The Benefits of Organic Sulfur Revisited
by Dallas Clouatre, Ph.D.

Back in the news is MSM (short for methylsulfonylmethane, also known as dimethyl sulfoxide). MSM has generated broad anecdotal support for its benefits in cases of allergies, arthritis and joint pain. However, the list of conditions that are said to respond to MSM is much longer. Broadly speaking, MSM has been tested with clinical results in inflammation, joint and tissue pain, muscle spasms, hair and nail growth, even snoring! So just what is this compound and how does it work? Is it really a panacea?

Nature's Sulfur Cycle
MSM's initial popularity was due, in part, to the success of the booklet, "The MSM Miracle: Enhance Your Health with Organic Sulfur," by Earl L. Mindell, R.Ph., Ph.D. which was followed in 1999 by the definitive The Miracle of MSM (by Jacob, Lawrence and Zucker). However, the story of MSM dates back at least to the early 1960s. Unfortunately, these first suggestions of the nutritional and therapeutic potential of MSM were not immediately followed up. Yet another decade lapsed before real clinical studies began. The catalyst for renewed interest was a report presented at a meeting of the New York Academy of Sciences in the early 1980s. Since that time, thousands of patients have been given MSM under medical supervision to determine its benefits and side effects when given either by mouth or intravenously, with much of that work performed at the Oregon Health Sciences University. Hundreds of thousands more individuals have purchased MSM from health food store shelves.

MSM is a stable source of sulfur that can be derived mostly from plants grown either on land or in the sea. Marine sources include algae and phytoplankton. Indeed, MSM is an integral part of the "sulfur cycle" in the biosphere in which sulfur is taken up from the soil by plants, is released into the atmosphere as the highly volatile dimethyl sulfide, which in turn is oxidized in the upper atmosphere to dimethyl sulfoxide (DMSO), which then becomes the atmospheric source of MSM. DMSO and MSM return to the soil via the rain, and then the sulfur cycle repeats itself.

Of our normal foods, milk is one example of a source of MSM, and so are onions, garlic, asparagus, cabbage, broccoli and Brussels sprouts as well as eggs and red peppers. However, there is a caveat. Plants in their fresh state thus contain a quantity of MSM when grown on sulfur-rich soils, yet most of the compound found in plant foods may be lost by improper handling and storage. Food preparation, especially excessive cooking and cooking in large volumes of water, also reduces the levels of MSM found in foods.

Bioavailable Sulfur Improves Joint Health and More
MSM is a bioavailable source of sulfur, which is important for supplying the building blocks for the production and repair of the skin, hair, cartilage, ligaments and tendons. In the cases of arthritis and similar joint and ligament injuries, MSM may work through several different mechanisms. For instance, it was discovered in the 1930s that sufferers from arthritis often have below normal levels of cystine (a metabolite of cysteine) in their fingernails. This can lead to brittle or soft nails and can be an indication of either inadequate sulfur in the diet or a poor ability to manipulate dietary sulfur to match the body's needs. Interestingly, when sulfur was given to one hundred arthritis patients intravenously in one trial, many found that the pain and other symptoms of their arthritis disappeared and that their fingernails returned to normal in the nail test for cystine.

Sulfur is required for the repair of joint tissues and for the construction of connective tissues generally. This is one rationale often given for the use of glucosamine sulfate as the preferred form of glucosamine in the treatment of osteoarthritis. Likewise, the cartilage extracts that were employed so successfully in many of the European arthritis trials certainly contained some quantity of sulfur along with other compounds. This suggests that MSM might be used in conjunction with glucosamine to yield improved results. This was confirmed recently in a trial combining MSM with glucosamine. The researchers concluded that "the combination of MSM with Glu (glucosamine) provides better and more rapid improvement in patients with osteoarthritis."

Joint health to most of us means arthritis. However, this leaves out sports injuries, one of the areas in which MSM has
been researched. Also, not just humans benefit from MSM. There even is research, for instance, on the effective use of MSM with racehorses.

