



# DR. AUBURN'S ADVANCED NUTRITIONALS

## CHONDRO-SUPPORT

### CLINICAL APPLICATIONS

- SUPPORTS JOINT INTEGRITY AND MOVEMENT
- HELPS PROTECT CARTILAGE CELLS
- MAINTAINS NORMAL INFLAMMATORY BALANCE
- ENHANCES SYNTHESIS OF PROTEOGLYCANS FOR HEALTHY CONNECTIVE TISSUE

This product combines glucosamine sulfate, chondroitin sulfate, vitamin C and bromelain, all of which have a long history of use and a large body of research highlighting their role in supporting joint health. As the key precursors to cartilage formation, the ingredients in this product provide full support for joint integrity and movement and a normal inflammatory balance. The formula also includes bromelain to enhance the absorption of chondroitin and vitamin C, an antioxidant that reduces free radicals and is a cofactor to enzymes critical for the synthesis of new collagen.

### Overview

Cartilage is composed of collagen fibers that impart tensile strength, and proteoglycan molecules (especially chondroitin) that serve as a cushion for joint impact. Proteoglycan molecules are made of a linear core protein with several hundred molecules of glycosaminoglycans and the protein's core molecules are attached to a hyaluronic acid framework. Lifestyle factors and age can both contribute to a breakdown of healthy cartilage and lead to discomfort, which can lead to nutrient and fluid deprivation of the affected articular cartilage. While most current therapies simply inhibit prostaglandin and thromboxane pathways, they also inhibit the regeneration and elongation of chondroitin sulfate polymers that maintain joint health.<sup>1</sup> The ingredients in this product address the root cause of joint discomfort and provide the precursors that enhance cartilage synthesis for healthy joints and connective tissue.

### Glucosamine<sup>†</sup>

Glucosamine sulfate (GS) is a naturally occurring, joint-supporting compound. As a precursor to the primary building blocks of joint tissue (glycolipids, glycoproteins, hyaluronate, and proteoglycans) it is an important starting point for cartilage synthesis. Meta-analyses have long confirmed positive trends for the use of glucosamine.<sup>2-4</sup> In an early double-blind, placebo-controlled trial (80 subjects, half received 1.5 g of glucosamine sulfate in 3 divided doses, and

the other half received placebo), those given glucosamine had double the joint health benefits compared with placebo (71% vs 41%).<sup>5</sup> In a double-blind trial of 178 patients, 1500 mg of glucosamine sulfate significantly supported joint health after four weeks and continued to maintain joint function two weeks after treatment was stopped.<sup>6</sup> A more recent 16-week, randomized, double-blind, placebo-controlled trial (glucosamine-based dietary supplement combined with chondroitin sulfate and three antioxidant micronutrients) showed a synergistic improvement when these ingredients were used in combination. The treatment group showed benefits at all four assessment time points in the test group, but not at any point in the placebo group.<sup>7</sup> Lastly, a 2013 study of data from a French database of 11,772 adults taking a glucosamine supplement showed a significant positive effect in joint health, functional limitation and quality of life.<sup>8</sup>

### Chondroitin Sulfate as CS b-Bioactive<sup>®†</sup>

As the major glycosaminoglycan associated with articular cartilage, chondroitin sulfate (CS) is designed to draw water into the joint tissues and hydrate them, allowing for compression when pressure is put on the joint and to rehydrate when the pressure is released. There is a growing body of research supporting the benefits of chondroitin for normal joint function. The MOSAIC study, a 24-month multi-center, randomized, double-blind, controlled and comparative study carried out in five medical centers in Quebec (Canada), that looked at structural changes in patients' knees. One hundred ninety-four patients were evaluated on standard joint function and joint symptom scales, and underwent three MRI scans: one at the beginning of the study, a second one after one year and a third one at the end of the study. The study looked at the effects of CS b-Bioactive<sup>®</sup> (1,200 mg/day) on functional scores and cartilage volume in knee after 24 months. The MOSAIC study found that CS b-Bioactive<sup>®</sup> was efficient across the entire study, reaching a clinically relevant improvement.<sup>9</sup> A review of seven clinical trials (327 total patients in which

CS was compared with placebo for 120 days or more) revealed it to be significantly superior to placebo.<sup>10</sup> Key research in the use of chondroitin sulfate confirmed the use for knee<sup>10,11</sup> and finger joint benefits.<sup>12</sup> A one year, randomized, double-blind, placebo controlled study showed a significant positive effect in knee joint health and mobility in patients taking CS (800 mg/day) compared to placebo.<sup>13</sup> CS has also been shown to maintain normal inflammatory balance, with an affinity to synovial cartilage and to have metabolic effects on synthesis of hyaluronate and cartilage proteoglycans. CS has also been shown to inhibit cartilage degrading enzymes (collagenase, elastase, proteoglycanase).<sup>14</sup>

### Bioavailability Considerations for Chondroitin Sulfate†

The importance of bioavailability is obvious: If consuming chondroitin sulfate has little effect on joint health, there is no reason to ingest it. Studies show that oral doses are well-absorbed and have a high affinity to cartilaginous tissues. This, however, is dependent on the size of chondroitin sulfate particles that are selected.<sup>15</sup> It is well established that the molecular weight (particle size) of chondroitin sulfate has a direct influence on its permeability and absorption. A study at the University of Maryland examining random retail chondroitin sulfate products showed that a majority of products use large molecular weight, acid-hydrolyzed chondroitin particles. These particles are inconsistent in size and too large to be absorbed in the intestine. The chondroitin sulfate in this product is enzymatically processed providing consistently small, highly absorbed chondroitin molecules ensuring the best results.

