

Dietary Therapies for Multiple Sclerosis — Research Suggests Diet May Have a Role in Its Prevention and Symptom Management

By Densie Webb, PhD, RD

Multiple sclerosis (MS) is an autoimmune neurological disease associated with inflammation and the loss of the myelin sheaths of the central and peripheral nervous systems. Myelin protects nerve fibers, allowing them to conduct electrical impulses. Symptoms appear as the myelin surrounding the nerves is destroyed and replaced with hardened sclerotic tissue and nerve fibers are damaged or severed.¹

MS is one of the most common neurological disorders, affecting an estimated 400,000 people in the United States and two to three times more women than men.¹ It's most commonly diagnosed between the ages of 20 and 50,^{1,2} though adolescence has been suggested as an important etiological period in the development of the disease.³ Disease-related symptoms can include blurred vision, slurred speech, weakness, numbness, extreme fatigue, tremor, muscle spasms, pain, dizziness, urinary incontinence, and cognitive impairment.¹ There's no cure for MS, but there are FDA-approved medications designed to slow the progression of the disease by altering the inflammatory processes in the central nervous system.⁴

There are four main types of MS: relapsing-remitting, primary-progressive, secondary-progressive, and progressive-relapsing. The overwhelming majority of people diagnosed with MS have the relapsing-remitting type in which a cyclical pattern of the disease occurs, characterized by periods of remission followed by intervals of relapses (or flare-ups). This cyclical pattern varies greatly among individuals, though Caldis-Coutris and colleagues reported in the *Canadian Pharmacists Journal* that as many as 75% of patients advance to the secondary-progressive form of the disease, in which there's a gradual, continuous decline in neurological function.

Genetic factors may make some individuals more susceptible to the condition, but research suggests that migration from one geographic area to another may alter a person's risk of developing MS, suggesting that environmental factors such as diet are involved. Currently, MS therapy isn't associated with any particular diet, but it's been reported that as many as 70% of MS patients try complementary and alternative medicinal treatments, often without informing their physicians.⁵

Diet could affect MS in one of two ways: dietary components that prevent or control the progression of the disease and those that help to manage symptoms and reduce flare-ups. It's extremely challenging to study diet therapy due to the individual nature and course of the disease: Every MS sufferer has a unique and unpredictable experience. Nonetheless, there's valuable research that may help MS patients benefit from medical nutrition therapy.

This continuing education activity will review the research on the role of diet in the prevention and management of MS symptoms and provide practical applications of the findings that nutrition professionals can use when counseling patients.

Dietary Fat and MS

It's been suggested that diets high in animal fat or saturated fat and low in polyunsaturated fat or omega-3 fatty acids from fish increase the risk of developing MS. According to the World Health Organization (WHO), MS has a geographical distribution corresponding to countries with hypercaloric, high-fat/high-carbohydrate diets.⁶ An epidemiologic survey of Greenland Eskimos, whose diets are traditionally high in omega-3 fatty acids, found an almost complete absence of MS compared with gender- and age-matched groups in Denmark.⁷

However, analysis of the data from the Nurses' Health Study and the Nurses' Health Study II, both large prospective studies of women, found no evidence that higher intakes of saturated fat or lower intakes of polyunsaturated fat and omega-3 fatty acids from fish were associated with an increased risk of MS. Neither were intakes of dairy products, fish, red meats, poultry, or processed meats.⁸

The type and amount of fat in the diet also has been suggested to affect the severity of symptoms in those already diagnosed with MS. The diet that's possibly the most widely discussed among patients and clinicians is the Swank Diet, promoted by Roy L. Swank, MD, PhD, beginning in the 1950s. Swank is coauthor of *The Multiple Sclerosis Diet Book*, which spells out the specifics of the diet plan. The diet shouldn't exceed 10 to 15 g of saturated fat per day and includes 5 g of cod liver oil supplementation per day. He reported in the *American Journal of Nutrition* in 1988 that after following patients for 35 years, those who consumed less than 20 g of fat per day experienced only slight deterioration in their condition and 31% had died, whereas those who consumed more than 20 g experienced serious disability and had a 79% to 81% death rate.⁹

But not all research is in agreement. In a randomized, double-blind, placebo-controlled trial of a high-dose (14 g) and low-dose (5 g) omega-6-rich oil, the high dose had a marked clinical effect in relapsing-remitting MS patients, significantly decreasing both the relapse rate and the progression of the disease.¹⁰ Another year-long, double-blind, randomized trial found that a low-fat diet supplemented with omega-3 fatty acids can have moderate benefits in relapsing-remitting MS patients who also are receiving disease modifying therapies.¹¹

Not all studies, however, have found an association. A randomized, double-blind, placebo-controlled trial was conducted in which MS patients received either omega-3 fatty acids (1.71 g of EPA and 1.41 g of DHA per day) or an olive oil placebo for two years. The results showed no significant difference between the groups in terms of the duration, frequency, and severity of relapses, though there was a trend in the improvement of disease severity in the omega-3-treated subjects compared with controls.¹² No adverse effects were reported.

