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MS AND FATS

Research has shown that metabolites for lipid peroxidation are high in MS patients and tend to be even higher during periods of exacerbation. The amount of fat and the type of fat in the diet may play a role. An article that appeared in *The Practitioner* (May 1994;238:358-363) recommended a diet with fats being less than 30% of the total calorie intake. A study appearing in *The Lancet* (July 7, 1990;336:37-39) looked at 144 MS patients on a low fat diet over a period of 34 years. It was a strict diet, allowing only 20g of fat per day. Those who followed the diet experienced less deterioration and lower death rates than those who did not follow the diet. There was a correlation with deviating from the diet and exacerbation of the disease. The patients who benefited the most from the diet were those with minimal symptoms at the beginning of the study. The authors go on to say that diets that omit sources of saturated animal fat (red meat and the dark meat of poultry) seem to be even more beneficial. Stricter fat restriction (allowing only 10-15g per day of fat) also seems to be more beneficial. The article also states that supplementing with omega-3 fatty acids (cod liver oil) reduces relapse rates in MS patients.

A double-blind, placebo controlled study, published in *Prostaglandins, Leukotrienes and Essential Fatty Acids* (2005; 73(5): 397-404) looked at 31 subjects with relapsing-remitting MS who were placed on either a low-fat (15%) diet, supplemented with fish oil capsules or a diet consisting of 30% fat, supplemented with olive oil capsules (control group). The subjects on the low-fat diet, receiving the omega-3 fatty acids enjoyed a better quality of life when compared to the control group. The fish oil group improved and had fewer relapses, according to the Physical Components Summary Scale of the Short Health Status Questionnaire and the Mental Health Inventory.

Lipid peroxidation seems to be a component of MS. To a certain extent, a low-fat diet will minimize it. Supplementing with omega-3 fatty acids seems to have a protective effect on the nervous system. Other research supports the idea of supplementing with antioxidants—ostensibly to protect the nerve cells. This is a reasonable and inexpensive approach.

MULTIPLE SCLEROSIS

There are approximately 350,000 people in the United States with MS. A number of studies have shown that certain nutrients, while not offering a cure, may help improve function and quality of life in MS patients. There are a number of studies that look at vitamin D levels and their relationship to the disease. A review of studies published in the *Annals of Pharmacotherapy* (Jun 2006; 40: 1158 - 1161) concluded that vitamin D supplementation may reduce the chances for developing MS and may also reduce the incidence of exacerbations in patients who already have MS.

One study published in the journal *Multiple Sclerosis* (2009; 15(1): 9-15) found that vitamin D had a protective effect in women and that higher serum vitamin D levels were associated with a reduced chance of developing the disease and reduced disability in those who already had the disease. A population-based study published in the *Journal of Neurology* (Volume 254, Number 5 / May, 2007) found an association between low serum vitamin D and the level of disability in MS patients. The authors recommend testing for vitamin D insufficiency and supplementing where needed as part of the clinical management of MS patients. Another cross-sectional study that was published in the journal, *Multiple Sclerosis* (2008 Jul 24; [Epub ahead of print]), found that serum vitamin D levels may be inversely associated with relapse rates in patients with relapsing remitting multiple sclerosis.

Antioxidants have also been studied. In the journal *Biological Trace Element Research* (1990;24:109-117) a study was published that looked at the antioxidant status of MS patients. The authors of the research state that studies have shown MS to be associated with low selenium levels and antioxidants like glutathione peroxidase (a selenium dependent enzyme) and antioxidants like vitamin C and vitamin E are of value to MS patients. Indeed, MS patients had higher levels of peroxidation metabolites (ethane and pentane) than healthy controls, according to research appearing in *The Nutrition Report* (September 1992;10(9):70). Also, during times of exacerbation, the ethane and pentane levels are higher. In another study that appeared in *Biological Trace Element Research*, 18 MS patients and 13 healthy patients

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(used as a control) were given 666 mg of vitamin C, 80 mg of vitamin E and 2 mg of sodium selenate, three times each day. The study found that MS patients had much lower glutathione peroxidase levels than the normal controls and that the supplementation drastically increased levels of the enzyme with no side-effects.

