

Nutritional Supplements for Osteoarthritis Prevention and Management

Glucosamine : 500 mg three times daily

Glucosamine is manufactured by the body and utilized in the production of Chondroitin, which is a significant component of our cartilage. As we get older and our production of glucosamine falls off, the amount of chondroitin falls off and the cartilage begins to wear excessively. So, do I recommend Glucosamine Sulfate, or Glucosamine HCl? Well, it really doesn't matter. The active ingredient is the glucosamine, the SO₄ or the HCl are just carriers to help it get absorbed in the gut. Some people argue that the sulfate version offers sulfur, which is an important nutrient for cartilage health, however in my experience, the lack of sulfur is more often a dietary problem than a result of getting older. Consequently, I like to tell people to eat right and supplement with whichever glucosamine product suits them. So what do I recommend?...

I recommend Glucosamine HCl. This is why;

- The sulfate attachment is larger than the HCl attachment and so you have to take more glucosamine sulfate to get the same amount of glucosamine that you get in a glucosamine HCl supplement. Rule of thumb: Take about 1500 mg or Glucosamine HCl or about 2300 mg of Glucosamine Sulfate to get 1500 mg of glucosamine per day.

Pain Relief – Shown to be superior to pharmaceutical anti-inflammatory drugs for pain relief without any clinically observed adverse side effects.

Vas AL. Double-blind clinical evaluation of the relative efficacy of glucosamine sulphate in the management of osteoarthritis of the knee in outpatients. *Curr Med Res Opin* 1982;8;145-49

Cartilage Protection – Shown to repair or at least slow degradation of joint cartilage in arthritis.

D'Ambrosio E, Casa B, Bompani R, et al. Glucosamine sulfate: a controlled clinical investigation in arthritis. *Pharmatherapeutica* 1981;2:504-08.

Drovanti A, Bignamini AA, Rovati AL. Therapeutic activity of oral glucosamine sulfate in osteoarthritis: a placebo-controlled double-blind investigation. *Clin Ther* 1980;3(4):260-72.

Pujalte JM, Llavore EP, Ylescupide FR. Double-blind clinical evaluation of oral glucosamine sulphate in the basic treatment of osteoarthritis. *Curr Med Res Opin* 1980;7:110-14.

Crolle G, D'Este E. Glucosamine sulphate for the management of arthrosis: a controlled clinical investigation. *Cur Med Res Opin* 1980;7;104-09.

Note that patients with Type II diabetes should only use this supplement under the supervision of their doctor as recent studies have shown increased insulin resistance in rats.

Virkamaki A, Daniels MC, Hamalainen S, et al. Activation of the hexosamine pathway by glucosamine in vivo induces insulin resistance in multiple insulin sensitive tissues. *Endocrinology* 1997;138(6);2501-07.

Virkamaki A, Yki-Jarvinen H. Allosteric regulation of glycogen synthase and hexokinase by glucosamine-6-phosphate during glucosamine-induced insulin resistance in skeletal muscle and heart. *Diabetes* 1999;48(5):1101-07

Chondroitin Sulfate : 400 mg two to three times daily

This supplement has been shown to be better than a placebo in management of arthritis. On the other hand, you must consider that this large molecule is going to be completely disassembled and then render its constituent parts to your body. You can be assured that no chondroitin will be absorbed by your body as chondroitin. Having said that, I would suggest you stick to the glucosamine recommendation above. But here is the data for you anyway...

Pain Relief – Shown to be effective in reduction of symptoms of arthritis.

Buesi L, Poor G. Efficacy and tolerability of oral chondroitin sulfate as a symptomatic slow-acting drug for osteoarthritis (SYSADOA) in the treatment of knee osteoarthritis. *Osteoarthritis Cartilage* 1998;6:(Suppl A):31-36.

Bourgeois P, Charles G, Dehais J, et al. Efficacy and tolerability of chondroitin sulfate 1200 mg/day vs chondroitin sulfate 3X400 mg/day vs placebo. *Osteoarthritis Cartilage* 1998;6:(Suppl A):25-30.

Cartilage Protection – provides raw materials for cartilage production and inhibits enzymatic breakdown of cartilage.

Ronca F, Palmieri L, Panicucci P, et al. Effects of oral chondroitin sulfate on the progression of knee osteoarthritis: a pilot study. *Osteoarthritis Cartilage* 1998;6:(Suppl A):39-46.

Vitamin E: 400 – 800 IU daily

Pain Relief – Shown to be effective in reduction of symptoms of arthritis.

Machtey I, Ouaknine L. Tocopherol in osteoarthritis: a controlled pilot study. *J Am Geriatr Soc* 1978;26(7):328-30

Scherak O, Lolarz G, Schodl C, et al. High dosage vitamin E therapy in patients with activated arthrosis. *Z Rheumatol* 1990;49(6):369-73

Cartilage Protection – Shown to reduce cartilage degradation caused by free radicals.

Tiku ML, Gupta S, Deshmukh DR. Aggrecan degradation in chondrocytes is mediated by reactive oxygen species and protected by antioxidants. *Free Radic Res* 1999;30(5):395-405.

Tiku ML, Shah R, Allison GT. Evidence linking chondrocyte lipid peroxidation: possible role in cartilage aging and the pathogenesis of osteoarthritis. *J Biol Chem* 2000;275(26):20069-76.

