

# GLUCOSAMINE SULFATE



## CLINICAL APPLICATIONS

- Supports Joint Integrity and Movement
- Helps Protect Cartilage Cells
- Enhances Synthesis of Proteoglycans for Healthy Connective Tissue

## MUSCULOSKELETAL HEALTH

Glucosamine sulfate has a long history and an extensive body of research highlighting its role in protecting cartilage, the shock-absorbing, gel-like material located between the joints. As the key precursor to cartilage formation, glucosamine sulfate supports connective tissue health to provide full support for joint comfort, as well as integrity and movement, while promoting a healthy inflammatory response. Glucosamine sulfate is also a precursor to chondroitin sulfate and hyaluronic acid, both of which are natural compounds found in the synovial fluid of cartilage. The Glucosamine Sulfate formula is a high-purity product, providing 750 mg per capsule and maximum support for joint health.

### Overview

The joint cartilage is composed of collagen fibers, which impart tensile strength, and proteoglycan molecules (especially chondroitin and hyaluronic acid), which serve as a shock-absorbing cushion. The hands, as well as weight-bearing joints, such as the knees, hips and spine, are the areas in the body that undergo the greatest stress from the impacting pressure of weight and movement. In order to maintain joint health, it is important that the collagen matrix, or the support structure of the cartilage, remains intact. Glucosamine is an aminomonosaccharide, which is a component of almost all human tissues, including cartilage. Glucosamine is the principal component of glycosaminoglycans (GAGs), which forms the matrix of all connective tissues.

### Joint Integrity and Movement<sup>†</sup>

Glucosamine sulfate's main physiological effect is to stimulate the production of glycosaminoglycans and promote the incorporation of sulfur into the cartilage in order for cartilage

to maintain its gel-like structure and ability to act as a shock absorber. Glucosamine is the most fundamental building block for the biosynthesis of other compounds required to maintain joint health including glycolipids, glycoproteins, hyaluronate and proteoglycans. Meta-analyses have long confirmed positive findings for the use of glucosamine.<sup>2-4</sup> In an early double-blind, placebo-controlled trial of 80 subjects, half of the group received 1.5 g of glucosamine sulfate in 3 divided doses, and the other half was given a placebo. Those given glucosamine sulfate demonstrated a significant improvement in maintaining joint health, versus the placebo group (71% vs 41%).<sup>5</sup> A more recent 16-week, randomized, double-blind, placebo-controlled trial of a glucosamine-based dietary supplement with chondroitin sulfate and three antioxidant micronutrients, found that joint health was maintained at all four assessment time points (weeks 4, 8, 12 and 16) in the control group, but not at any time point in the placebo group.<sup>7</sup> Lastly, a 2013 study of data from a French database of 11,772 adults found that those taking a glucosamine supplement were able to maintain joint health.<sup>7</sup>

### Supports Normal Inflammatory Response<sup>†</sup>

Although exact mechanisms of action are yet to be established, research suggests that glucosamine supplementation helps modulate cytokine production in addition to directly stimulating chondrocytes (cartilage cells that help produce and maintain a healthy cartilage matrix), while aiding in the incorporation of sulfur into cartilage.<sup>8,9</sup> Glucosamine has been found to balance numerous markers of inflammatory response<sup>10</sup> and to alleviate oxidative stress.<sup>11</sup>

<sup>†</sup> These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.

## Directions

1 capsule two times per day 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>v2</sup>		
Serving Size 1 Capsule		
Servings Per Container 120		
1 capsule contains	Amount Per Serving	% Daily Value
Glucosamine Sulfate	750 mg	*
Potassium Chloride		
* Daily Value not established		

ID# 541120 120 Capsules

## 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):1469-75.
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 placebo-controlled double-blind investigation. *Clin Ther* 1980; 3(4):260-72.
6. 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.
7. 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.
8. Selvan T, Rajiah K, Nainar MS, et al. A clinical study on glucosamine sulfate versus combination of glucosamine sulfate and NSAIDs in mild to moderate knee osteoarthritis. *Scientific World Journal*. 2012;2012:902676. *Epub* 2012 Apr 1.
9. Dahmer S, Schiller RM. Glucosamine. *Am Fam Physician*. 2008 Aug 15;78(4):471-76. *Review*.
10. Richter J, Capková K, Hříbalová V, Vannucci L, Danyi I, Malý M, Fišerová A. Collagen-induced arthritis: severity and immune response attenuation using multivalent GlcNAc. *Clin Exp Immunol*. 2014 Mar 4.
11. Wu YL, Lin AH, Chen CH, Huang WC, Wang HY, Liu MH, Lee TS, Ru Kou Y. Glucosamine attenuates cigarette smoke-induced lung inflammation by inhibiting ROS-sensitive inflammatory signaling. *Free Radic Biol Med*. 2014 Apr;69:208-18.

† These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.