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Our July 2022 Newsletter for Healthy Living

Give Those Joints A Jolt

Sulfur is a somewhat "forgotten" nutrient you don't hear mentioned very often, but it's very important for optimal body function and health. You get most of your sulfur from certain proteins in your diet, specifically the amino acids methionine, cysteine, cysteine, homocysteine, homocystine and taurine. Of these, the two most important sources are methionine and cysteine. Methionine is an essential amino acid, which means it cannot be synthesized by your body and must be supplied through your diet. Cysteine is conditionally essential, because it can be synthesized from methionine but not from inorganic forms of sulfur.

Neither of these primary sulfur-containing amino acids is stored in your body per se, although glutathione is a key storage form for sulfur. Glutathione is composed of three amino acids: cysteine, glutamate and glycine, and is your body's most potent antioxidant. Glutathione also keeps many other antioxidants performing at peak levels, and cysteine availability is thought to be a rate-limiting factor for glutathione synthesis.

While sulfur is found in many foods, sulfur deficiency may still be quite common — in part due to sulfur deficiency in crops, and in part due to low consumption of sulfur-rich foods such as leafy greens, cruciferous veggies, alliums such as garlic and onions, seafood, grass fed meats and or-



ganic pastured eggs. Frequent use of drugs that require sulfur for excretion and/or detoxification can also contribute to an inadequate sulfur status. Acetaminophen is one such example. A vegan diet can also put you at increased risk for sulfur deficiency, because plant-based foods contain fewer sulfur-containing amino acids than animal-based foods.

According to Stephanie Seneff, Ph.D., who has written several papers on

syndromes, athletic injuries, and bladder disorders. Other sulfur compounds such as SAME ... taurine, glucosamine or chondroitin sulfate, and reduced glutathione may also have clinical applications in the treatment of a number of conditions such as depression, fibromyalgia, arthritis, interstitial cystitis, athletic injuries, congestive heart failure, diabetes, cancer, and AIDS."

Sulfur is the third most abun-

"Glucosamine, MSM and their combination produced an analgesic and anti-inflammatory effect in osteoarthritis."

sulfur and sulfur metabolism and its role in human disease, sulfur plays a role in many biological processes, including metabolism and the sulfonation of hormones, and deficiency appears to play a role in a wide range of health problems and diseases, including obesity, heart disease, chronic fatigue syndrome, Alzheimer's and autism. Required in the creation of connective tissues such as cartilage, tendons and ligaments, sulfur is also essential for healthy joints, and deficiency has been linked to joint pain and joint-related diseases.

Other benefits, uses and sources are also noted in the paper "Sulfur in Human Nutrition and Applications in Medicine": "*Methylsulfonylmethane (MSM), a volatile component in the sulfur cycle, is another source of sulfur found in the human diet ... Organic sulfur, as SAAs [sulfur-containing amino acids], can be used to increase synthesis of S-adenosylmethionine (SAME), glutathione (GSH), taurine, and N-acetylcysteine (NAC). MSM may be effective for the treatment of allergy, pain*

dant mineral in your body, based on percentage of total body weight. Sulfur bonds are required for proteins to maintain their shape, and these bonds determine the biological activity of the proteins. For example, hair and nails consist of a tough protein called keratin, which is high in sulfur, whereas connective tissue and cartilage contain proteins with flexible sulfur bonds, giving the structure its flexibility. With age, the flexible tissues in your body tend to lose their elasticity, leading to sagging and wrinkling of skin, stiff muscles and painful joints.

