

# **Diet and NMO:** **A Three-Step Approach**

By  
**Allen C. Bowling, M.D., Ph.D.**

Many people with NMO and related conditions would like to use dietary approaches to try to control the disease. These approaches have many appealing features. They may be a way to slow down the disease process in a safe and “natural” way. In addition, they may provide a sense of control, hope, and empowerment. Due to these features, dietary strategies are, for some, an important component of their treatment plan.

For those who are interested in using dietary strategies for NMO, it is extremely important to be well informed. High quality information allows one to identify and use approaches that are low risk and potentially beneficial and avoid those that are possibly harmful or ineffective. Due to the complexity of NMO and NMO medications, it is challenging to evaluate dietary studies within the context of this disease. As a result, it may be difficult to obtain high quality, unbiased NMO-specific dietary information.

Some people who provide dietary information may have financial incentives, biases, or limitations in their knowledge base that lead them to provide inaccurate--and sometimes potentially dangerous--information. For example, those who have financial interests in specific dietary products may provide information that is excessively supportive of those products and disregarding of other approaches that may actually be more reasonable. Also, people who are only knowledgeable about a few therapies may, without evidence, make those therapies relevant to an excessively wide range of diseases, including NMO. Finally, people who have little or no specific knowledge of NMO and NMO medications may apply dietary information to this complex disease in a way that is incorrect or overly simplistic.

The aim of this article is to help people with NMO make well informed decisions about diets and dietary supplements. There are two main parts of this article. The first part, “Background Information,” objectively summarizes NMO-relevant dietary research. This information was obtained from an unbiased review of hundreds of scientific and clinical studies. The second part of the article, “A Three Step Approach,” translates the research findings into practical dietary strategies. “Appendix I” and “Appendix II” provide detailed information about specific dietary supplements. Finally, the article concludes with “References and Additional Reading.”

When reading this article, several key points should be kept in mind:

- Before pursuing specific dietary approaches (or any other unconventional therapies), the risks and benefits of these approaches should be discussed with a conventional health provider.
- There are multiple conventional medications that have been shown to have beneficial effects on the disease process of NMO. The dietary strategies discussed in this article should not be used *instead of* conventional medications.

- Unfortunately, no dietary approach has ever been systematically studied in NMO. Thus, for those who are only interested in absolutely proven therapies, there is not a dietary approach that can be formally recommended. This article provides information about approaches that are not absolutely proven but are low risk and may possibly benefit the underlying disease process in NMO.

## **Background Information**

### **General Dietary Approaches**

Before considering the possible influence of diet on NMO, it is important to understand the basic components of a healthy diet. *Regardless of one's specific diet, adequate amounts of a variety of foods should be consumed.* Previously, the U.S. Department of Agriculture (USDA) provided general guidelines for food intake in the form of a pyramid, known as the Food Guide Pyramid.

In 2005, the Food Guide Pyramid was replaced by MyPyramid, a strategy that provides a more individualized approach to diet and lifestyle. Guidelines are based on one's gender, age, and physical activity level. Recommendations are provided for the intake of vegetables, grains, vegetables, fruits, dairy, meat/beans, and oils. MyPyramid may be accessed through a website, [www.mypyramid.gov](http://www.mypyramid.gov).

### **Possibly Beneficial Dietary Approaches--Diets and Supplements That May Mildly Suppress the Immune System**

In NMO and similar immune diseases (such as multiple sclerosis (MS)), the immune system is excessively active. Medications that appear to be effective for NMO are those that decrease immune system activity. Like these medications, there are diets and dietary supplements that also decrease immune system activity and thus could possibly slow down the disease process in NMO.

When considering underlying disease processes and treatment approaches, NMO is sometimes compared to MS and described as an "MS variant." While there are similarities between MS and NMO, there are important differences as well. Both conditions are characterized by immune abnormalities that cause the immune system to attack the nervous system. In terms of two major components of the immune system, known as "T cells" and "B cells," NMO and MS may involve abnormalities of both T cells and B cells. However, among these two cell types, B cells play a more critical role in NMO, while T cells appear to be more centrally involved in MS. Thus, "T cell therapies" are generally used in MS and "B cell therapies" are usually used in NMO. However, this distinction is not entirely black and white. B cells are involved in MS, and recent studies indicate that B cell therapies may play an important role in MS treatment. Likewise, T cells may play a role in NMO. In summary, NMO might be generally thought of as a more B cell

directed condition and MS as a more T cell directed condition, but there is a large “grey zone” in which the two conditions may involve both B cells and T cells.

Two dietary approaches for which there is evidence for suppressing the immune system are vitamin D and fatty acids.

