

## Canine Arthritis

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Arthritis is inflammation in a joint. This can result in changes to the joint cartilage, the joint fluid, the bones involved in the joint and the actual capsule of the joint. Arthritis affects not only people of all ages -- including children -- but one in every five adult dogs in the U.S. and is one of the most common sources of chronic pain that veterinarians treat. According to the Arthritis Foundation, "Arthritis is one of the oldest diseases in history. We know that the dinosaurs had it and there is evidence that early humans lived with the same chronic aches and pains." There are no cures for arthritis. There are many different types of pain killers and anti-inflammatory medications and alternative therapies available which can help either you or your dog to live with arthritis.

Arthritis can affect any joint area, some of the more common sites are:

- Hips - Hip dysplasia (a loose fitting joint) allows excessive movement between the femoral head and acetabulum. This leads to bone spur formation and bone degeneration and is one of the most common causes of canine arthritis.
- Elbows - In poor fitting joint, a small piece of the bone breaks off due to abnormal pressure on the ulna and floats in the elbow, causing inflammation and arthritis.
- Knees - If the cruciate ligament ruptures, it creates instability in the knee joint - allowing the tibia to move forward in relation to the femur - which can lead to arthritis.
- Backs and necks - If chronic disc disease develops, arthritis can occur between the vertebra causing a condition call spondylitis. This can be a very debilitating disease.

### Osteoarthritis

Osteoarthritis is a condition once thought to be due simply to wear and tear on the cartilage of a joint; however, it is now known to be a complex problem that involves an active disease process. Normal joint surfaces are covered with a smooth layer of cartilage. Healthy cartilage allows bones to glide over one another. It also absorbs energy from the shock of physical movement. In osteoarthritis, the surface layer of cartilage breaks down and wears away. This allows bones under the cartilage to rub together, causing pain, swelling, and loss of motion of the joint. Over time, the joint may lose its normal shape. Also, bone spurs may grow on the edges of the joint. Bits of bone or cartilage can break off and float inside the joint space. This causes more pain and damage.

Primary canine osteoarthritis is believed to have an inherited predisposition. Genetic studies for humans indicate that inheritance plays a role in 25 to 30 percent of osteoarthritis cases. Secondary osteoarthritis is more common and arises from some insult of the joint such as the trauma of an accident, abnormal stresses on the joint surfaces or infection in a joint.

#### Treatments

- Maintain ideal body weight, avoid obesity.
- If there is a traumatic cause, surgical repair of ligaments may be necessary to stabilize the joint.
- Fitness and exercise are important.
- Anti-inflammatory medications to control pain and inflammation.
- Acupuncture can give excellent results in pain management and may eliminate the requirement for medications.
- Herbal medicine / holistic treatment

### Rheumatoid Arthritis

Rheumatoid Arthritis is an immune-mediated disease. This means it is caused by an overreaction of the immune system. In rheumatoid arthritis the body mistakes some of its own protein for foreign protein. It then makes antibodies against its own protein. These unique antibodies are collectively called the "rheumatoid factor". The antibodies and protein form immune complexes, which are then deposited in the joint. These complexes trigger inflammation.

With rheumatoid arthritis, the body tries to rid itself of the injurious immune complexes, but manages to only create more damage to the joint. Eventually the cartilage and even the bone in the joint are worn away.

The symptoms may be the same as with other forms of arthritis. An animal with rheumatoid arthritis generally has several joints affected. The animal is usually lame, but not always. The lameness may be mild or very severe to the point where the animal cannot walk. Sometimes the lameness shifts from leg to leg. In some cases, the lameness comes on suddenly and the animal also has a fever and loss of appetite. At other times, the only symptom of rheumatoid arthritis is stiffness. The joints affected are swollen and painful. Some dogs with rheumatoid arthritis also have kidney disease, enlarged lymph nodes, tonsillitis and pneumonia.

## Treatments

- Maintain ideal body weight, avoid obesity.
- Blood test for auto-antibodies known as 'rheumatoid factor'
- Chemistry profiles, radiographs, and possibly MRI may be needed for correct diagnosis
- Anti-inflammatory medications to control pain and inflammation in mild cases.
- Treatment with glucosamine/ chondroitin and Ester-C®
- Severe cases may require immunosuppression with steroids and other cytotoxic agents
- Herbal medicine / holistic treatment

## Idiopathic Polyarthritis

This group covers all the inflammatory diseases causing arthritis where no common feature or cause can be found. They can be divided into four groups but have few common denominators. Causative factors can be cancer, gastrointestinal disease, infections elsewhere in the body and other types of immune complex disease. What this indicates, is that if arthritis occurs along with other disease problems, there may be a link between them.

