Vegan Glucosamine Chondroitin MSM

INGREDIENTS
Vegan GCMSM formula features a unique combination of three major ingredients universally well-known to support your healthy joints and active lifestyle: glucosamine, chondroitin, and MSM (methylsulfonylmethane). Vegan GCMSM formula by Doctor’s Best is the first of its kind because it provides the first non-animal chondroitin combined with glucosamine sulfate that is 100% vegetable source glucosamine and OptiMSM®, the highest purity form of MSM.

Glucosamine sulfate, the sulfate derivative of glucosamine, is a natural amino-monosaccharide and a normal constituent of glycosaminoglycans in cartilage matrix and synovial fluid that is found naturally in the body as one of the building blocks of cartilage. For many decades, glucosamine have been clinically studies and have been found to have pharmacological activities and beneficial effects in particular cartilage and joint tissues.*1 Glucosamine sulfate supplements have become a mainstay of joint and cartilage management due to their important structure-preserving and symptom-relieving effects, as well as their cost effectiveness.*2 Several clinical trials have shown the significant positive effects of glucosamine sulfate in improving joint health and its good safety profile.*3-5

Chondroitin sulfate (CS) is a component of human connective tissues found in cartilage and bone. The main source for CS used in dietary products is of animal sources obtained by extraction from tissues and organs of various animals or fish (bovine, porcine, avian, and piscine fish). However, the animal origin may cause potential safety complications (potential presence of transmissible infective agents, allergic reactions) and quality and bioavailability problems.*6 Vegan GCMSM formula features MythoChondro® Chondroitin from Gnosis, the first non-animal source of chondroitin sulfate (CS) with clinically proven positive effects of joint health.*7,8 MythoChondro® is the result of many years of research and development and has generated five patents based upon scientific advances in the biotechnology areas and is the first CS obtained with a fermentation-based manufacturing process followed by a chemical selective sulfation.*8,9

Vegan GCMSM formula features GreenGrown® Glucosamine Sulfate 2KCl, a new source of glucosamine that provides 100% vegetable source glucosamine and meets the highest levels of purity. GreenGrown® Glucosamine, manufactured by using environmentally-friendly technology, offers a unique glucosamine dietary supplement free of shellfish allergens.

Vegan GCMSM formula features the highest purity of methylsulfonylmethane (MSM) or OptiMSM®. MSM is a naturally occurring nutrient that provides sulfur, used by the body to maintain connective tissues.*10

BENEFITS
- Supplies the body with building material for proteoglycans, a component of cartilage*
- Supports healthy joint structure and function*
- Provides sulfur, a key element that helps maintain the structural strength of joints and cartilage*
- Helps support joint health and flexibility*
- Helps support cartilage and connective tissues*

EXTENDED BENEFITS
Supplies the body with building material for proteoglycans, a component of cartilage*
Cartilage, a “connective tissue,” is composed of cells (chondrocytes), protein fibers and clusters of complex molecules named “proteoglycans.” A proteoglycan consists of a long protein with many side chains attached to it. The attached side chains are polysaccharides—chiefly chondroitin sulfate and keratin sulfate.*6 Glucosamine is biosynthesized endogenously in animals and man by amination of glucose in position-2. It is structurally incorporated in glycosaminoglycans and proteoglycans, especially in cartilage and synovial fluid.*12,13 Because glucosamine is one of the building blocks of glycosaminoglycans, early studies suggested that dietary glucosamine sulfate could stimulate their synthesis and thus the production of new cartilage matrix.*12,14

Supports joint structure and function*
Glucosamine sulfate (GS) supports joint function by supplying the body with dietary ingredients (glucosamine and sulfur) for building joint tissue.*

Supplement Facts

<table>
<thead>
<tr>
<th>Serving Size</th>
<th>4 Veggie Capsules</th>
</tr>
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<tbody>
<tr>
<td>Servings Per Container</td>
<td>30</td>
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<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Amount Per Serving</th>
<th>% Daily Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Total Carbohydrate</td>
<td>1 g</td>
<td>&lt;1 %**</td>
</tr>
<tr>
<td>Chloride (from GreenGrow® glucosamine sulfate 2KCl)</td>
<td>194 mg</td>
<td>8 %</td>
</tr>
<tr>
<td>Potassium (from GreenGrow® glucosamine sulfate 2KCl)</td>
<td>176 mg</td>
<td>4 %</td>
</tr>
<tr>
<td>Glucosamine Sulfate 2KCI (from GreenGrow® glucosamine sulfate 2KCI)</td>
<td>1500 mg</td>
<td>†</td>
</tr>
<tr>
<td>MSM (Methylsulfonylmethane/OptiMSM®)</td>
<td>1000 mg</td>
<td>†</td>
</tr>
<tr>
<td>Chondroitin Sulfate (from chondroitin sulfate sodium (Mythocondro®))</td>
<td>400 mg</td>
<td>†</td>
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** Percent Daily Values are based on a 2,000 calorie diet. 1 Daily Value not established.
† Other Ingredients: Hypromellose (vegetarian capsule), microcrystalline cellulose, silicon dioxide, stearic acid.
Suggested Adult Use: Take 4 capsules daily with food, or as recommended by a nutritionally-informed physician.
WARNING: Consult your physician before using any health supplement if pregnant, lactating, have a medical condition, or taking medications for diabetes, glaucoma or warfarin. Not for use by individuals under the age of 18 years. Keep out of reach of children.
Non-GMO / Gluten Free / Soy Free / Vegan
Store in a cool dry place.

