

## **CHONDROITIN SULFATE**

Chondroitin sulfate is the patriarch of the family of compounds that once were known as muco-polysaccharides, and which have more recently been re-named glycosaminoglycans, or GAGS. It is even more absurd with chondroitin sulfate than with glucosamine that the health food industry has pigeon-holed it as an arthritis remedy when that is only one of many (and not nearly the most important) beneficial effect it offers.

Of all the amazing ingredients in Formula ES and Go Power/Diphasic A.M., chondroitin sulfate gives you the greatest power over cardiovascular disease. Before we describe the biological activity of this amazing substance let us make one thing perfectly clear with respect to your NUTRI-SPEC supplements – they do not contain some crude cartilage concentrate passed off as chondroitin sulfate. This is the real thing. This is chondroitin-4-sulfate, the biologically active compound (also known as chondroitin sulfate A). There are a lot of companies out there selling products they call chondroitin sulfate that are nothing more than powdered beef trachea. That crude substance has a tiny fraction of the biological activity, and quite frankly, isn't worth a fraction of the cost.

Chondroitin sulfate (CS) has many important functions in human physiology. Many of those functions relate to the structure and function of joints and other connective tissues. The importance of CS to connective tissues will be discussed in future Letters. For now, let us concentrate on the most important function of CS – the protection of the cardiovascular system.

- CS helps maintain arterial elasticity. (Remember, arteries are largely connective tissue.)
- CS retards the arteriosclerotic and aging processes within the arterial wall.
- CS also possesses lipid clearing activity. It lowers cholesterol and triglycerides, and it normalizes the ratio between HDL, LDL, and VLDL. Most importantly, CS clears lipids not just in the serum but from within the cells as well.
- CS supplementation has also been shown to significantly reduce angina in patients with cardiovascular disease.
- CS has been found to protect against thrombus formation.
- The most striking statistic regarding CS supplementation shows that in cardiovascular disease patients treated with CS, the likelihood of having a myocardial infarct, suffering coronary insufficiency or myocardial ischemia,

or developing congestive heart failure, is only 1/6 of that reported for control patients who receive no CS supplementation.

- In addition to the striking reduction in mortality and morbidity in patients with ischemic coronary heart disease, the Institute for Arteriosclerosis Research at Loma Lind University School of Medicine reports experimental studies showing that...

**CS CAN PREVENT, AS WELL AS ACCELERATE REGRESSION AND HEALING OF, CORONARY AND AORTIC ATHEROSCLEROSIS.**

- CS not only clears lipids at the cellular level, but also stimulates cellular metabolism, increases turnover of fatty acids at the cellular level, and increases RNA and DNA synthesis in tissue cultures.

Sound good so far? Do you begin to get the idea that Formula ES might be the most important thing you can do to stop and prevent cardiovascular disease in you patients? Read on, there is more.

It has been known for more than 25 years that chondroitin sulfate has a powerful impact on reversing cardiovascular disease. As early as 1969, two studies were cited in JAMA demonstrating the tremendous clinical effects of CS. In both studies, the number of coronary incidents (myocardial infarction, coronary insufficiency, myocardial ischemia, and congestive heart failure) in CVD patients treated with CS was about 1/6 the number reported for the control patients who received no CS.

How does CS work these wonders? Quite simply (to put it in NUTRI-SPEC terms), it reverses an Electrolyte Stress Imbalance. Just what is an Electrolyte Stress Imbalance? It is the destruction of the electronegative colloidal properties of the body fluids. Once the polarity of the body fluids begins to drop (in association with excess electrolyte load and with the loss of tissue membrane integrity associated with many of the NUTRI-SPEC imbalances) you get a vicious cycle. The loss of electronegativity accelerates the rate of tissue destruction – and the rate of tissue destruction further decreases the electronegativity.

In a broad generalization it could be said that...

**ALL THE BENEFITS OF CS REFLECT ITS BENEFICIAL EFFECT ON THE ELECTRONEGATIVE COLLOIDAL PROPERTY OF BODY FLUIDS.**

CS is a polyanionic component of cell walls and intracellular and intercellular fluids. The ion exchange properties of CS are involved in the

transfer of electrolytes and nutrients through cell walls. CS occurs in the organic matrix of connective tissue throughout the body.