Although the immunomodulatory effects of omega-3 fatty acids are well established, there are few studies evaluating the effect of omega-3s on MS.¹³ A recent review of the effect of

polyunsaturated fats on the disease found neither omega-6s nor omega-3s to have any benefit for slowing the progression of the disease or reducing the risk of clinical relapses.¹⁴

In addition to the possible role omega-3s have in decreasing levels of proinflammatory compounds, there's also evidence that omega-3 fatty acids may decrease matrix metalloproteinase (MMP) levels, which are thought to have a significant role in the migration of inflammatory cells into the central nervous system and may be related to the formation of new MS lesions.^{4,15} Several studies have reported higher MMP-9 levels in MS subjects when compared with controls.^{15,16}

Published pilot studies examining MS patients have shown supplementation with 2 to 9.6 g/day of omega-3s for three to six months to be safe, with only mild side effects, including gastrointestinal symptoms such as burping, stomach upset or bloating, and diarrhea.^{4,17}

The evidence for an association between the types and amounts of fats in the diet and the risk of developing MS and the degree and frequency of flare-ups is intriguing but not conclusive. General dietary recommendations to decrease saturated fat and increase omega-3 intake may benefit those with MS, but there are no specific therapeutic guidelines for supplementation. A diet low in saturated fat and rich in omega-3s, recommended as a beneficial diet for everyone, may be helpful for MS patients.

Vitamin D and MS

The 2008 WHO report found that exposure to sunlight and diet affected the geographical distribution of MS, suggesting that vitamin D may play a role in MS risk.⁶ Some studies have found that low vitamin D levels may increase the risk of developing MS, and several studies have suggested that patients with MS with low levels of vitamin D are at increased risk of relapses, new lesions, and disability.¹⁸ Overall, however, studies conducted to evaluate the association between vitamin D and MS have yielded inconsistent findings.

In the Nurses' Health Study, women who took additional vitamin D supplements had a 40% lower risk of MS.¹⁹ Analyzing data from the Nurses' Health Study II, researchers recently found that higher maternal consumption of milk and vitamin D was associated with a lower risk of offspring developing MS.²⁰ However, in another study, no association was found between dietary intake of vitamin D during adolescence and the risk of developing MS.³

A prospective cohort study of 145 participants with MS found that for every 10 nmol/L increase in serum levels of 25-hydroxyvitamin D, there was up to a 12% reduction in the risk of relapse.²¹ Based on these findings, the researchers suggested that raising 25-hydroxyvitamin D levels by 50 nmol/L could halve the risk of a relapse. However, the first published randomized, double-blind, placebo-controlled clinical trial found no benefit in MS patients receiving 7,000 IUs of vitamin D₂ compared with those receiving 1,000 IUs.²²

Despite the epidemiologic evidence supporting a relationship between vitamin D and MS, in reviewing the research, the Institute of Medicine concluded that the widely variable outcomes diminishes the likelihood for a relationship between vitamin D and MS.²³ Because of the wide variability of MS among patients, Sandra Allonen, MEd, RD, LDN, an outpatient dietitian at

Beth Israel Deaconess Medical Center in Boston, an MS sufferer for 20 years, recommends that patients see their neurologist or primary care provider and have vitamin D levels checked.

Antioxidants

Immune-mediated inflammation and oxidative stress are involved in the pathology of MS, and dietary antioxidants have the potential to alleviate disease symptoms by targeting this inflammation.^{24,25} In animal models, oxidative damage resulting in cell death has been implicated in the demyelination process.²⁵ Specifically, T cells, B cells, and macrophages are believed to cause demyelination and cell injury.²⁶ In addition, MS results in a weakened cellular antioxidant defense system in the central nervous system, possibly increasing the vulnerability to oxidative damage. A small cross-sectional study of MS patients and age- and sex-matched controls found that the total antioxidant capacity of the MS groups was significantly lower than the control group, suggesting the importance of antioxidants in the condition.²⁷

Two large epidemiologic studies examined the association between the antioxidant vitamins C and E and dietary carotenoids and the risk of developing MS. One study found a decreased risk with increased vitamin C intake, while the other found none. Neither study found an association with vitamin E intake and the risk of developing MS.^{28,29} An association between fruit and vegetable intake, because they are rich in antioxidants, was found in one study—a higher intake was associated with lower risk—while the second study found no such association.

Alpha-lipoic acid (ALA), a naturally occurring antioxidant and dietary supplement, has been found to be effective in treating diabetic neuropathy. Due to its potential antioxidant properties, it's also been considered as a possible immune modulator in MS²⁶ and has been shown to be effective in treating animal models of MS.^{30,31} In one human pilot study of ALA supplementation in MS patients, subjects were given 600 mg of ALA twice per day, 1,200 mg once per day, or 1,200 mg twice per day for 14 days. The higher dose of ALA reduced levels of serum MMP-9. The study's duration was too short to evaluate any possible effect on disease progression or severity or frequency of relapses.³²

A two-year study is under way at Oregon Health & Science University to investigate the effectiveness of ALA supplementation on MS progression and relapse. High-doses of ALA have been found to be generally safe, with some patients experiencing mild gastrointestinal symptoms and nausea.