Vitamin B_{12} and its role in MS have been researched. A review article appearing in the *Journal of Neurology, Neurosurgery and Psychiatry* (1992;55:339-340) looked at MS and B_{12} deficiency. While MS is clinically different from a B_{12} deficiency, both conditions are involved with demyelination. The article notes research that shows MS patients to have macrocytosis (a condition found with B_{12} deficency). While not a cause, B12 deficiency may be an aggravating factor. A study appearing in the *Archives of Neurology* (August 1991;48:808- 811) found low levels of vitamin B_{12} in MS patients. *The Journal of Neuroimmunology* (1992;40:225-230) notes that MS patients seem to suffer from macrocytosis and high homocysteine. The author believes that there is more than a casual link between vitamin B_{12} deficiency and MS.

MAGNESIUM AND GLUCOSE TOLERANCE

There is a lot of research supporting the idea that chromium is a valuable supplement for people with glucose and insulin issues. People don't always think of magnesium when it comes to this issue, but there is a fair amount of research supporting magnesium supplementation for insulin insensitivity and poor glucose tolerance.

An observational study appearing in the Journal *of the American College of Nutrition* (2006; 25(6): 486-92) found that subjects who consumed more magnesium in their diets had better glucose tolerance. The subjects were 1,223 men and 1,485 women without diabetes. Food frequency questionnaires were given to participants of the Framingham Offspring Study and it was found that subjects in the highest quintile of magnesium consumption had better insulin sensitivity than those in the lowest quintile.

A double-blind, placebo-controlled study appearing in the *American Journal of Clinical Nutrition* (1992;55:1161-1167) looked at the relationship between glucose tolerance and magnesium status. The subjects were 25 young, healthy men and 12 elderly men. They were given the equivalent of 360 mg of magnesium or a placebo over a period of four weeks. In the group receiving the magnesium, red cell magnesium levels and the microviscosity of the red cell membranes improved. Magnesium affects insulin secretion and is necessary for the glucose transport system. It is also involved with energy production and an important cofactor for phosphorylation.

It is estimated that 25% of the diabetic population is magnesium deficient. Lethargy, weakness, irritability, confusion, vertigo, paresthesia, anorexia, nausea, vomiting, and tetany are possible symptoms in magnesium deficiency. Diabetic complications include high blood pressure, cardiac arrhythmias, retinopathy, mineral homeostasis, dyslipidemia, and reduced release of insulin—all of which can be the result of insufficient magnesium.

Of course if insulin insensitivity is a problem, other nutrients are of value. Chromium, zinc, B vitamins, selenium, antioxidants and omega-3 fatty acids are all important nutrients for those who are insulin insensitive, diabetic or who have syndrome X.

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THIAMIN AND GLUCOSE TOLERANCE

There are three enzymes involved in glucose metabolism that are thiamin dependent, a-ketoglutarate dehydrogenase, pyruvate dehydrogenase, and transketolase. So it stands to reason that thiamin may help with glucose tolerance. A number of studies have shown fiber to help with glucose tolerance (*Archives of Internal Medicine* [*2007; 167(21): 2304-9*], to name one of many). A study published in *Diabeologia* (1998;41:1168-1175) looked at glucose tolerance in nearly 2200 non-diabetic men and women between the ages of 50 and 75. Researchers noted that there was an inverse association between fiber intake and fasting glucose. Fiber intake was also associated with lower glucose two hours into a glucose tolerance test. Adjusting for the lower fasting glucose level existing with high fiber intake negated the glucose lowering effect at two hours post-prandial. Thiamin intake was associated with lower glucose at two hours; this lowering effect was independent of fiber intake or fasting glucose levels.

Another study published in the *Journal of Gastroenterology and Hepatology* (1991;6:59-60), demonstrated that thiamin helped the glucose tolerance curves in patients with cirrhosis. Thiamin is stored, to a certain extent, in the liver and is also metabolized there.

Thiamin also improves the function of the vascular endothelium. A study published in the *Annals of Vascular Surgery* (2006; 20(5): 653-8) looked at 10 patients with diabetes, 10 patients with impaired glucose tolerance and 10 healthy patients. It found that giving 100 mg of thiamin intravenously improved vessel elasticity and that thiamin may be useful in improving atherosclerosis in patients with type 2 diabetes.