* 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.
Glucosamine, an amino sugar that is essential to the glycosaminoglycans found in cartilage and synovial fluid, stimulates chondrocytes (cartilage cells) to manufacture cartilage building blocks known as proteoglycans. These building blocks contribute to the maintenance of sound joint structure, ultimately enhancing healthy joint function. Because glucosamine is one of the building blocks of glycosaminoglycans, early studies suggested that dietary glucosamine sulfate could stimulate their synthesis and thus the production of new joint tissue.\(^{12,14}\) Many years of research have produced evidence that glucosamine sulfate supports cartilage metabolism and structure, thereby enhancing healthy joint function.\(^{5,15-19}\)

The European Society for Clinical and Economic Aspects of Osteoporosis and Osteoarthritis (ESEO) recommends the intake of glucosamine sulfate as first-line for knee joint improvement, enhancing healthy joint function.\(^{100}\) Experimental studies and human clinical trials convincingly demonstrated that orally consumed glucosamine sulfate promotes healthy joint function.\(^{11,16,20-22}\)

**Provides sulfur, the key element that helps maintain the structural strength of joint and cartilage**

Sulfur is an essential structural non-metallic chemical element and a vital nutrient for our bodies to stay vigorous and flexible. Besides glucosamine sulfate and chondroitin sulfate, methylosulfonylmethane (or MSM) provides sulfur, oxygen and methyl groups (MSM). MSM can be found in small quantities in various foods (milk, some fruits and vegetables). Several health-related benefits of MSM have been attributed to sulfur and its antioxidant activity and include improved skin health, physical function, muscle soreness, and joint flexibility.\(^{23-26}\)

As a Generally Recognized As Safe (GRAS) approved substance, MSM is well-tolerated by most individuals at dosages of up to four grams daily, with few known and mild side effects.\(^{27}\) Sulfur is incorporated into the structure of glycosaminoglycans such as chondroitin sulfate and keratin sulfate and plays an important role in joint and cartilage structure.\(^{11,28}\)

** Provides the first non-animal chondroitin sulfate, highly purified, safe and clinically proven better bioavailability of chondroitin sulfate obtained through a fermentation-based manufacturing process**

As a dietary supplement, chondroitin sulfate (CS) is often extracted from various animal cartilages, thus has a wide range of molecular weights and different amounts and patterns of sulfation. Although chondroitin sulfate has a good safety profile and various meta-analyses have concluded that it has a beneficial effect on joint health, others have concluded little benefit. This may be due partly to variations in the quality of the animal chondroitin sulfate used in various clinical studies. Chondroitin sulfate is now available as non-animal product made by fermentation, and does not have variations due the preparation, composition, purity and effects of animal derived chondroitin. Some animal products can even contain insignificant amount of chondroitin sulfate and among samples with reasonable amounts, in vitro testing have showed widely varying effects.\(^{29,30}\)

The potential consumer safety and quality problems associated with the use of animal-derived chondroitin sulfate have led research to search for an alternative source the development of non-animal sources of chondroitin. MythoCondro\(^{®}\) is the first non-animal CS with joint health benefits that addresses the serious concerns about the quality of animal CS. MythoCondro\(^{®}\) is the result of many years of research and development and is the first CS obtained with a fermentation-based manufacturing process followed by a chemical selective sulfation. This biotechnological procedure is able to ensure strict quality standards and provide a reliable and reproducible source of CS avoiding concerns related to poor quality of animal derived CS.\(^{9}\)

**PHARMACOLOGICAL & CLINICAL STUDIES**

In a randomized, double-blind placebo-controlled trial, 212 participants were randomly assigned 1,500 mg oral glucosamine sulfate once daily, or placebo. The results found supported the view that glucosamine sulfate is efficient is supporting joint and cartilage health.\(^{27}\)

A randomized, placebo-controlled trial was conducted in 202 individuals. The participants were randomized to receive oral glucosamine sulfate, 1,500 mg once daily, or placebo, for a 3-year treatment. The results showed that the treated-group presented with better symptoms of joint pains compared to placebo-group. The study arrived at the conclusion that administration of glucosamine glucose may help maintain joint health.\(^{21}\)

