

Sulfur Consumption Reduces Risk of Death

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✓ Fact Checked

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STORY AT-A-GLANCE

- A large epidemiological study found people who took glucosamine supplements daily had a reduced overall mortality to the degree that is conferred by regular exercise
- One contributing factor may be the sulfate in the supplement. Stephanie Seneff, senior research scientist at the Massachusetts Institute of Technology, calls sulfur an "unappreciated deficiency" and proposes it may be central to heart disease, muscle wasting and altered glucose metabolism
- Bone broth and Epsom salt baths are simple and effective strategies to naturally boost your sulfur levels; each also has other health benefits
- Methylsulfonylmethane (MSM) is a sulfur donor widely used in the treatment of arthritic pain and known to reduce inflammation, balance reactive oxygen species and modulate your immune response

Sulfur is in the top three abundant minerals found in the human body¹ and the topic of the interview with Stephanie Seneff, senior research scientist at the Massachusetts Institute of Technology, in the video above. An epidemiological study from West Virginia University found glucosamine sulfate supplements may lower overall mortality as much as regular exercise.² The underlying mechanism may be related to sulfur.

If you've ever smelled sulfur gas when it comes up from well water, you won't forget the smell of rotten eggs. In fact, the natural gas industry adds mercaptan, a component of sulfur, to natural gas — which has no odor — to make it smell like rotten eggs so you can detect a natural gas leak.³

While stinky in gas form, sulfur is an important mineral in the optimal function of your body. Interestingly, you'll get most of your sulfur from specific amino acids, including methionine, cysteine, cystine, homocysteine, homocysteine and taurine.⁴ Of these, the two most important are methionine and cysteine. Methionine is an essential amino acid, which means your body can't synthesize it so it must be supplied through your diet.

Your body can make cysteine from methionine but not from inorganic forms of sulfur. Some individuals are allergic to sulfa drugs and may have concerns about eating sulfur-containing foods. However, since sulfur is an essential element to life, no one is allergic to sulfur. When a sulfonamide molecule from sulfa drugs is metabolized it can bind to a protein that serves as an allergen.⁵

The sulfonamide molecule in sulfa drugs does have sulfur, but it is embedded in a compound with the unique property of being able to form proteins that cause an allergic reaction in some people. Glucosamine, the subject of the featured publication, is an amino acid that is often combined with sulfate and not known to trigger allergic reactions from the sulfate.⁶

However, most glucosamine supplements are derived from shellfish and there is some concern of an allergic reaction in people who have an allergy to shellfish.⁷ There are several forms of glucosamine supplements that are not interchangeable.

They include glucosamine sulfate, glucosamine hydrochloride and n-acetyl glucosamine. Glucosamine sulfate is what is used to help painful arthritis and was the focus of this study.

Study: Glucosamine/Chondroitin Lowers All-Cause Mortality

In an epidemiological study released from West Virginia University, researchers found that individuals using glucosamine supplements had reduced overall mortality to the degree conferred by regular exercise.⁸ The first author, Dana King, is chair of the department of family medicine at West Virginia University.⁹

He and his partner, a data analyst, evaluated information from 16,686 adults who had

participated in the National Health and Nutrition Examination Survey. The results were from 1999 to 2010 and the data was merged with 2015 mortality figures.

The researchers controlled for a variety of confounding factors, such as age, activity level and smoking status, and found those taking a glucosamine/chondroitin supplement each day for at least a year or longer had a 39% reduced potential of all-cause mortality and a 65% reduction in mortality from cardiovascular-related events.¹⁰

King shared that his interest in glucosamine and chondroitin began when he learned many of the cyclists he rode with on weekends used the supplement. King points out that the data are from an epidemiological study and not a clinical trial so it can't conclusively demonstrate that death is less likely, but goes on to comment:¹¹

"Does this mean that if you get off work at five o'clock one day, you should just skip the gym, take a glucosamine pill and go home instead? That's not what we suggest. Keep exercising, but the thought that taking a pill would also be beneficial is intriguing.

Once we took everything into account, the impact was pretty significant. In my view, it's important that people know about this, so they can discuss the findings with their doctor and make an informed choice. Glucosamine is over the counter, so it is readily available."

The results of this study support previous research published in the BMJ in which researchers engaged 466,039 participants without cardiovascular disease to determine if there was an association between glucosamine use and a reduction in the risk of cardiovascular disease.¹²

After adjusting for confounding factors, such as age, body mass index, dietary intake, sex and drug use, researchers found there was a "significantly lower risk" of 9% to 22% of all outcome measures.

The outcome measures included cardiovascular disease events, coronary heart disease and stroke in people who used glucosamine supplements daily. The researchers found

that their findings supported past studies that had demonstrated an inverse relationship between glucosamine supplementation and cardiovascular disease risk and mortality.

Interestingly, they also found those taking glucosamine and who were current **smokers** experienced reductions in cardiovascular disease greater than in those who were past smokers or never smokers. They theorized this was because smokers have a higher level of inflammation and glucosamine is associated with a reduction in C-reactive protein, a marker for systemic inflammation.