Gluten

A possible relationship between the presence of antigliadin antibodies in gluten intolerance and the incidence of MS has been debated since the 1960s.³³ It's been suggested that antibodies directed against gluten and gliadin in wheat may play a role in the pathogenesis of MS by affecting the permeability of the blood-brain barrier.³⁴ Studies have found an increased incidence of immunoglobulin A and G antibodies from exposure to both gluten and gliadin among MS patients, sometimes highly significant, compared with controls,^{33,35} while others have found no association.^{36,37}

One recent study that discovered a positive association found the prevalence of gluten intolerance to be 5.5 to 11 times higher among a group of 72 MS patients compared with controls.³⁸ However, anecdotal evidence for beneficial effects of a gluten-free diet for MS patients has been inconsistent.³³

It may be advisable to suggest antibody testing and counseling for appropriate dietary therapy for those who test positive. However, Allonen says, “Once dietary therapy has begun, there’s the possibility of a placebo effect.”

The Jury Is Still Out

Several associations between diet and the risk of developing MS as well as the risk of increased frequency and severity of flare-ups have been proposed and studied. None to date have been proven, though research continues. Evaluating whether any diet benefits a particular MS patient is difficult due to the unpredictable nature of flare-ups and the long-term progression of the disease. Although none of the dietary treatments discussed here have been shown to be harmful, some may be more difficult to adhere to, such as the Swank Diet or a gluten-free diet.

According to the National Multiple Sclerosis Society, weight management is important, as overeating can increase fatigue, place stress on joints and demands on the heart and lungs, and increase the risk of other illnesses, such as coronary heart disease, diabetes, and hypertension, further complicating the course of the disease. The patient’s healthcare provider should be included in any discussion about major dietary alterations or a supplementation regimen.

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The Four Faces of MS

According to the National Multiple Sclerosis Society, no two people experience multiple sclerosis (MS) in the same way. Four disease courses have been identified, any one of which may be mild, moderate, or severe. Even individuals with the same type and degree of severity of the disease may experience MS differently. Here’s a list of the four types of MS and their definitions.

- **Relapsing-remitting:** Affecting about 85% of people who are newly diagnosed, relapsing-remitting MS manifests itself as clearly defined attacks of worsening neurologic function, called relapses, flare-ups, or exacerbations, and are followed by partial or complete recovery periods (remissions).
- **Primary-progressive:** Affecting about 10% of people diagnosed with MS, primary-progressive MS is characterized by slowly worsening neurologic function from the start, with no distinct relapses or remissions.

- **Secondary-progressive:** Approximately 50% of people with relapsing-remitting MS develop the progressive form of the disease within 10 years.
- **Progressive-relapsing:** This form is relatively rare, affecting 5% of MS patients. Those affected experience a steady worsening of the disease from the outset but with clear attacks of worsening neurologic function along the way that may or may not be followed by periods of recovery.

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Examination

1. Which of the following statements has not been suggested as truth in research regarding diet and multiple sclerosis (MS)?

- A. Maternal diet may influence a child's risk of developing MS.
- B. Vitamin D supplements may lower the risk of developing MS.
- C. Omega-3 fatty acids may reduce the risk of relapses.
- D. A high-protein diet may help reduce the risk of relapses.

2. Dietary changes as a result of geographic relocation appear to affect the risk of developing MS.

- A. True
- B. False

3. A large body of evidence suggests that specific changes in diet can improve MS symptoms and progression.

- A. True
- B. False

4. Which of the following are known to be symptoms of MS?

- A. Numbness
- B. Extreme fatigue
- C. Depression
- D. A and B
- E. All of the above

5. The development of MS has been associated with:

- A. an increased presence of antigliadin antibodies typical of gluten intolerance.
- B. low blood levels of vitamin D.
- C. low blood levels of antioxidants.
- D. high intakes of saturated fat.
- E. All of the above

6. Which of the following statements is true about gluten-free diets in relation to MS?

- A. They're recommended for all patients with MS.
- B. They're always recommended for those who test positive for immunoglobulin G antibodies.
- C. They're not recommended for patients with MS.
- D. They may be recommended to MS patients on a case-by-case basis.

7. A clinical trial is under way to evaluate the effect of which of the following on MS?

- A. Alpha-lipoic acid
- B. Vitamin E
- C. Protein
- D. Fruits and vegetables

8. MS is most commonly diagnosed between the ages of:

- A. 7 and 12.
- B. 15 and 19.
- C. 20 and 50.
- D. 55 and 70.

9. The National Multiple Sclerosis Society has endorsed a specific set of dietary guidelines for the treatment of MS.

- A. True
- B. False

10. Which of the following statements is false?

- A. Gluten antibodies are found more commonly among MS patients than the general population.
- B. Serum antioxidant levels have been found to be lower among MS patients than the general population.
- C. Genetic factors do not play a role in the risk of developing MS.
- D. Exposure to sunlight may decrease the risk of developing MS.