Medical Xpress

Vitamin D impairs immune cell trafficking in mouse model of multiple sclerosis

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In mice with a rodent form of multiple sclerosis (MS), vitamin D appears to block damage-causing immune cells from migrating to the central nervous system, offering a potential explanation for why the so-called "sunshine vitamin" may prevent or ease symptoms of the neurodegenerative disease, according to results of a study at Johns Hopkins.

A report on the findings, published online Dec. 9 in the *Proceedings of the National Academy of Sciences*, offers new insight into the widely suspected benefits of vitamin D in people with MS. The quest to understand the role of the nutrient began with the observation that the disease is more prevalent in regions of the world farthest from the equator where there is less sunshine, the main natural source of vitamin D.

While a clinical trial testing vitamin D supplements in multiple sclerosis patients is underway at Johns Hopkins and elsewhere, most of the evidence of its efficacy currently comes from animal studies.

"With this research, we learned vitamin D might be working not by altering the function of damaging immune cells but by preventing their journey into the brain," says study leader Anne R. Gocke, Ph.D., an assistant professor of neurology at the Johns Hopkins University School of Medicine. "If we are right, and we can exploit Mother Nature's natural protective mechanism, an approach like this could be as effective as and safer than existing drugs that treat MS."

MS is believed to be an autoimmune disorder, caused when the immune system wrongly attacks a person's own cells; in this case, the fatty protein called myelin that insulates nerves and helps them send electrical signals that control movement, speech and other functions. The immune system primes so-called T cells in the body's lymph nodes, preparing them to seek out and destroy myelin, a process that can lead to debilitating symptoms such as blurred vision, weakness and numbness.

For their study, Gocke and her colleagues simultaneously gave mice the rodent form of MS and a high dose of vitamin D. They found that this protected the mice from showing symptoms of the disease. The researchers still found a large number of T cells in the bloodstream of the mice, but very few in their brains and spinal cords.

"Vitamin D doesn't seem to cause global immunosuppression," Gocke says. "What's interesting is that the T cells are primed, but they are being kept away from the places in the body where they can do the most damage."

Gocke says vitamin D may slow a process of making a sticky substance that allows the T cells to grab onto blood vessel walls, which allows the T cells to remain in circulation and keeps them from migrating to the brain.

In the United States, there are an estimated 400,000 people living with multiple sclerosis. The disorder typically strikes those between the ages of 20 and 50 and affects two to three times as many women as men.

Gocke says an important thing to consider with vitamin D treatment is that its immunosuppressive effects appear to be fleeting. Once vitamin D is withdrawn, MS-like flare-ups in mice can occur very quickly. The upside is that if a patient developed an infection and the body appeared too immune-compromised to fight it, discontinuing the vitamin D

temporarily could quickly allow the immune system to recover and attack the infection, she says.

Current popular immune-suppressing medications for MS, such as natalizumab (Tysabri) and fingolimod (Gilenya), can take six to 12 weeks to be cleared from the body.

"Vitamin D may be a very safe therapy," says Peter A. Calabresi, M.D., a professor of neurology at Johns Hopkins University and a co-author of the study. "But we still have to be careful with it. It's not just a vitamin. It's actually a hormone. When the animals stopped taking it, reactivation of the immune system

With the clinical trial on vitamin D supplementation ongoing, no one is certain whether it will actually work to prevent or slow the progression of MS in humans. But this new research, Calabresi says, can offer the opportunity to study samples taken from participants to see whether vitamin D is having the same effect on human cells as it appears to be having in mice.

More information: "1,25-Dihydroxyvitamin D3 selectively and reversibly impairs T helper-cell CNS localization," by Inna V. Grishkan et al. www.pnas.org/cgi/doi/10.1073/pnas.1306072110

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