What are some of the things that happen as Electrolyte Stress Imbalance progresses? One major problem is the flocculation of the body fluids. The red blood cells begin to clump. In the presence of adequate chondroitin sulfate the rouleaux formation of RBCs is prevented.

The other thing that happens along the lines of flocculation is that platelets begin to aggregate. Photomicrographs taken within arteries show that CS works by inducing electronegative charges on platelets. The maintenance of the normal electronegative charge prevents the platelets from aggregating and adhering to one another, thereby lowering the tendency for developing thrombosis.

Another interesting activity of CS that directly impacts one of the major factors involved with Electrolyte Stress Imbalance is that CS increases the excretion of sodium. Remember, sodium is the salt whose excretion by the kidneys is most limited in your Electrolyte Stress patients.

The cholesterol and triglyceride lowering capability of CS is also tied in with its effect on maintaining the normal body colloid. It is only when damage to the arterial intima creates a loss of tissue membrane polarity that cholesterol, calcium, and the other components of atherosclerotic plaquing are pulled into the lesion. CS prevents the accumulation of lipids in atherosclerotic lesions. But it does even more than that – it can actually reverse these lesions. This gets into what we call "oral chelation."

Oral chelation is the process of not just preventing arterial plaquing but actually breaking up and eliminating those plaques. Chondroitin sulfate achieves this. It acts in much the same way as the chelating agent EDTA. It goes into the atherosclerotic lesion and breaks it apart by grabbing the calcium contained in the plaque.

[Interesting side note: The plaques on arterial walls contain cholesterol. It is therefore recommended (by the "experts") that we decrease our cholesterol intake to avoid atherosclerosis. Arterial plaques contain even more calcium molecules than they do cholesterol – yet you don't hear anyone (except NUTRI-SPEC) suggesting we restrict our calcium intake to avoid hardening of the arteries.]

CS is the only substance that is calcium-specific in its chelating ability. In other words, it has the ability to go in and grab calcium, rip it out of a plaque, carry it to the kidneys and eliminate it – and not grab any other important mineral nutrients at the same time.

The biggest problem with the EDTA chelation therapy that has become so popular for cardiovascular disease is that the EDTA used as a chelator has no discriminating capability whatsoever. Yes, it grabs calcium and it grabs toxic heavy metals, but at the same time it takes all your zinc and your copper and your manganese and your selenium and all your other important trace mineral nutrients. The long-term damage from trace mineral depletion can outweigh the short term benefit of the chelation.

This effect of CS to maintain normal biological membrane polarity and thus normal permeability, shows up in kidney function as well. One impact of CS on the kidneys is to help the kidneys eliminate excess sodium build up. The second interesting fact about CS as it relates to kidney function is that CS is very effective at blocking the growth of kidney stones.

In its now popular role as an arthritis cure, chondroitin sulfate does decrease the pain and inflammation of arthritis. Furthermore, this is not simply a matter of symptomatic relief, as the CS actually halts the progression of the arthritic degeneration, and actually reverses it in most cases. One important aspect of the CS impact in joints suffering from osteoarthritis is that it increases the synovial hyaluronic acid of these joints.

But to further illustrate the diversity of the beneficial effects to be obtained from CS associated with its impact on body fluid and tissue membrane polarity, consider the following:

Chondroitin sulfate has been shown in studies on mice to be effective in decreasing motor neuron disease.

Chondroitin sulfate has been shown to regulate mammary gland development. CS is active in controlling the proliferation, the differentiation, and the involution of breast tissue. It may be that it has its effects on breast tissue by potentiating the benefits of progesterone, or by opposing the damaging effects of estrogen.

CS is also an important activator of the immune system. In particular, macrophage function is enhanced by CS supplementation.

Last, and certainly not least, chondroitin sulfate has shown amazing power as a – you guessed it – antioxidant. Particularly in oxidative damage associated with copper and iron, CS has shown a protective effect. Iron is perhaps the most ubiquitous participant in the oxidative damage associated with aging. Brain aging is almost by definition the accumulation of iron compounds in neurological tissue. All the lipofuscin pigments found in skin and connective tissue and associated with aging are iron compounds. CS supplementation is a valuable protectant against these iron-associated components of aging.