A shortage of sulfur likely contributes to these age-related problems. In addition to bonding proteins, sulfur is also required for the proper structure and biological activity of enzymes. If you don't have sufficient amounts of sulfur in your body, enzymes cannot function properly. A cascade of health problems may thus ensue, since your metabolic processes rely on biologically active enzymes. Sulfur also plays an important role in: your body's electron transport system,

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Magnesium for Your Health

Magnesium is the fourth most abundant mineral in your body and the second most common intracellular cation (positively charged ion) after potassium. It's required for the healthy function of most cells in your body, but is especially important for your heart, kidneys and muscles. According to one scientific review, which included studies dating as far back as

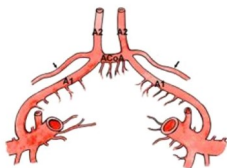
(between 300 and 420 mg/day for most people) may prevent frank magnesium deficiency, it is unlikely to provide optimal health and longevity, which should be the ultimate goal."

The importance of magnesium becomes even more evident when you consider it is involved in more than 600 different biochemical reactions in your body, which play important roles in:

"Most people need an additional 300 mg of magnesium per day to lower their risk of developing numerous chronic diseases."

1937, low magnesium actually appears to be the greatest predictor of heart disease, and other recent research shows even subclinical magnesium deficiency can compromise your cardiovascular health.

Low magnesium will also impede your cellular metabolic function and deteriorate mitochondrial function, and as a component necessary for the activation of vitamin D, magnesium deficiency may



also hamper your ability to convert vitamin D from sun exposure and/or oral supplementation. Overall, people with high magnesium intake were less likely to have low vitamin D. They also had a lower mortality risk from cardiovascular disease and bowel cancer.

Magnesium supports heart health via a number of different mechanisms. For starters, it combats inflammation, thereby helping prevent hardening of your arteries and high blood pressure. It also improves blood flow by relaxing your arteries, and helps prevent your blood from thickening, allowing it to flow more smoothly. All of these basic effects are important for optimal heart function. Indeed, low magnesium has been linked to a higher risk for: hypertension; cardiovascular disease; arrhythmias; stroke, and sudden cardiac death.

A paper in the *Open Heart* journal warns that even subclinical deficiency can lead to cardiovascular problems. According to the authors: "... *Various studies have shown that at least 300 mg of magnesium must be supplemented to establish a significantly increased serum magnesium concentrations ...* In other words, most people need an additional 300 mg of magnesium per day in order to lower their risk of developing numerous chronic diseases."

"So while the recommended daily allowance [RDA] for magnesium

creation of adenosine triphosphate (ATP), the energy currency of your body; metabolism of calcium, potassium, zinc, phosphorous, iron, sodium, hydrochloric acid, acetylcholine and nitric oxide, as well as 300 enzymes, and the activation of thiamine; vitamin D activation and regulation DNA, RNA and protein synthesis and integrity, and the creation of chromosomes; mitochondrial function and health; regulation of blood sugar and insulin sensitivity, which is important for the prevention of Type 2 diabetes (In one study, prediabetics with the highest magnesium intake reduced their risk for blood sugar and metabolic problems by 71%); normalizing blood pressure; detoxification, including the synthesis of glutathione, a powerful antioxidant; muscle and nerve function, including the action of your heart muscle; antioxidant defense via a number of different mechanisms.

Considering the widespread influence of magnesium, it's no great surprise that deficiency can snowball into significant health problems and even increase your risk of death from all causes — One 2016 meta-analysis found increasing magnesium intake by 100 mg per day lowered participants' all-cause mortality risk by 10%.

When it comes to knowing your magnesium level, ask your health care provider for an RBC magnesium test (which measures the amount of magnesium in your red blood cells) and track your signs and symptoms of magnesium deficiency. Checking your potassium and calcium levels can also be helpful, as low potassium and calcium are common laboratory signs of magnesium deficiency.

Among the more common signs and symptoms of magnesium insufficiency are: seizures; muscle spasms, especially "charley horses" or spasms in your calf muscle that happen when you stretch your leg, and/or eye twitches; numbness or tingling in your extremities; insulin resistance; high blood pres-

sure, heart arrhythmias and/or coronary spasms; increased number of headaches and/or migraines, and low energy, fatigue and/or loss of appetite.