**Vitamin D** Recent studies have significantly changed our understanding of the role of vitamin D in health and disease. In the past, it was assumed that most people have adequate vitamin D levels and that the effects of vitamin D are restricted to regulating calcium absorption and maintaining bone health. However, studies over the past decade have proven that these views are incorrect. It is now recognized that there is an epidemic of vitamin D deficiency in many countries, including the United States, and that, in addition to its effects on bones and calcium, vitamin D exerts important actions on many other body systems, including the immune system.

Vitamin D has not been rigorously studied in NMO. It has been fairly extensively studied in MS. Multiple studies suggest that vitamin D may have a beneficial effect on the disease process of MS. In the animal model of MS, disease severity is worsened by vitamin D deficiency and improved by supplementing the diet with vitamin D. Multiple studies indicate that the risk of developing MS is increased in those who have low vitamin D levels. For those who have MS, low vitamin D levels have been associated with higher risk for attacks and more severe disability. Large, rigorously conducted clinical trials of vitamin D supplements in people with MS are planned but have not yet been conducted.

As noted, MS is generally thought of as a more T cell directed disease. In terms of B cells, which appear to be more centrally involved in NMO, scientific studies indicate that vitamin D has regulatory effects on B cell function. In addition, there is suggestive evidence that vitamin D may have beneficial effects on some “B cell diseases,” including lupus and rheumatoid arthritis.

**Fatty Acids** Fatty acids, the compounds that make up fats, have important actions on multiple body systems, including the immune system. There are two main types of fatty acids. Saturated fatty acids, or saturated fats, are hard at room temperature and are what we generally think of as *fat*. The fat on red meat is an example of a saturated fat. The other major type of fatty acid is unsaturated fatty acid, which is liquid or soft at room temperature and is commonly referred to as *oil*. On the basis of chemical structure, unsaturated fats are referred to as *monounsaturated fatty acids* (which are present in olive oil) or *polyunsaturated fatty acids*. The two main forms of polyunsaturated fatty acids, also known as *PUFAs*, are omega-six fatty acids, which are found in sunflower and safflower seed oils, and omega-three fatty acids, which are present in fish oil.

Fatty acids affect immune system function. Immune system suppression, which could be beneficial for NMO, is produced by omega-six fatty acids and especially by omega-three fatty acids. This effect on the immune system appears to involve T cells as well as B cells.

Although omega-three and omega-six fatty acids have not been studied specifically in NMO, they have been studied in other immune diseases. In investigations of MS, some studies of large populations, known as *epidemiologic studies*, suggest that a high intake of omega-three fatty acids may be associated with a lower risk of developing MS. Similarly, in the animal model of MS, the severity of the disease is decreased by increasing the intake of PUFAs. Finally, several

clinical trials of variable quality indicate that omega-three and omega-six fatty acids may slow down the disease process in MS. Overall, these findings in MS are suggestive but not definitive. In studies of “B cell diseases,” including lupus and rheumatoid arthritis, PUFAs have produced beneficial effects in some, but not all, studies.

### **Possibly Harmful Dietary Approaches--Supplements That May “Activate” the Immune System or Cause Other Harmful Effects**

Like medications, dietary supplements contain chemical compounds that may produce beneficial as well as harmful effects. People with NMO should avoid dietary supplements that have potential harmful effects and lack any known beneficial effects for NMO. For people with NMO, there are three main types of possibly harmful supplements:

- “Immune-stimulating” supplements  
Some supplements activate various components of the immune system. Through this process, these supplements could actually worsen the disease process of NMO or inhibit the therapeutic effects of NMO medications. There have never been (and probably never will be) any clinical studies to determine if taking these supplements worsens disease activity in people with NMO or other immune diseases. The risk with these supplements is based on scientific studies and thus is “theoretical.” These supplements should be approached with caution and certainly should not be used in high doses or for extended periods of time.
- Supplements with side effects  
Many dietary supplements are well tolerated. However, some may produce side effects that range in severity from mild, such as sedation, to severe, such as liver or kidney toxicity or death.
- Supplements that interact with medications  
Some supplements may interact negatively with conventional medications, including NMO medications (such as steroids and chemotherapy medications).

## ***A Three Step Approach***

### **STEP ONE: Eat A Well-Balanced Diet**

To be certain that a diet has an adequate intake of a variety of nutrients, the following general guidelines, which were used to construct MyPyramid, should be followed:

- Consume a variety of nutrient-dense foods and beverages.
- Limit the intake of saturated and trans fats, cholesterol, added sugars, salt, and alcohol.
- Consume adequate amounts of fruits and vegetables.