A clinical and laboratory study was conducted to identify the effect of glucosamine sulfate (GS) on serum level of interleukin-1b (IL-1 \(\beta\)) in patients with symptomatic primary knee problems. Sixty participants were randomized in two groups: Group I had participants receiving 1500 mg GS and 1200 mg Ibuprofen, an NSAID (Non-Steroidal Anti-Inflammatory drugs). Group II had participants receiving 1200 mg ibuprofen daily. Results showed group I presented significant progressive improvement in joint stiffness and physical function subscales compared to group II. This study highlighted the beneficial effect of glucosamine sulfate in supporting healthy joint function.\(^{13}\)

In a clinical study on glucosamine sulfate versus combination of glucosamine sulfate and NSAIDs, the results showed the efficacy of glucosamine sulfate on improving the symptoms of joint function.\(^{23}\)

In a double-blind randomized placebo-controlled clinical trial, participants were given 1,500 mg of glucosamine sulfate daily in combination with 800 mg chondroitin sulfate. Based on the results obtained, the study concluded glucosamine sulfate had a positive effect on joint health compared to placebo.\(^{24}\)

In the PROOF Study, the impact of role of diet, exercise, and glucosamine sulfate supplements was studied over 2.5 years of research. The overall results showed the positive effect of glucosamine sulfate on joint health compared to diet and exercise.\(^{35}\)

A randomized, double-blind, placebo-controlled clinical trial was conducted to evaluate the effect of MSM on joint health. Fifty men and women were enrolled. The study was to take MSM (3 g) or placebo twice a day for 12 weeks. Compared to placebo, MSM produced significant decreases in WOMAC pain and physical function impairment (P < 0.05) and in performing activities of daily living when compared to placebo. The study concluded MSM supplementation improved physical function during the short intervention without major adverse events.\(^{40}\)

A prospective, randomized, double-blind, controlled clinical trial evaluated the efficacy of MSM in helping individuals with knee problems. The controlled group received MSM daily for 12 weeks. Results showed significant differences between treatment groups over time in WOMAC physical function and in WOMAC total score. Overall, there were positive effects of MSM on improving physical function. Although these improvements are small they showed promising outcomes for use of MSM in improving joint health.\(^{22}\) Similar results were also found in a pilot study that showed the beneficial effect of oral MSM supplementation on exercise-induced pain after a randomized double-blind clinical study was conducted among twenty-two healthy participants who were given either 3 grams daily of MSM (OptiMSM) or placebo. From this later study, MSM supplementation safely decreased joint discomfort.\(^{36}\)

A double-blind randomized placebo-controlled trial studied the effect of daily oral administration of 1500 mg of glucosamine (G) and 1200 mg of chondroitin sulfate (CS) with and without 500 mg of methylsulfonylmethane (MSM) in participants with knee problems. After 12 weeks, results showed that combination of G + CS + MSM had more clinical benefits in terms of joint discomfort than GC and placebo. They concluded combination of glucosamine-chondroitin sulfate-MSM could bring significant clinical improvement in joint health.\(^{37}\)

The effect of non-animal high- and low-molecular mass chondroitin sulfates (CSs) produced by a biotechnological process in an animal model of polyarthrits was studied. The results underlined the importance of low molecular mass in the use of CS. Based on this study, the greater effect of low-molecular mass CS in reducing arthritic parameters...
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A study was conducted to assess the safety parameters (toxicity and
genotoxicity) of non-animal CS in rats and its bioavailability in humans.
Results showed that no mortality or significant changes in clinical signs,
body weights, body weight gain or feed consumption were noted.
Similarly, no toxicologically relevant treatment-related changes in
hematological, clinical chemistry, urinalysis and organ weights were
noted. In vitro mutagenic and clastogenic potentials as evaluated by
Ames assay, chromosomal aberration test and micronucleus assay did not
reveal genotoxicity of the non-animal CS. In pharmacokinetic study in
human, non-animal CS showed higher absorption as compared to
chondroitin sulfate of animal origin.\textsuperscript{38}

The pharmacokinetic profile of a new 800-mg tablet of non-animal
chondroitin sulfate (CS) (MythoChondro\textsuperscript{®} Chondroitin from Gnosis) was
investigated against an animal CS in healthy volunteers for a total period
of 48 hours. The safety and tolerability profile after a single dose of the
new non-animal CS tablets was excellent. After baseline-corrected
concentrations, an overall greater plasma concentration was observed
after 24 hours of 44\% and after 48 hours of 45\% from administration of
non-animal when compared to animal-derived CS. In conclusion, non-
animal CS, possessing a lower molecular weight than an animal-derived
sample, produces a greater CS concentration for a more prolonged period
in plasma and an increase in charge density and specific 6-sulfation of
endogenous plasma CS. This study highlighted the overall better
pharmacokinetic profile of a non-animal CS compared to an animal CS.\textsuperscript{8}

MSM and Chondroitin sulfate from Gnosis have been determined to be
Generally Recognized As Safe (GRAS notification) based on scientific
procedures.\textsuperscript{39,40}
SCIENTIFIC REFERENCES


http://www.mythochondro.com


* 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.

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