If you frequently eat processed foods, your risk of deficiency is magnified. However, even if you eat plenty of greens (magnesium is actually part of the chlorophyll molecule responsible for the plant's green color), you may not get enough, due to many foods being grown in mineral depleted soils. Magnesium absorption is also dependent on having sufficient amounts of selenium, parathyroid hormone and vitamins B6 and D, and is hindered by excess ethanol, salt, coffee and phosphoric acid in soda.

Taking a magnesium supplement is particularly advisable if you:

experience symptoms of insufficiency or deficiency such as cravings for chocolate, muscle spasms and eye twitches; have hypertension; engage in strenuous exercise on a regular basis; are insulin resistant or diabetic (as this increases magnesium depletion).

To get the maximum magnesium from your diet, dark-green leafy vegetables lead the pack when it comes to magnesium content, and juicing your greens is an excellent way to boost your intake. Veggies with the highest magnesium levels include: spinach, chard, beet and collard greens, broccoli, Brussels sprouts, kale and bok choy. Other foods that are particularly rich in magnesium include: **raw cacao nibs** and/or unsweetened cocoa powder — one ounce of raw cacao nibs contain about 65 mg of magnesium; **avocados** — one cup of avocado on average contains about 44 mg of magnesium; **seeds and nuts** — pumpkin seeds, sesame seeds and sunflower seeds score among the highest, with one-quarter cup providing an estimated 191 mg, 129 mg and 41 mg of magnesium respectively. Cashews, almonds and Brazil nuts are also good sources; **herbs and spices** — herbs and spices pack lots of nutrients in small packages and this includes magnesium. Some of the most magnesium-rich varieties are coriander, chives, cumin seed, parsley, mustard seeds, fennel, basil and cloves; **organic yogurt** — choose yogurt made from raw organic grass fed milk.

Reference: *Open Heart* 2018:e000668(PDF). *Medicalpress.com* Feb 27, 2018. *Thyroidmom.com* Feb 1, 2018. *Medical News Today* July 12, 2016. *Journal of Biological Chemistry* 1999 oct 8; 274 (41):28853-6. *Magnesium* 1987; 6(1):28-33. *Nutrients* Sept 27, 2013. *Science Daily* Feb 1, 2018. *Journal of the American College of Nutrition* December 2006; 25(*)486-92. *Biomedicine* 2016 Dec; 6(4):20. *Journal of the Academy of Nutrition and Dietetics* July 2014; 114(7):1009-22.

Sleep for Your Heart

Your heart health depends on multiple factors, including how many hours of sleep you get each night. Researchers with the National Center for Cardiovascular Research in Madrid, Spain found people who slept less than six hours each night were 27% more

likely to have subclinical atherosclerosis than those who slept for seven or eight hours each night. Subclinical atherosclerosis can trigger congestive heart failure as it increases the exercise load on the heart muscle. People who have fragmented sleep, which means they wake up often or have trouble falling asleep, also had a 34% increased risk of subclinical atherosclerosis compared to longer sleepers.

“Sleep-deprived people have higher blood levels of stress hormones ...that indicate inflammation.”

In the study, the researchers found there was a sweet spot since sleeping either too little or too much increased risk. Women who slept for more than eight hours a night doubled the risk of subclinical atherosclerosis compared to those who slept seven or eight hours each night. The participants who were an average age of 46 years had a 5.9% risk of having a heart attack or stroke in the next 10 years or 17.7% in the next 30 years. Yet, when the women slept for less than six hours a

night, that risk increased to 6.9% for 10 years and 20.9% for 30 years.

“*[T]his study emphasizes we have to include sleep as one of the weapons we use to fight heart disease — a factor we are compromising every day,*” senior study author José M. Ordovás,

Ph.D., said. What’s more, he added, “*This is the first study to show that objectively measured sleep is independently associated with atherosclerosis throughout the body, not just in the heart.*” The link between sleep and heart health is not new, and it could be that even seven hours is just barely enough.

