Study explores link between sunlight, multiple sclerosis

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For more than 30 years, scientists have known that multiple sclerosis (MS) is much more common in higher latitudes than in the tropics. Because sunlight is more abundant near the equator, many researchers have wondered if the high levels of vitamin D engendered by sunlight could explain this unusual pattern of prevalence.

Vitamin D may reduce the symptoms of MS, says Hector DeLuca, Steenbock Research Professor of Biochemistry at University of Wisconsin-Madison, but in a study published in PNAS this week, he and first author Bryan Becklund suggest that the ultraviolet portion of sunlight may play a bigger role than vitamin D in controlling MS.

Multiple sclerosis is a painful neurological disease caused by a deterioration in the nerve's electrical conduction; an estimated 400,000 people have the disabling condition in the United States. In recent years, it's become clear the patients' immune systems are destroying the electrical insulation on the nerve fibers.

The ultraviolet (UV) portion of sunlight stimulates the body to produce vitamin D, and both vitamin D and UV can regulate the immune system and perhaps slow MS. But does the immune regulation result directly from the UV, indirectly from the creation of vitamin D, or both?

The study was designed to distinguish the role of vitamin D and UV light in explaining the high rate of MS away from the equator, says DeLuca, a world authority on vitamin D.

"Since the 1970s, a lot of people have believed that sunlight worked through vitamin D to reduce MS," says DeLuca. "It's true that large doses of the active form of vitamin D can block the disease in the animal model. That causes an unacceptably high level of calcium in the blood, but we know that people at the equator don't have this high blood calcium, even though they have a low incidence of MS. So it seems that something other than vitamin D could explain this geographic relationship."

Using mice that are genetically susceptible to MS-like disease, the researchers triggered the disease by injecting a protein from nerve fibers. The researchers then exposed the mice to moderate levels of UV radiation for a week. After they initiated disease by injecting the protein, they irradiated the mice every second or third day.

The UV exposure (equivalent to two hours of direct summer sun) did not change how many mice got the MS-like disease, but it did reduce the symptoms of MS, especially in the animals that were treated with UV every other day, DeLuca says.

The research group also found that although the UV exposure did increase the level of vitamin D, that effect, by itself, could not explain the reduced MS symptoms.

In some situations, radiation does reduce immune reactions, but it's not clear what role that might play in the current study. "We are looking to identify what compounds are produced in the skin that might play a role, but we honestly don't know what is going on," DeLuca says. "Somehow it makes the animal either tolerate what's going on, or have some reactive mechanism that blocks the autoimmune damage."

MS is a progressive neurological disease with few effective treatments, but DeLuca stresses that the study, however hopeful, may or may not lead to a new mode of treatment. "There are several ways this could go. If we can find out what the UV is producing, maybe we could give that as a medicine. In the short term, if we can define a specific wavelength of light that is active, and it does not overlap with the wavelengths that cause cancer, we could expose patients who have been diagnosed with MS to that wavelength."

Does this information change the common prescription to avoid excessive sun exposure? "If you have an early bout with MS, then you have to think about your options," says DeLuca. "Remember, this is just experimental work at this stage. Whether it can be translated into practical applications on MS remains to be seen."

The study results are published this week in the *Proceedings of the National Academy of Sciences*.

Provided by University of Wisconsin-Madison