

Environmental Factors That Influence MS

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What impact does cigarette smoking have on multiple sclerosis?

The development and disease course of multiple sclerosis (MS) are influenced by a variety of factors. Some—such as genetics, environmental exposure to viruses, and place of residence at an early age—cannot be modified. There are, however, other factors that *can* be modified, one of which is cigarette smoking.

Between 15% and 17% of patients with MS smoke cigarettes, a rate comparable to that of the general United States population; among US veterans with MS, prevalence can reach as high as 28.5%.¹⁻⁴ Factors that correlate with smoking in patients with MS include younger age, lower economic/educational background, being single, and lack of available or affordable cessation strategies.^{1,2,4}

Studies have found that in addition to contributing to the development of diseases (eg, cardiovascular and pulmonary) and certain cancers, smoking cigarettes may put individuals at higher risk for MS.⁵⁻⁷ Data also show that increased duration of smoking and/or increased quantity of cigarettes smoked may exacerbate this risk.⁵ While the mechanisms are not well understood, there appears to be a higher prevalence of MS in male smokers and in current smokers (compared with those who have already quit).⁶ Other studies have also suggested an increased risk with passive exposure to cigarette smoke.^{6,7}

Current cigarette smoking accelerates the conversion from a relapsing to a progressive form of MS.⁸⁻¹¹ One study demonstrated that after the diagnosis of MS had been made, continued smoking increased the rate of acceleration to a progressive form by 5% per year.⁹ Current smokers also had a higher disability rate attributable to their MS, but smoking cessation may improve disability outcomes.⁹⁻¹¹

Current smokers, with or without other risk factors, therefore have incentive to quit

smoking to reduce risk for MS. Patients with MS who smoke should be counseled on the increased risk associated with the combination of passive smoke exposure and other genetic and environmental factors, which may increase risk for MS in first-degree family members.³

While there is no one-size-fits-all strategy for smoking cessation in patients with MS, traditional behavioral and/or medication therapies should be offered. Some factors involved in cigarette smoking are variable and difficult to address, in addition to the physical dependence on nicotine. Many patients will require interventions to address related poor health behaviors (eg, lack of exercise) and comorbid factors (eg, depression).^{5,7} —**BW**

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What is the role of vitamin D in multiple sclerosis? Is it beneficial?

The exact etiology and pathophysiology of multiple sclerosis (MS) is still not fully

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understood. Research strongly suggests that there are two major causative factors: one genetic, and the other, environmental. From an environmental standpoint, multiple studies have shown that living farther from the equator, not being exposed to sunlight, and having a low vitamin D level are all correlated with increased risk for MS and MS relapse.¹

Our bodies need sunlight to successfully synthesize vitamin D in the skin. Research has found that individuals with lightly pigmented skin are five times more efficient at synthesizing vitamin D in the presence of sunlight than those with darker skin.² However, the ability to absorb sunlight is also correlated with the earth's latitude; worse absorption occurs in areas beyond the 40th parallel (in either hemisphere), where UVB levels are too low to synthesize vitamin D four to six months out of the year.²

When exposed to UVB rays, our bodies start to synthesize vitamin D; it undergoes a transformation in the liver and then the kidneys and ultimately becomes the hormonally active form of vitamin D, 1,25-dihydroxyvitamin D3 (calcitriol).² Calcitriol is recognized by multiple tissues throughout the body that contain vitamin D receptors. Specifically, in the central nervous system, receptors are located on microglia, activated monocytes, and B and T lymphocytes.¹ In MS, myelin (the coating around the nerves) is destroyed by an immune-mediated inflammatory process involving the microglia and B and T lymphocytes. Vitamin D quiets down this inflammation, thereby reducing disability accumulation and relapse risk and resulting in fewer changes on MRI.

Vitamin D is also believed to shift the immune response to an anti-inflammatory state by focusing the response on the cytotoxic T cells often found in MS lesions, which attack neurons and oligodendrocytes.² This theory was tested by Munger

and colleagues, who used a pooled cohort of 187,000 women from the Nurses' Health Study and Nurses' Health Study II to assess vitamin D intake and risk for MS. Compared to women with lower vitamin D intake, those who took 700 IU/d had a 41% lower incidence of MS. Women who took \geq 400 IU/d had a 33% lower risk for MS, compared to nonusers.³ In another evaluation of 7 million US military personnel, individuals with a serum vitamin D level of 40 ng/mL were 62% less likely to develop MS.⁴

In light of the anti-inflammatory effects of vitamin D and its purported reduction of MS risk, it is possible that patients with MS should begin vitamin D supplementation early to obtain maximum anti-inflammatory effects. While an optimal vitamin D goal has not been established in the literature, some studies suggest 30 to 55 ng/mL as a target range for serum vitamin D level.¹

While vitamin D has been found to be well-tolerated, patients should be cautioned that very high doses can cause fatigue, abdominal cramps, nausea, vomiting, kidney damage, hypertension, hypercalcemia, and other toxic effects.¹ Additional research is needed to determine the exact dosage MS patients need to gain the optimal anti-inflammatory benefits. What we do know is that the Institute of Medicine's current guidelines recommend a daily allowance of 600 IU/d of vitamin D for the general public.⁵ —LMF **CR**

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