- Eat a variety of vegetables and fruits each day.
- Consume three or more ounces of whole-grain products daily.
- Consume less than 10 percent of calories from saturated fats.
- Maintain total fat intake to between 20 and 35 percent of calories.
- Consume fiber-rich foods.
- Limit sodium intake.

More specific information may be found at [www.mypyramid.gov](http://www.mypyramid.gov).

## **STEP TWO: Consider Using Diets and Supplements That May Mildly Suppress the Immune System**

People with NMO may want to consider strategies that increase the intake of vitamin D and PUFAs:

- Take supplements of vitamin D if the blood level of vitamin D is low  
Vitamin D levels may be determined with a simple blood test known as “25-hydroxyvitamin D.” If the level is normal, then there is no clear need for vitamin D supplements. If the level is low, then supplements may be taken. Vitamin D doses of 1,000 to 2,000 international units (IU) daily are often needed. Supplements of calcium should also be considered. After supplementing for three to six months, blood levels of vitamin D and calcium should be rechecked to be certain that the levels are in the normal range. Also, if the vitamin D level is low, consideration should be given to having a bone densitometry test to evaluate for decreased bone density (osteoporosis). Additional information about vitamin D and calcium may be found in Appendix I.
- Increase intake of omega-three fatty acids
  - Fatty fish  
Fatty fish are the richest source of omega-three fatty acids. Fatty fish include salmon, Atlantic herring, Atlantic mackerel, bluefin tuna, sardine, and cod. Consider at least two servings of oily fish per week. Due to concerns about mercury toxicity, all people should avoid very high fish intake and pregnant women or women who may become pregnant should consume less than 12 ounces of fish per week.
  - Oils  
One form of omega-three fatty acid (“ALA”) is present in the oils of some seeds and nuts, including flaxseed and walnut.
  - Supplements  
Omega-three fatty acids are available in a wide variety of supplements, including fish oil, salmon oil, and cod liver oil. The supplement for which there is the best safety data is fish oil. The FDA has determined fish oil is “generally regarded as safe” when it is used in daily doses that contain 3 grams or less of omega-three fatty acids (referred to as “EPA” and “DHA”). Additional information about fish oil may be found in Appendix I.

- Maintain or modestly increase intake of omega-six fatty acids  
The average American diet is relatively high in omega-six fatty acids and relatively low in omega-three fatty acids. Thus, the single most reasonable strategy may be to increase omega-three fatty acid intake. Beyond that, and depending on one's current diet, it may be reasonable to increase intake of omega-six fatty acids, which are found in sunflower, safflower, corn, and soybean oils. Flaxseed oil and evening primrose oil also contain omega-six fatty acids.
- Decrease dietary sources of saturated fat.  
Saturated fat is found mainly in meat and dairy products. The American Heart Association recommends that saturated fats represent less than 10% of the total calories that are consumed.
- Supplement with vitamin E if omega-three or omega-six fatty acid intake is increased  
Supplements of omega-three or omega-six fatty acids may cause vitamin E deficiency. As a result, modest doses of vitamin E (100 IU daily) should be taken. Additional information about vitamin E may be found in Appendix I.

### **STEP THREE: Avoid or Use Caution With Supplements That May “Activate” the Immune System or Cause Other Harmful Effects**

People with NMO should avoid or use caution with supplements that may increase immune system activity, cause significant side effects, or interact with medications:

- See Appendix II for alphabetical listing of supplements that may be harmful.

### **Getting Some Perspective and Broadening the View**

There are many different types of unconventional therapies that may be used in NMO. The five main types of unconventional therapy, along with representative examples, are:

- Biologically based therapies: diets, dietary supplements
- Mind-body medicine: meditation, hypnosis
- Manipulative and body-based systems: massage, chiropractic medicine
- Alternative medical systems: traditional Chinese medicine, Ayurveda
- Energy therapies: magnets, therapeutic touch

Unconventional therapies may be described more simply as those that are *biologically based*, such as diets and dietary supplements, and those that are *non-biologically based*, which includes therapies in all of the other categories.

People often think about biologically based approaches when they think about using unconventional therapies for conditions like NMO. One likely reason for this is that conventional medicine, with its emphasis on drugs and surgery, is extremely focused on biological approaches, and we thus tend to then apply that biological focus to unconventional medicine. While unconventional medicine may have some reasonable biologically based therapies, conventional medicine is already quite powerful in that regard. Non-biological approaches are a relative weakness of conventional medicine and a strength of unconventional medicine. By recognizing this important point and changing one's perspective, one can begin to recognize and appreciate some of the novel, low risk, under recognized, and under utilized approaches that unconventional medicine has to offer.

