above as meeting the Standards adopted by the AAVSB.

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