

GLUCOSAMINE USAGE IN DOGS

by Laurie Edge-Hughes

Introduction:

Dietary supplements such as glucosamine and/or chondroitin sulfate are widely used to relieve the symptoms from osteoarthritis in both humans and animals. This report will attempt to review relevant studies on the use of glucosamine in dogs.

What is Glucosamine?

Glucosamine is a naturally occurring aminomonosaccharide derived from chitin in crustacean shells. It is a combination of glucose and the amino acid glutamine. Glucosamine is a major component of proteoglycans and is vital for the synthesis of glucosaminoglycans (components that hold water in the supporting structure of cartilage) and collagen.

Effectiveness in Humans:

Holt (1998) reviewed literature on glucosamine and chondroitin sulfate in humans. He found several double blinded placebo controlled trials that reported oral glucosamine administration can significantly improve the symptoms of osteoarthritis (O/A) as compared to placebo. Additional studies have found a correlation with glucosamine use and a reduction in joint space narrowing and erosive effects of O/A over a period of three years (Bruyere et al and Verbruggen et al).

Glucosamine Absorption in Dogs:

Adebowale et al studied the bioavailability and pharmacokinetics of glucosamine in dogs and found that the absorptions of glucosamine HCl occurred 1.1 to 1.6 hours after oral administration. The bioavailability after a single dose was 12.1 – 12.7% and after multiple dosing was 9.7 – 10.6% (dosage was 1500 – 2000mg). It is interesting to note that in this study, chondroitin sulfate absorption occurred 1.54 – 2.7 hours after administration and had a bioavailability of 4.8 – 50% (dosage of 1200 – 1600mg). However after multiple doses, the bioavailability was 200 – 278%! The animals tested were all beagles of an average weight of 12 kgs.

Effectiveness in Dogs:

Canapp et al studied the effects of two orally administered glucosamine products (Cosequin® and SAME) on chemically induced synovitis in the radiocarpal joint of dogs. They found that the dogs previously treated with Cosequin® for 21 days had a protective effect against chemically induced synovitis and associated bone remodeling. Prior treatment with Cosequin® also reduced lameness in dogs with induced synovitis as compared to a placebo control group and the SAME group.

Johnson et al also studied the effectiveness of glucosamine / chondroitin sulfate (Cosequin®) in dogs with surgically transected cruciate ligaments on the histological reaction within the stifle joint. Histological markers (3B3 & 7D4) that indicate synthesis and turn over of the matrix of proteoglycans and collagen by chondrocytes were utilized. Johnson studied four groups:

1. a sham treatment group (receiving a sham arthrotomy) and given Cosequin®
 2. a group that had the transection, received Cosequin® and then a sham repair after 4 weeks
 3. a group that had the transection, no Cosequin® and then a repair at 4 weeks
 4. a group that had the transaction, received Cosequin® and then a repair at 4 weeks
- Findings presented showed that at the once month stage following transection, there was no difference between the treatment groups. At the three month stage, the Cosequin® groups showed elevated levels of the 3B3 and 7D4 markers as compared to the non-Cosequin® group. This included the treatment group that did not have the repair of the transected cruciate! The study reported that glucosamine / chondroitin sulfate alters proteoglycan biosynthesis as well as anti-inflammatory, anticatabolic and chondroprotective actions.

Over-Dosage or Side-Effects of Glucosamine:

Anderson et al reviewed articles on glucosamine and found that there was no evidence of toxicity with large doses in animals. Dosages as high as 5000 – 15 000 mg/kg were reported. Additionally, oral doses of 159 – 2700 mg/kg/day for 12 – 365 days had no noted adverse side effects.

Consistency / Deviations in Label Claims of Glucosamine Products:

Adebowale et al studied 14 products containing glucosamine HCl or sulfate. Deviations in labeling and actual content of glucosamine were as low as 25 % or as high as 115%. They also studied 32 products containing chondroitin sulfate and found that only 5 contained the labeled amount of chondroitin, hence indicating that 84% of chondroitin (and glucosamine) on the market are inferior products.

Beale B reviewed chondroprotective agents and reported that glucosamine hydrochloride and glucosamine sulfate are both readily available, but the the hydrochloride form provides more glucosamine per unit weight than the sulfate form.

Dosage:

May of the studies used Cosequin® as the glucosamine product to test in their research. Personal communication with Dr. Sherman Canapp revealed that part of this reason was that Cosequin® was one of the products determined to have accurate labeling and contents as determined in the Adebowale study sited above. (Note also that Nutramax Laboratories® (makers of Cosequin®) is generous in their sponsorship and funding of research that uses or studies their product.) Cosequin® contains (per capsule):

Glucosamine HCl (500mg), Sodium Chondroitin Sulfate (400mg), Ascorbic Acid (33mg), Manganese (5mg). The recommended dosage is one capsule daily for 4 – 6 weeks (for 10 – 24 lb dogs), and then reduce the dosage in half as a maintenance dose.

Note: Personal communications have sited that 4 of the 5 glucosamine/chondroitin brands that had effective levels of product and accurate labeling were: Cosequin, Glycoflex, Synovacare, and Nature's Way. The Fifth product could not be recalled.

References:

1. Holt (1998) 'Bone and Joint Health, Part 2 – Dietary Supplements'. June.
2. Bruyere O, Honore A, Ethgen O et al (2003) 'Correlation between radiographic severity of knee osteoarthritis and future disease progression. Results from a 3-year prospective, placebo-controlled study evaluating the effect of glucosamine sulfate.' *Osteoarthritis and Cartilage*. Jan;11(1):1-5.
3. Verbruggen et al (2002) 'Systems to assess the progression of finger joint osteoarthritis and the effects of disease modifying osteoarthritis drugs.' *Clinical Rheumatology*. 21: 231 – 243.
4. Adebawale A, Du J, Liang Z et al (2002) 'The bioavailability and pharmacokinetics of glucosamine hydrochloride and low molecular weight chondroitin sulfate after single and multiple doses to beagle dogs'. *Biopharm. Drug Dispos*. 23: 217 – 225.
5. Canapp SO Jr, McLaughlin RM Jr, Hoskinson JJ et al (1999) 'Scintigraphic evaluation of dogs with acute synovitis after treatment with glucosamine hydrochloride and chondroitin'. *Am J Vet Res*. Dec;60 (12), 1552 – 1557.
6. Johnson KA, Hulse DA, Hart RC et al (2001) 'Effects of an orally administered mixture of chondroitin sulfate, glucosamine hydrochloride and manganese ascorbate on synovial fluid chondroitin sulfate 3B3 and 7D4 epitope in a canine cruciate ligament transection model of osteoarthritis'. *OsteoArthritis and Cartilage*. 9, 14 – 21.
7. Anderson JW, Nicolosi RJ and Borzelleca JF (2005) 'Glucosamine effects in humans: a review of effects on glucose metabolism, side effects, safety considerations and efficacy'. *Food and Chemical Toxicology*. 43, 187 – 201.
8. Adebawale AO, Cox DS, Liang Z et al (2000) 'Analysis of glucosamine and chondroitin sulfate content in marketed products and the caco-2 permeability of chondroitin sulfate raw materials'. *JANA*. Spring Vol 3, No 1, 37 – 44.
9. Beale B 'The role of chondroprotectants and nutraceuticals in rehabilitation' in *Canine Rehabilitation and Physical Therapy*. Millis, Levine and Taylor eds. (Saunders: St Louis, Missouri).
10. A bottle of Cosequin®