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Glucosamine and Chondroitin in Mobility Foods for Dogs

Dog foods, snacks and nutritional supplements containing glucosamine and chondroitin make joint-health claims. Corresponding veterinary diets purport to manage osteoarthritis, a degenerative joint disease. It has not yet been studied whether dogs ingesting glucosamine and/or chondroitin maintain healthy mobility. Research in dogs with osteoarthritis indicates that the two substances do not improve the condition.

Osteoarthritis is caused by progressive loss of the cartilage that protects bones where they meet. This process is associated with inflammation, so that the dog's joints may become swollen and painful. Touching the joint area then elicits yelping or flinching. Dogs are reluctant to walk, run and jump, and may develop lameness and overt immobility.

Joint cartilage consists of cells embedded in a gel-like matrix between the adjacent bones. A significant proportion of the matrix molecules contain glucosamine and/or chondroitin. The two compounds can be synthesised by the dog's body, but supplementation is believed to make up ageing-induced low synthetic capacity. A small fraction of orally administered pure glucosamine and chondroitin is available to joint metabolism in dogs.

The mere intervention of entering dogs with osteoarthritis into an experimental setting generally produces positive observations. This is caused by biased evaluation and/or course of the disease, which are taken into account by experiments with double-blind, placebo-controlled design. Data from such experiments indicate that the intake of glucosamine and/or chondroitin does not ameliorate osteoarthritis symptoms in dogs.

Canine Osteoarthritis

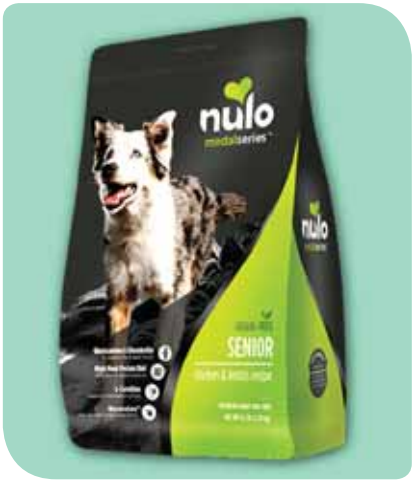
Most dogs older than five years are affected by osteoarthritis in various degrees of severity. Severe cases show symptoms of chronic pain, lameness, and immobility. Osteoarthritis is a degenerative and inflammatory condition in which degradation of cartilage matrix, not compensated for by synthesis, is associated with the release of pro-inflammatory cytokines.

Obesity, heavy exercise, and genetics are risk factors for osteoarthritis. Cartilage damage causes inflammation of the membranes lining the joint. This triggers cartilage cells to secrete enzymes (metalloproteinases) that further break down the extracellular cartilage matrix. Once osteoarthritis has arisen, it evolves into a perpetuating process with progressive loss of cartilage and increasing severity of clinical symptoms.

Osteoarthritis cannot be cured. Ideally, treatment is directed towards relief of pain by inhibition of inflammatory reactions and promoting cartilage conservation. Pharmacological therapy consists of non-steroid, anti-inflammatory drugs. Various dietary supplements, including preparations containing glucosamine and chondroitin sulphate, are recommended for support of canine joint health and treatment of osteoarthritis.

Extracellular cartilage matrix

The extracellular matrix of joint cartilage is composed of collagen and proteoglycans.



The large proteoglycan molecules consist of glucosaminoglycans (GAGs) and a core protein. GAGs are polymers of disaccharides such as hyaluronic acid, keratin sulphate and chondroitin sulphate. The first two contain N-acetylglucosamine as one of the two monosaccharides. For chondroitin sulphate it is N-acetylgalactosamine. The proteoglycans, which are synthesised by the cartilage cells, have high water-holding capacity, thus providing cushioning and lubrication effectiveness.

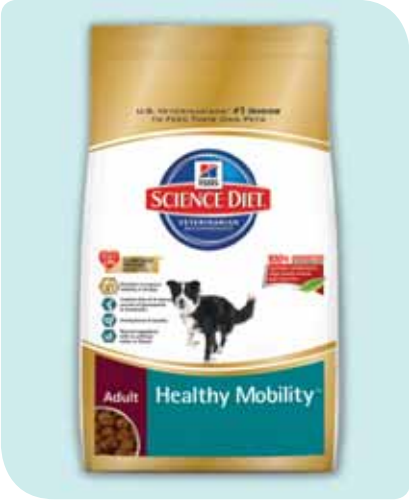
Glucosamine and Chondroitin Sulphate

The dog's body can synthesise N-acetylglucosamine and N-acetylgalactosamine from glucose. It is hypothesised that synthesis diminishes with ageing and that oral supplementation of glucosamine and chondroitin sulphate compensates for it. Prerequisite is that two substances are usable and available for the synthesis of GAGs. In dogs, the extent to which orally administered glucosamine and disaccharides of chondroitin sulphate reach the general blood circulation was found to be 11 and 5 percent (1). Glucosamine labelled with carbon 13 made its way through the digestive tract to the joint cartilage of dogs (2).

Glucosamine and chondroitin occur naturally in connective tissues and thus are present in dog foods with ingredients of animal origin. In the form of GAGs, glucosamine and chondroitin may not be nutritionally available. Glucosamine in commercial preparations is usually derived from the shells of crab, lobster and shrimp through various steps of hydrolysis and extractions. Purified chondroitin sulphate is manufactured from animal cartilage such as bovine tracheal rings.

Double-blind, Placebo-controlled Trials

For arthritic dogs subjected to control treatments in experiments, improvement is generally reported (3-9). The improvement over time is a placebo effect as it cannot be attributed to the investigational



intervention. Double-blind, placebo-controlled trials take into account any placebo effects. Four out of five such trials do not provide proof for efficacy of oral glucosamine and chondroitin sulphate in dogs with osteoarthritis.

Chondroitin sulphate alone (22 mg per kg body weight per day for 12 weeks) had no effect (3). Likewise, a mixture of glucosamine and chondroitin sulphate (25 + 30 mg per kg body weight per day for 6 months or 46 + 37 mg for 30 days) was ineffective (7, 10). The combination (61 + 48 mg per kg body weight per day) was slightly beneficial after 120 days in one experiment (11), but fruitless in another study with identical design (12).

Mobility Claims

There is a wide variety of commercial preparations containing glucosamine and/or chondroitin. It cannot be excluded that some mobility foods in the marketplace are enhanced with an effective preparation. Pet owners who wish to learn about the investigations underlying the mobility claim on a certain pet food brand should contact the manufacturer.

List of references is available on request from the author (beynen@freeler.nl)

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