Sulfur Deficiency May Contribute to Multiple Conditions

An opinion piece that ran in the same publication points out that the sulfate in glucosamine sulfate supplements, which make up “most glucosamine products available on the market,”¹³ may have been a contributing factor as it satisfies a potential sulfur deficiency.¹⁴

One study analyzing how much sulfur is available in the diet concluded “a significant portion of the population that included disproportionately the aged, may not be receiving sufficient sulfur.”¹⁵ Scientists are aware that nutrient deficiencies can produce significant health problems.

In one paper in the Journal of the American Heart Association the writers said: “Micronutrients are necessary cofactors for normal cardiac metabolism, and deficiencies have been implicated in the development and progression of HF [heart failure].”¹⁶

Seneff and her team proposed the hypothesis that atherosclerosis is the result of a cholesterol sulfate deficiency.¹⁷ They proposed that atherosclerosis can be explained by the body using plaque to replenish cholesterol and sulfate to the microvasculature. They argue that insufficient sulfate may increase the risk of high blood pressure and blood clot formation.

Seneff calls sulfur an “unappreciated deficiency” since it is found in several foods and most assume that your diet meets your minimum daily requirements.¹⁸ Excellent food sources include eggs, garlic, onions and green leafy vegetables. Nuts, grass fed meat and

seafood also contain sulfur.

However, a depletion in the soil creates a deficiency in your fruits and vegetables and may contribute, in part, to sulfur deficiency. She theorizes that a sulfur deficiency is related to rising obesity rates and is connected to glucose metabolism and cardiovascular disease.

In her research, she found people who experience muscle wasting from diseases such as cancer, HIV, sepsis, irritable bowel disease and athletic overtraining may be the result of a deficiency in cysteine and glutathione, two amino acids with sulfur molecules.

MSM Is a Powerful Sulfur Supplement

Sulfur can be found in your muscles, skin and bones. It helps with fat digestion, is needed to make bile acid and required to form collagen.¹⁹ The element plays important roles in hundreds of physiological processes. For example, sulfur bonds are needed for proteins to maintain their shape and they determine the biological activity of the protein.

Hair and nails are made of a tough protein called keratin, which is high in sulfur, whereas connective tissue and cartilage have protein with flexible sulfur bonds.²⁰ In addition to proteins, sulfur is also required for the proper structure and biological activity of enzymes.

Methylsulfonylmethane (MSM) is a sulfur donor and contains 34% elemental sulfur by weight.²¹ Many of the benefits of [supplementing with msm](#) are related to the compound's ability to reduce inflammation, regulate the balance of reactive oxygen species and antioxidant enzymes,²² and modulate your immune response.²³ It is widely used in the treatment of pain, especially pain associated with arthritis.

In one clinical trial, researchers found people with osteoarthritis of the knee who took three grams of MSM twice a day for 12 weeks experienced a significant reduction in pain and improvement in physical function, as compared to those who took the placebo.²⁴

In another randomized double-blind placebo-controlled study,²⁵ data showed participants with mild-to-moderate osteoarthritis experienced an analgesic and anti-inflammatory effect when given oral glucosamine and MSM, both individually and in combination.

In this study, the treatment groups received 500 milligrams (mg) of glucosamine and/or 500 mg of MSM three times a day for 12 weeks. According to the authors:

"Combination therapy showed better efficacy in reducing pain and swelling and in improving the functional ability of joints than the individual agents.

All the treatments were well tolerated. The onset of analgesic and anti-inflammatory activity was found to be more rapid with the combination than with glucosamine. It can be concluded that the combination of MSM with glucosamine provides better and more rapid improvement in patients with osteoarthritis."

The Benefits of Bone Broth and Epsom Salts

In addition to food and MSM supplementation, you may also absorb sulfur from homemade bone broth or a relaxing soak in a warm Epsom salt bath. As I've written in the past, bone broth contains other valuable minerals that your body can easily absorb in use, including magnesium, phosphorus, calcium, silicon, sulfur chondroitin and glucosamine.²⁶

Bone broth also helps attract and hold liquids in the digestive system and supports proper digestion. In one study, researchers found that chicken soup has medicinal qualities and significantly mitigated inflammation and infection.^{27,28} The amino acids in bone broth helps to fight inflammation and courtesy of chondroitin sulfate and glucosamine, it helps to reduce joint pain and inflammation.²⁹

Bone broth is made from animal bones. It's important to use homemade bone broth since the store-bought variety is produced by adding chemical-laden bouillon cubes, whereas traditional soups are made by cooking bones and meat for several hours. In its simplest form, it's made by using bones, vinegar and spices, and simmering in a pot or slow cooker for as long as 24 to 72 hours.

Bone broth made over longer periods of time increases the release of gelatin, minerals and other nutrients from the bones, which are key to many of the benefits and restorative properties.

Epsom salt baths are a simple way of absorbing both magnesium and sulfate. Epsom salt is magnesium sulfate, which is easily absorbed through your skin. It is also a preferable way of absorbing magnesium and sulfate since it's readily available to your body without having to be converted as it is when taken orally.

As a general recommendation, use 1 to 2 cups of Epsom salt in a tub of water. The warmer the water, the more the salt will dissolve and the more your body will be able to absorb it.

Some people may experience a negative reaction, such as irritability or hyperactivity. In this case, decrease the amount you use and incrementally raise it based on your tolerance. Alternatively, make a foot bath of one part Epsom salt to two parts water and soak your feet for about 30 minutes.

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