People who sleep less than seven hours a night have an increased risk of heart disease, and this is true regardless of other factors that influence heart health, like age, weight, smoking and exercise habits. People who struggle with sleep apnea, which causes frequent nighttime awakenings, often have heart trouble as well. Women with sleep apnea tend to have higher levels of the protein troponin T, which is a marker for heart damage and are more likely to have an enlarged heart, which is a risk factor for heart failure.

Too little sleep may also increase the inflammation in your body.

“*Sleep-deprived people have higher blood levels of stress hormones and substances that indicate inflammation, a key player in cardiovascular disease. Even a single night of insufficient sleep can perturb your system,*” according to Dr. Susan Redline, of the Division of Sleep Medicine at Harvard Medical School. Lack of sleep also increases your risk of

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several health problems that take a toll on heart health, including high blood pressure, Type 2 diabetes and obesity - all risk factors for heart failure.

Reference: Journal of the American College of Cardiology, 2019; 73 (2). Reuters, January 17, 2019. Circulation, 2015; 132(14). Eat This Not That, May 23, 2021.

Jolt Those Joints, *continued from page 2*

as part of iron/sulfur proteins in mitochondria, the energy factories of your cells; synthesizing important metabolic intermediates, such as glutathione, SAME, taurine and NAC; detoxification — without sulfur, glutathione (your body’s built-in detoxifier) is rendered ineffective; thiamine (vitamin B1) and biotin (B7) conversion, which in turn are essential for converting carbohydrates into energy; proper insulin function — the insulin molecule consists of two amino acid chains connected to each other by sulfur bridges, without which the insulin cannot perform its biological activity; glucose metabolism — one hypothesis is that if a sufficient amount of sulfur is available, it will act as a decoy to glucose, effectively diverting it to reduce the sulfur rather than glycating and causing damage. This would have the beneficial effect of reducing chronic inflammation, as sugar (glucose) is highly inflammatory and wreaks havoc in your body.

Methylsulfonylmethane (MSM) is known as a sulfur donor, be-

ing 34% elemental sulfur by weight. Many of the benefits of MSM supplementation are related to its ability to reduce inflammation, regulate the balance of reactive oxygen species and antioxidant activity and modulate your immune response. As a supplement, MSM is widely used in the treatment of pain, especially pain associated with arthritic conditions.

One clinical trial found that people with osteoarthritis of the knee who took 3 grams of MSM twice a day for 12 weeks experienced significantly decreased pain and improved physical function, compared to a placebo. Another randomized double-blind placebo-controlled study found patients with mild to moderate osteoarthritis benefited from oral glucosamine and MSM, both individually and in combination. Here, 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: “*Glucosamine, MSM and their combina-*

tion produced an analgesic and anti-inflammatory effect in osteoarthritis. 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.”

As mentioned earlier, sulfur-rich foods include leafy greens, cruciferous veggies, alliums, seafood, grass fed meats and organic pastured eggs. Another excellent source, and perhaps the best one, is bone broth made from organically raised animals.

Reference: *Alternative Medicine Review* 2002 Feb; 7(1):22-44. *Nutrition and Metabolism* Nov, 6, 2007; 4(24). *Plant* 2018 June; 7 (2):37. MIT “*Could Sulfur Deficiency Be a Contributing Factor in Disease?*” (PDF). *Medical Hypotheses* Feb 2012; 78(2):213-17. The Weston A. Price Foundation July 2, 2011. *Endocrine Reviews* 2002 Oct.; 23(5):703-32. Study.com *Sulfur Deficiency*. Science Direct, *Iron-Sulfur Proteins*. *Nutrients* 2017 March; 9(3):290. MSM Guide, *How MSM Works*. *Osteoarthritis and Cartilage* 2006 March; 14(3):286-94. *Clinical Drug Investigation* 2004; 24(6):353-63.