MULTIPLE SCLEROSIS

Multiple sclerosis (MS) has in recent times been referred to as "the great crippler of young adults". It usually strikes victims in the prime of their life and is one of the most dreaded degenerative diseases of the nervous system. The symptoms of MS are quite variable, ranging from one or two attacks of weakness in a limb or blurred vision, to a relentless, progressive deterioration of speech, movement and other basic functions.

MS affects various parts of the nervous system by destroying myelin, a fatty sheath that insulates nerve fibers rather as a plastic sheath insulates electrical wire. This destruction leaves scars or plaques that short-circuit the electrical signals passing through the nerve fibers. The scarring process is called sclerosis.

Depending on the location of the nerves affected, patients may suffer localized weakness or stiffness, visual difficulties, diminished bladder or bowel control and other neurological dysfunctions. Attacks may be mild, lasting only days and followed by remission, but most sufferers relapse after months or years. A few experience rapid progression of the disease and are quickly disabled.

The causes of MS are still unclear. However, many theories have been put forward. Some point to environmental and/or genetic factors, and some researchers believe that certain viruses may be involved, or view MS as an autoimmune ailment (in which the immune system mistakenly attacks healthy tissue). Others are investigating dietary factors or exposure to toxins such as lead, mercury, pesticides and carbon monoxide. Yet another theory considers the role of allergies.

Conventional medicine treats the symptoms of MS but cannot cure it. However, some newer drugs show promise in diminishing the rate of relapse. Diets of all sorts have been widely tested without consistent results. Everything about this disease is difficult to study because symptoms vary so widely, patients often recover spontaneously and one can never be sure whether or not a treatment has been instrumental.

Multiple sclerosis is one of a group of nervous system diseases called neurodegenerative disorders. This group also includes Alzheimer's, Parkinson's and ALS (amyotrophic lateral sclerosis or Lou Gehrig's disease). Although the specific causes of these diseases are unknown, a number of recent studies suggest that an important role is played by oxygen-derived free radical formation and/or lack of adequate antioxidant defenses.

OXIDATION AND MULTIPLE SCLEROSIS

The myelin sheaths destroyed by MS are made of lipids, fatty substances highly sensitive to damage by lipid peroxidation, a particularly aggressive type of oxidation. Our key metabolic defenses are GSH and SOD (super-oxide dismutase). It has been shown that elevating these natural defense systems reduces the damage of oxidative stress.

Investigations looking specifically at the breakdown products of oxidation have revealed significantly higher levels in MS patients. Pradlip Toshniwal and Edwin Zarling from

Loyola University in Chicago went one step further in their studies. They were able to show that these levels of oxidative stress corresponded to the severity of the MS attack.

Some authors including S.M. LeVine from the University of Kansas suggest that the pathological process leading to the demyelination of nerves is possible because the immune system cooperates with a free radical generating system present within the myelin sheaths. This explanation combines the two hypotheses that describe MS – that it is an autoimmune disease, and is also caused by oxidative stress. He describes how during a demyelination episode, macrophages (cells of the immune system that are supposed to act protectively) seek out myelin and release powerful chemicals (lipases, proteinases, H_20_2 and others). These biochemicals result in tremendous levels of oxidative stress.

Such a hypothesis leads us to believe that either blunting the immune response or minimizing oxidative stress could help MS patients. Immunosuppressive drugs that blunt the immune response have had only limited success. This has driven researchers to find ways to improve antioxidant protection, glutathione modulation being one of the most promising areas.

GLUTATHIONE AND MULTIPLE SCLEROSIS

Many studies have compared groups of MS patients to healthy individuals. Among other things, they have measured levels of reactive metabolites (breakdown products of oxidation) and of protective enzymes, especially GSH.

An Italian group headed by Vince Calabrese drew samples of cerebrospinal fluid (CSF) through spinal taps. CSF analysis is a good indicator of brain metabolism. They found that GSH-peroxidase levels in the cerebrospinal fluid of MS patients were consistently low. Their conclusion was that in MS, the fundamental activity of anti-oxidation is abnormal and that oxidative stress plays a causative role.

Another study looking at CSF was performed by the Swedes G. Ronquist and G. Frithz who tested spinal taps from a large number of patients including those with stroke, seizures, brain tumors and MS. The cerebrospinal fluid of MS patients were found to be almost entirely lacking in GSH.

There is further evidence of the involvement of free radical elevation and GSH depletion in MS. Helen Langemann in Switzerland measured GSH levels within MS plaques themselves. Without exception, they were depleted.

Researchers led by I. Singh at the University of South Carolina examined the fundamental tissue abnormality in multiple sclerosis. The actual myelin breakdown occurs to a large part because of the release of strong inflammatory chemicals called cytokines. These cytokines generate huge numbers of free radicals. Pre-treating neurological tissues with NAC (N-acetylcysteine) to raise glutathione levels protected these tissues from demyelination. Conversely, when GSH was chemically depleted the demyelination grew worse.

Simpler studies demonstrating decreased blood levels by GSH peroxidase in MS patients have been repeated by many Scandinavian, Italian and North American researchers. These levels as well can be inversely correlated with the degree of severity of the attack.

SELENIUM AND MULTPLE SCLEROSIS

Some research suggests that low selenium levels are connected to the development of MS. Selenium is an essential part of the GSH peroxidase enzyme and low selenium levels certainly decrease GSH effectiveness. A Danish team led by J. Mai supplied high-dose antioxidant supplements to MS patients made up of 6 mg selenium, 2 g vitamin C, and 480 mg of vitamin E. These patients showed few side effects and glutathione peroxidase activity increased by a factor of five within five weeks.

CONCLUSION

MS is a difficult disease to study because its spontaneous remissions and relapses make it very unpredictable. It is therefore hard to correlate any sort of intervention with changes in a patient's condition. In order to be statistically significant, prospective trials would have to include hundreds of subjects.

However, certain findings have been demonstrated consistently in multiple sclerosis patients. The breakdown products of oxidative stress are present in large numbers, and the level of free radical formation corresponds to the severity of the MS attack. Furthermore, glutathione activity is clearly impaired in this disease.

Also, individual tissues suffer less free radical damage when antioxidants and glutathione therapy are used. Although not a cure, many authors have suggested that reduced oxidative damage would help MS patients, and suggest in particular the helpful role of elevated GSH levels.

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