Pilot clinical trials suggest that a realistic time frame for response to MSM therapy is four to six weeks. For instance, in a small arthritis trial conducted at UCLA by R. M. Lawrence, pain scores exhibited a 60 percent improvement at four weeks and an 82 percent improvement at six weeks compared with placebo, which exhibited improvements of 20 and 18 percent respectively. Similarly, in a pilot trial on hair and nail health, 3 grams of MSM ingested daily led to significant improvements within six weeks.

**An Autoimmune Connection?**

One of the more curious findings with MSM is that some types of autoimmune responses are positively modulated. The reasons for this are not at all clear. One route of protection may be improvements in gastrointestinal health. Rheumatoid arthritis, which is an autoimmune disease, is strongly associated with the passage of toxins and certain proteins through the wall of the gut and into the blood stream. This is sometimes referred to as "leaky gut" syndrome. Interestingly, MSM is sometimes said to improve allergies, constipation, and even problems with parasites. Common to all of these are problems with the health of the intestinal wall.

This observation actually takes us back to the role of the glucosamines in health. Glucosamines are forms of amino sugars. Amino sugars are essential components of all body tissues, being integral parts of cell membranes and their surface structures, and of interstitial tissue that holds cells together. About half of the interstitial tissue components are derived from amino sugars. An amino sugar is made up of a sugar (glucose or galactose) and an amino group (typically one nitrogen and one or more hydrogen atoms), forming glucosamine or galactosamine. While most sugars come from dietary sources and are burned for energy, amino sugars are mainly formed in the body and used in manufacturing tissue components. Normal wear and tear during body functions means that tissues are constantly broken down and rebuilt or restructured. The amino sugars are steadily and necessarily recycled. The loss sustained during such turnover must be made up by the bodily synthesis of new amino sugars from glucose inasmuch as dietary supplies of amino sugars are usually low. Of course, if amino sugars are to be used to efficiently construct connective tissue, there must be sulfur freely available to the body.

Normally, the mucosal cells lining the digestive tract have an especially high turnover rate such that the whole layer of surface cells may be renewed in three to four days. An inability to manufacture adequate glucosamine therefore will cause the intestinal wall to "thin" and allow toxins and not fully digested proteins into the blood stream. A lower than normal sulfur content in the gut wall is also associated with rheumatoid arthritis and may play a contributory role. Studies with MSM given to animals in their drinking water indicated that microorganisms in the gut lining may be responsible for incorporating sulfur from MSM into sulfur-bearing amino acids, with a positive benefit to this essential aspect of the metabolism. MSM may thus play a role in improving this aspect of gut health and likely works even better in this regard in conjunction with a glucosamine source, such as glucosamine sulfate, or N-acetyl-glucosamine (NAG).

It may be the case that the autoimmune modulating effects of MSM are partially due to free radical scavenging actions. Unfortunately, although it is the object of numerous U.S. patents, MSM, has been the subject of only a handful of published studies in this particular area.

**Dosage**

MSM often is associated with the name of Stanley W. Jacob, M.D. in the Department of Surgery at Oregon Health Sciences University in Portland, Oregon. Dr. Jacob used MSM with more than 12,000 patients and therefore from clinical practice there is a foundation for suggesting an approximate intake of MSM for supplemental purposes. The minimum dosage is 750–1,000 mg and a common dosage level is two to three grams of MSM per day taken in divided doses; for instance, 1.5 grams ingested with the morning and evening meals. Increase the dosage slowly if a dosage higher than 1 gram per day is intended. Vitamin C and glucosamine are two nutrients often used in conjunction with MSM. A recent clinical trial for arthritis tested three grams MSM taken twice per day. Benefits usually become evident with three weeks or less, but as indicated above, there typically is further improvement in the period from four to six weeks. MSM is safe for chronic intake and is not associated with serious side effects even at dosages far above the two to three gram level.

**Dallas Clouatre Ph.D.** is a frequent contributor to *totalhealth*.

**Selected Sources**