### Bromelain†

Bromelain is a protease derived from pineapple stems that helps to maintain normal inflammatory balance by affecting both the kinin and fibrin pathways. Bromelain also increases the absorption of chondroitin sulfate.<sup>16</sup>

### Synergy†

A number of studies support the synergy of glucosamine and chondroitin when co-supplemented. A double-blind, placebo-controlled, cross-over trial using GS (1500 mg/day) and CS (1200 mg/day), in 34 males (US Navy diving and special warfare communities),<sup>17</sup> showed statistical significance for normal knee joint support after 4 months.

### Directions

1 capsule three times per day on an empty stomach or as recommended by your health care professional.

### Does Not Contain

Gluten, corn, yeast, artificial colors and flavors.

### Cautions

If you are pregnant or nursing, consult your physician before taking this product.

## Supplement Facts <sup>v3</sup>

Serving Size 1 Capsule  
Servings Per Container 90 & 180

1 capsule contains	Amount Per Serving	% Daily Value
Vitamin C (as Ascorbic Acid USP)	20 mg	22%
Sodium (as Chondroitin Sulfate Sodium)	20 mg	<1%
Potassium (as Glucosamine Sulfate Potassium Chloride)	60 mg	1%
Glucosamine Sulfate Potassium Chloride	500 mg	*
Chondroitin Sulfate Sodium	300 mg	*
Bromelain (2,400 GDU/g) (from Pineapple)	15 mg	*

\* Daily Value not established

## References

1. Brandt KD. Effects of nonsteroidal anti-inflammatory drugs on chondrocyte metabolism in vitro and in vivo. *Am J Med* 1987;83(5A):29-34.
2. McAlindon TE et al. Glucosamine and chondroitin for treatment of osteoarthritis: a systematic quality assessment and meta-analysis. *JAMA* 2000; 283(11):1469-75l.
3. Da Camara CC, Dowless GV. Glucosamine sulfate for osteoarthritis. *Ann Pharmacother* 1998; 32(5):580-7.
4. Barclay TS, Tsourounis C, McCart GM. Glucosamine. *Ann Pharmacother* 1998; 32(5):574-9.
5. Drovanti A, Bignamini AA, Rovati AL. Therapeutic activity of oral glucosamine sulfate in osteoarthritis: a placebocontrolled double-blind investigation. *Clin Ther* 1980; 3(4):260-72.
6. Efficacy and safety of glucosamine sulfate versus ibuprofen in patients with knee osteoarthritis. *Arzneimittelforschung* 1998;48(5):469-74.
7. Nakasone Y, Watabe K, Watanabe K, Tomonaga A, Nagaoka I, Yamamoto T, Yamaguchi H. Effect of a glucosamine based combination supplement containing chondroitin sulfate and antioxidant micronutrients in subjects with symptomatic knee osteoarthritis: A pilot study. *Exp Ther Med*. 2011 Sep;2(5):893-899. Epub 2011 Jun 27.
8. Bertin P, Taieb C. NSAID-sparing effect of glucosamine hydrochloride (Structoflex®) in patients with knee osteoarthritis: an analysis of data from a French database. *Curr Med Res Opin*. 2013 Oct 16. [Epub ahead of print].
9. Pelletier J-P, et al. Chondroitin sulfate efficacy versus celecoxib on knee osteoarthritis structural changes using magnetic resonance imaging: a 2-year multicenter exploratory study. *Arthritis Research and Therapy* 2016 Nov 3;18 (1):256
10. A metaanalysis of chondroitin sulfate in the treatment of osteoarthritis. *J Rheumatol* 2000; 27(1):205-11.
11. Uebelhart D, Thonar EJ, Delmas PD, et al. Effects of oral chondroitin sulfate on the progression of knee osteoarthritis: a pilot study. *Osteoarthritis Cartilage* 1998; 6 (Suppl A):39-46.
12. Bucsi 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.
13. Verbruggen G, Goemaere S, Veys EM. Chondroitin sulfate: S/DMOAD (structure/disease modifying antiosteoarthritis drug) in the treatment of finger joint OA. *Osteoarthritis Cartilage* 1998; 6 (Suppl A):37-8.
14. Uebelhart D et al. Effects of oral chondroitin sulfate on the progression of knee osteoarthritis: a pilot study. *Osteoarthritis and Cartilage* 1998; 6(Suppl A):39-46.
15. Ronca F, Palmieri L, Panicucci P, Ronca G. Anti-inflammatory activity of chondroitin sulfate. *Osteoarthritis Cartilage* 1998; 6 (Suppl A):14-21.
16. Adebowale, Abimbola O., PhD, Donna S. Cox, MS, Zhongming Liang, MS, and Natalie D. Eddington, PhD. "Analysis of Glucosamine and Chondroitin Sulfate Content in Marketed Products and the Caco-2 Permeability of Chondroitin Sulfate Raw Materials." *JANA* 3.1 (2000): 37-44. Print.
17. Bock U et al. Transport of proteolytic enzymes across Caco-2 cell monolayers. *Pharm Res* 1998; 15(9): 1393-400.
18. Leffler CT, Philippi AF, Leffler SG, et al. Glucosamine, chondroitin, and manganese ascorbate for degenerative joint disease of the knee or low back: a randomized, double-blind, placebo-controlled pilot study. *Mil Med* 1999; 164(2):85-91.