An immune-based polyarthritis can follow vaccinations. It can follow the first injection or booster vaccinations. The arthritis is usually self-limiting and can spontaneously resolve within several days. An accurate vaccination history is therefore important in all dogs presenting with polyarthritis. Immune-mediated arthritis can also occur secondary to infectious disease, for example, rocky mountain spotted tick fever, heart worm disease, and idiosyncratic reaction to medications (this includes "herbal" treatments)

### Treatment

- Therapy is directed at the underlying disease if possible
- In some cases, analgesic/anti-inflammatory drugs or corticosteroids are indicated
- In most cases, immunosuppressive therapy with prednisolone is indicated
- No controlled studies have been done

## NSAIDs

Non-steroidal anti-inflammatory drugs (NSAIDs) reduce inflammation by controlling prostaglandin production. Prostaglandins, produced by virtually every cell in the body have been shown to induce fever, possibly by participating in the temperature-regulating mechanisms in the hypothalamus; they also play a part in causing inflammation. Aspirin and NSAIDs have been shown to inhibit prostaglandin production accounting for their usefulness in reducing fever and inflammation, thereby bringing relief.

On the other hand, NSAIDs increase stomach acid secretion and diminish the mucosal protective barriers, leading to gastrointestinal irritation and upset. Although many new medications have developed which have less side-effects, little data is available to show that NSAIDs actually delay the onset or progression of arthritis.

## Naturopathic treatment

These are herbal products have anti-inflammatory properties similar to NSAIDs, yet do not appear to cause the same gastro-intestinal irritation. Always consult a professional before administering to ensure correct dosage.

Glucosamine is an amino acid sugar complex with anti-inflammatory properties. It actually helps the cartilage to regenerate itself. It is essential for the formation of two vital connective tissue substances necessary for tendons, ligaments, skin tissue, fingernails, mucous membranes in the respiratory and digestive systems. It reduces pain and swelling in affected joints and helps damaged cartilage to redraw and is a precursor molecule for chondroitin. Glucosamine provides the building blocks to synthesize new cartilage.

Chondroitin sulfate consists of repeating chains of molecules called mucopolysaccharides. Chondroitin sulfate is a major constituent of cartilage, providing structure, holding water and nutrients, and allowing other molecules to move through. Animal studies indicate that chondroitin sulfate may promote healing of bone, which is consistent with the fact that the majority of glycosaminoglycans found in bone consist of chondroitin sulfate. Chondroitin sulfate also appears to help restore joint function in pets with osteoarthritis.

Ester-C® is a buffered form of Vitamin C that is "body ready" and 4 times more available to the tissues than ordinary Vitamin C, which is highly acidic. In Ester C®, the acid is buffered with calcium and processed to contain threonate, a metabolite which dramatically enhances absorption.

Methylsulfonylmethane (MSM) enters the body as a dietary sulfur associated with the amino acids. In clinical tests, use of MSM produced significant relief of pain in joints and stiffness along with reduced swelling and inflammation. MSM prevents pressure build up in cells, permitting nutrients in and pushing toxins out and heals connective tissues and at the same time insulates the bones from friction and cushions the joints in movement. Feverfew is a natural NSAID compound without the side-effects of prescription drugs. It can be used in dogs with pain or arthritis to help reduce inflammation and discomfort. There is some recommendation that this not be used routinely, but rather 8-12 hours as needed.

Perna Mussel is a marine bivalve mussel and has been used to treat Degenerative Joint Disease (DJD). This mussel contains many bioactive compounds, including glycosaminoglycans, an anti-inflammatory component and an antihistamine compound. In a number of scientific studies, Perna mussel has been shown to reduce the inflammation of rheumatoid arthritis and DJD of the stifle. While the exact mechanism for this beneficial effect in arthritis is not known, it may be due to the unique combination of complex proteins, glycosaminoglycans, amino and nucleic acids and chelated minerals which it contains. It seems to enhance the regenerative capacities of joint chondrocytes, regulating the chondroitin sulfates and hyaluronic acid production needed to maintain healthy chondrocytes.

## Acupuncture

Traditional Chinese Medicine (TCM) describes the body as having a network of energy channels called meridians, that conduct the flow of a life-sustaining vital energy force called "Qi" ('Chee'). When Qi flows smooth, there is health. Acupuncture treatment by needles or any other means is an attempt to re-establish the balance and/or flow of the Qi throughout the body. Specific acupuncture point stimulation has been shown to aid production of endogenous cortisone and other anti-inflammatory secretions, release the body's internally produced pain killers, increase oxygenation, generally support the body's immune system, and assist in pain management. The Academy of Medical Acupuncture says: Acupuncture as a sole therapy has not shown itself to be of substantial value in severe and chronic inflammatory and immune-mediated disorders such as ulcerative colitis, asthma, rheumatoid arthritis, and collagen-vascular diseases, especially if those conditions have advanced to require systemic corticosteroid medication. There can be general value, however, for the symptom control and vitality-promoting effects of acupuncture in all of these conditions.

