Multiple sclerosis: Two new approaches

Some 250,000 Americans and three million people around the world have multiple sclerosis. It is an especially tragic disease because it strikes young people and progressively destroys their central nervous systems as they grow older, causing neurological disorders, blindness, paralysis and loss of coordination.

There has been no effective treatment for the disease, but now two possibilities look promising. Both consist of manipulating the immune system.

One treatment is based on the premise that multiple sclerosis is caused by a measles virus that gets out of hand because there is a defect in the body's cellular immunity. The lymphocytes are not able to keep the virus out of the brain and spinal cord tissue, and hence the virus is able to attack them. Certainly there is evidence to support this concept.

Measles-virus-like particles have been seen in the brain tissue of two victims of multiple sclerosis (SN: 12/2/72, p. 362). When lymphocytes from multiple sclerosis patients were put in the presence of measles virus, the lymphocytes responded poorly compared to lymphocytes from healthy persons, John B. Zabriskie and Virginia Utermohlen of Rockefeller University have found. So Zabriskie and Utermohlen hypothesized that if patients' lymphocytes could be primed to respond to measles virus, perhaps the ravages of multiple sclerosis could be successfully countered.

They collected human lymphocytes that showed high immunity to measles virus. From them they extracted a chemical, a so-called transfer factor, and injected it into the lymphocytes of 10 multiple sclerosis patients. Lymphocytes from eight out of ten of the patients recognized measles virus after being primed with the transfer factor, whereas they could not do so before being primed. Zabriskie and Utermohlen then injected the transfer factor into eight multiple sclerosis patients to see whether it would prime their lymphocytes against measles virus and also counter multiple sclerosis.

As Zabriskie reported last week at an immunity symposium at the Johns Hopkins Medical Institutions, "We see objective clinical signs of improvement." That is, the patients' lymphocytes now respond to measles virus, and their neurological symptoms have abated. Zabriskie cautions, though, that multiple sclerosis is notorious for spontaneous remissions, and they want to make sure that the improvements are really due to transfer factor.

The other promising treatment for multiple sclerosis is based on the premise that a virus, not necessarily a measles virus, carries a so-called A1 protein out of the brain and spinal cord tissue into the bloodstream. The protein provokes an immune response from lymphocytes in the bloodstream. The lymphocytes then go into the brain and spinal cord and damage tissue there containing the protein. In other words, multiple sclerosis is an autoimmune disease precipitated by a virus. There is evidence to support this.

E. H. Eylar, P. J. Kniskern and their co-workers at the Merck Institute in Rahway, N.J., have found that lymphocytes become sensitized to A1 protein in multiple sclerosis patients before and during multiple sclerosis attacks, but not at other times. After injecting the protein into different kinds of animals, they have found that lymphocytes in the animals migrate to the animals' brains and spinal cords and produce experimental allergic encephalomyelitis. This is a pathological condition that many investigators believe to be the animal equivalent of multiple sclerosis in humans. Merck scientists have also found, most intriguingly, that if the protein is put in a saline solution and injected into the animals with the disease, the protein desensitizes their lymphocytes and reverses the disease.

The Merck immunologists admit that they do not understand how the protein first plays a bad guy by sensitizing lymphocytes and causing multiple-sclerosis-like damage, then plays a good guy by desensitizing lymphocytes and reversing the damage. When they understand these seeming contradictions better, they hope to use the A1 protein to treat multiple sclerosis patients. "There are no drawbacks from a safety viewpoint," Eylar told SCIENCE NEWS.

Although the transfer-factor and A1-protein theories are based on different hypotheses of the causes of multiple sclerosis, both treatments may turn out to have clinical value. Kniskern, for example, suggests that the A1 protein might counter flare-ups of multiple sclerosis as they occur, yet tranfer factor might prevent future attacks of multiple sclerosis—provided, of course, that the disease is triggered by a measles virus. □

The northeastern U.S.'s acid rain

Of significant environmental importance, yet rarely discussed, is the phenomenon of acid rain. Rain and snow have become surprisingly acidic in the past 20 years, according to Gene E. Likens of Cornell University and F. Herbert Bormann of Yale University, who have been studying for the past 11 years the chemistry of precipitation in the northeastern United States as part of a continuing ecosystem study.

Normally, when water in the atmosphere is in equilbrium with prevailing carbon dioxide, precipitation will have a pH value of about 5.7. (Acidity is expressed on a pH scale from 0 to 7, with 0 being strongly acidic and 7, neutral.) However, Likens and Bormann report in the June 14 SCIENCE that the northeastern United States is significantly more acid than elsewhere, with an annual acidity value about pH 4. Individual storms have been recorded as acidic as 2.6 by Likens and Bormann and 2.1 (the acidity of vinegar) by the National Center for Atmospheric Research.

Though precipitation has become increasingly acid in the past 20 years, present-day precipitation contains about 70 percent less sulfur than that prior to 1950. The drop in sulfur concentration occurred between 1950 and 1955, roughly the same time the use of coal for heating and industry shifted to natural gas. Likens and Bormann reconcile the increase in acidity with the decrease in sulfur in the following manner: When the major source of man-produced sulfur for the atmosphere was the combustion of coal, much of the sulfur was precipitated to the land near the combustion source in particulate form and as neutralized salts. But today, they say, "with the increasing combustion of fossil fuels, with mounting numbers of taller smokestacks fitted with precipitators to remove the larger particles, and with increasing combustion of fossil fuels other than coal, greatly increased quantities of sulfur dioxide apparently are being introduced into the atmosphere, at least on a regional basis. Injected at heights of 60 to 360 meters, the SO_2 may be dispersed over wide areas." The researchers propose that in the absence of equivalent amounts of alkaline substances in the atmosphere, "appreciable quantities" of SO_2 are converted to acid.

Acid rain and snow is believed to be at least partly responsible for a reduction of forest growth in the Northeast over the last two decades. Upon contact with chemicals in plant tissue, acid rain will leach nutrients from the plant. A similar leaching of nutrients occurs in the soil. In addition, acid precipitation may also be responsible for acidification of certain lakes and rivers in Canada and Scandinavia. Serious fish mortality has been directly attributed to increased acidity from precipitation, as has damage to buildings and art forms. □