Machtey I, Ouaknine L. Tocopherol in osteoarthritis: a controlled pilot study. *J Am Geriatr Soc* 1978;26(7):328-30

Scherak O, Lolarz G, Schodl C, et al. High dosage vitamin E therapy in patients with activated arthrosis. *Z Rheumatol* 1990;49(6):369-73

Vitamin C: 500 mg three times daily

Pain Relief – No significant pain effects.

Cartilage Protection – Shown to be critical in creation of collagen, a vital component of cartilage. Shown to be a very important antioxidant and is capable of regenerating other antioxidants such as Vitamin E. Appears to protect against erosion of joint cartilage and is associated with a 3-fold reduction in the risk of knee osteoarthritis.

McAlindon TE, Jacques P, Zhang YT et al. Do antioxidant micronutrients protect against the development and progression of knee osteoarthritis? *Arthritis Rheum* 1996;49(4):648-56.

Schwardz RI, et al. Ascorbate can act as an inducer of the collagen pathway because most steps are tightly coupled. *Third Conference of Vitamin C* 1987;498:172-84

Mahan LK, Arlin M. Krause's Food Nutrition and Diet Therapy. 8th ed. Philadelphia: WB Saunders; 1992.

Niki E. Interaction of ascorbate and alpha-tocopherol. *Third Conference of Vitamin C* 1987;498:187-98.

Schwartz ER, Oh WH, Leveille CR. Experimentally induced osteoarthritis in guinea pigs. *Arthritis Rheum* 1981;24(11):1345-55.

N-acetylcysteine: 200 mg two to three times daily

Pain Relief – no pain relief benefit has been demonstrated.

Cartilage Protection – Provides dietary cysteine, the major precursor to Glutathione. Glutathione is the primary defense within the body against free radicals. Shown to have an inhibitory effect upon the collagen induced arthritis in mice.

Kroger H, Miesel R, Dietrich M, et al. Suppression of type II collagen induced arthritis by N-acetylcysteine in mice. *Gen Pharmacol* 1997;29:671-74.

Kelly GS. Clinical applications of N-acetylcysteine. *Alt Med Rev* 1998;3(2):114-27.

Tsuji F, Miyake Y, Aono H, et al. Effects of bucillamine and N-acetyl-cysteine on cytokine production and collagen-induced arthritis (CIA). *Clin Exp Immunol* 1999;115(1):26-31.

Morin I, Li WQ, Su S, et al. Induction of stromelysin gene expression by tumor necrosis factor alpha is inhibited by dexamethasone, salicylate, and N-acetylcysteine. *Inflammation* 1999;289(3):1634-40.

Kroger H, Hauschild A, Ohde M, et al. Enhancing the inhibitory effect of nicotinamide upon collagen II induced arthritis in mice using N-acetylcysteine. *Inflammation* 1999;23(2):111-15.

Niacinamide: 500 mg two to three times daily

Pain Relief – Shown to improve effects of arthritis by 29% and allow for reduction in pain relieving medication necessary to address symptoms of arthritis.

Jonas WB, Rapoza CP, Blair WF. The effect of niacinamide on osteoarthritis: a pilot study. *Inflamm Res* 1996;45(7):330-34.

Cartilage Protection – no cartilage protective benefit has been demonstrated.

Minerals

Zinc: 15 mg daily

Copper: 2 mg daily

Selenium: 200-400 micrograms daily

Manganese: 20 mg daily

Pain Relief – No direct pain effects identified.

Cartilage Protection – Shown to increase anti-oxidant and free radical scavengers.

Garewal HS, editor. Antioxidants and Disease Prevention, New York: CRC Press; 1997
DiSilvestro RA, Marten J, Skehan M. Effects of copper supplementation on ceruloplasmin and copper-zinc superoxide dismutase in free-living rheumatoid arthritis patients. *J Am Coll Nutr* 1992;11:177-80.

Davis CD, Greger JL. Longitudinal changes of manganese dependent superoxide dismutase and other indexes of manganese and iron status in women. *Am J Clin Nutr* 1992;55:74-77.

Bosellia Serrata: standardized extract equivalent to 150 mg boswellic acids, 3 times daily

Turmeric: Standardized extract equivalent to 150 mg curcuminoids, 3 times daily

Ginger: Standardized extract equivalent to 10 mg gingerols, 3 times daily.

Pain Relief – Ginger was shown to improve pain and swelling in 75% of tested arthritis patients and 100% of those studied with muscle discomfort reported symptomatic relief. Curcumin (1200 mg/day from Turmeric) was found to have anti-inflammatory properties comparable to that of the anti-inflammatory drug phenylbutazone (300 mg/day). Boswellia was found to reduce joint pain and swelling in 50-60% of arthritis patients tested.

Srivastava KC, Mustafa T. Ginger (*Zingiber officinale*) in rheumatism and musculoskeletal disorders. *Med Hypoth* 1992; 39:342-48.

Deodhar SD, Sethi R, Srimal RC. Preliminary study on antirheumatic activity of curcumin. *Indian J Med Res* 1980;71:632-34.

Singh GB, Bani S, Singh S. Toxicity and safety evaluation of boswellic acids. *Phytomedicine* 1996;3:87-90.