## Current research news

The National Institute of Arthritis and Musculoskeletal and Skin Diseases reports from their website:

**Genetics Studies:** Scientists have identified a mutation (a gene defect) affecting collagen, an important part of cartilage, in patients with an inherited kind of osteoarthritis that starts at an early age. The mutation weakens collagen protein, which may break or tear more easily under stress. Scientists are looking for other gene mutations in osteoarthritis.

**Tissue Engineering:** This technology involves removing cells from a healthy part of the body and placing them in an area of diseased or damaged tissue in order to improve certain body functions. Currently, it is used to treat small traumatic injuries or defects in cartilage, and, if successful, could eventually help treat osteoarthritis. Researchers at the NIAMS are exploring three types of tissue engineering. The two most common methods being studied today include cartilage cell replacement and stem cell transplantation. The third method is gene therapy.

- **Cartilage cell replacement:** In this procedure, researchers remove cartilage cells from the patient's own joint and then clone or grow new cells using tissue culture and other laboratory techniques. They then inject the newly grown cells into the patient's joint. Patients with cartilage cell replacement have fewer symptoms of osteoarthritis. Actual cartilage repair is limited, however.
- **Stem cell transplantation:** Stem cells are primitive cells that can transform into other kinds of cells, such as muscle or bone cells. They usually are taken from bone marrow. In the future, researchers hope to insert stem cells into cartilage, where the cells will make new cartilage. If successful, this process could be used to repair damaged cartilage and avoid the need for surgical joint replacements with metal or plastics.
- **Gene therapy:** Scientists are working to genetically engineer cells that would inhibit the body chemicals, called enzymes, that may help break down cartilage and cause joint damage. In gene therapy, cells are removed from the body, genetically changed, and then injected back into the affected joint. They live in the joint and protect it from damaging enzymes.

Animals help researchers understand how diseases work, why they occur, what happens to cartilage, how treatment strategies might work, and what might prevent the disease. Animal models also help scientists study osteoarthritis in very early stages before it causes detectable joint damage.

In recently published studies, two teams of researchers have discovered a specific protein responsible for cartilage decay. The researchers investigated a family of enzymes, called aggrecanases, that are thought to contribute to osteoarthritis by destroying a vital component of cartilage that makes it tough and elastic. The groups were led by Amanda Fosang at the University of Melbourne, Australia, and Elisabeth Morris at Wyeth Research in Cambridge, Massachusetts. Research efforts showed that mice genetically engineered to lack a form of the enzyme, ADAMTS5, or where the ADAMTS5 was blocked, had no cartilage breakdown or arthritis symptoms when joints were damaged or inflammation was induced.

Working under Grant No. 2616 from the American Kennel Club Canine Health Foundation, and using shelties as one of the study models, Alpana Ray, PhD; University of Missouri, Columbia is conducting molecular analysis of factors contributing to osteoarthritis in canine hip dysplasia. Grant Abstract: Hip Dysplasia is a common disease of dogs that will ultimately lead to osteoarthritis (OA), a serious debilitating condition, which at present, is treated by symptomatic management of pain. Accidental injuries also lead to the development of OA. Cartilage degeneration is fundamental to the pathogenesis of OA. We propose to study the transcriptional control of MMP-1, a major enzyme involved in the degradation of articular cartilage. Expression of MMP-1 gene and the corresponding protein is markedly increased under osteoarthritic condition. At present no data is available on canine MMP-1 gene regulation.

This proposal is aimed towards understanding the regulation of canine MMP-1 gene expression in response to biomechanical stress and cytokines by isolating canine MMP-1 gene; identifying the regulatory elements in the promoter responsive to biomechanical stress and cytokines; and analyze MMP-1 expression in chondrocytes of articular cartilage from normal and osteoarthritic dogs with the intent to develop novel therapeutic drugs to combat this disease.

In an email this month from Dr Ray, she states that funding was granted July 2004 and research is underway. The MMP-1 gene has been sequenced. Research is proceeding to identify proteins that work with and stimulate MMP-1 protein content in a diseased joint. Currently she and her team are running trials to find a compound which will inhibit only MMP-1 protein and not other needed proteins and enzymes.

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