Non-biological unconventional strategies that are low risk and potentially beneficial include yoga, tai chi, music therapy, relaxation methods, and acupuncture. These strategies may be used to complement conventional therapies.

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### **Additional Information**

Dr. Allen Bowling is the Medical Director of the Multiple Sclerosis Service and the Director of the Complementary and Alternative Medicine Service at the Colorado Neurological Institute (CNI). In addition, he is Clinical Associate Professor of Neurology at the University of Colorado-Denver and Health Sciences Center. Additional information about unconventional medicine may be found in his book, **Complementary and Alternative Medicine and Multiple Sclerosis** (2<sup>nd</sup> edition, Demos Medical Publishing), and his website, [www.NeurologyCare.net](http://www.NeurologyCare.net).

## **Appendix I: Safety Information for Specific Dietary Supplements**

### **Calcium**

**Conditions in Which Use Supplements Should be Avoided or Used With Caution:** low parathyroid function (“hypoparathyroidism”), high blood phosphate levels (“hyperphosphatemia”), kidney disease, sarcoidosis

**Major Drug and Supplement Interactions:** thiazide and thiazide-like diuretics (may cause “milk alkali syndrome”); absorption of some drugs (bisphosphonates, fluoroquinolones, levothyroxine, tetracyclines) and minerals (iron, zinc, magnesium) may be decreased if they are taken at the same time as calcium

**Main Side Effects:** gastrointestinal irritation; excessive gas; belching; daily doses greater than 4,000 milligrams (mg) may cause decreased kidney function, high blood levels of calcium (“hypercalcemia”), and deposits of calcium (“ectopic calcium deposition”)

### **Fish Oil**

**Conditions in Which Use Supplements Should be Avoided or Used With Caution:** bleeding disorders; aspirin sensitivity (may cause decreased lung function); diabetes (high doses may increase blood sugar levels); bipolar disorder and depression (may cause excessive activity levels (“hypomania”)); pregnancy and lactation (insufficient information)

**Major Drug and Supplement Interactions:** blood-thinning medications (“anticoagulants” and “antiplatelets”); oral diabetes medications (“hypoglycemic medications”) and insulin (may cause high blood sugar levels); high blood pressure medications (may cause excessively low blood pressure)

**Main Side Effects:** generally well tolerated; combined daily intake of omega-three fatty acids (“EPA” and “DHA”) of 3 grams or less has been given the “Generally Regarded as Safe” (“GRAS”) designation by the FDA; fishy taste; belching; bad breath; nosebleeds; bruising; heartburn; high doses may cause nausea and loose stools; since supplementation with fish oil may produce vitamin E deficiency, supplementation with vitamin E may be necessary (0.6–0.9 IU of vitamin E for each gram of polyunsaturated fatty acid)

### **Vitamin D**

**Conditions in Which Use Supplements Should be Avoided or Used With Caution:** high blood calcium levels (“hypercalcemia”); sarcoidosis; low parathyroid function (“hypoparathyroidism”); kidney disease

**Major Drug and Supplement Interactions:** “cardiac glycosides” (may cause irregular heart rhythms)

**Main Side Effects:** generally well tolerated in reasonable doses; high doses of vitamin D may cause high blood calcium levels (“hypercalcemia”), nausea, vomiting, abdominal cramps, fatigue, muscle and bone pain, decreased kidney function, and high blood pressure

### **Vitamin E**

**Conditions in Which Use Supplements Should be Avoided or Used With Caution:** retinitis pigmentosa (accelerated visual decline with synthetic vitamin E supplements); vitamin K deficiency (may worsen blood clotting abnormalities)

**Major Drug and Supplement Interactions:** blood-thinning medications (may increase bleeding risk)

**Main Side Effects:** usually well tolerated in reasonable doses; increased risk of bleeding, especially with high doses; rarely nausea, diarrhea, fatigue, stomach cramps, blurred vision, and headache

## **Appendix II: Glossary of Potentially Harmful Dietary Supplements**

**Alfalfa:** Immune-stimulating

**Aloe:** May interact with steroids, possible toxic effects with oral use

**Androstenedione:** Multiple possible toxic effects

**Ashwagandha:** Ayurvedic herb that is sometimes recommended for MS, may be immune-stimulating

**Asian ginseng:** No definite therapeutic effects; possibly immune-stimulating; may interact with steroids; may inhibit blood clotting; may interact with warfarin (Coumadin)

**Astragalus:** Possibly immune-stimulating

**Barberry:** Possibly sedating

**Bayberry:** May interact with steroids

**Bearberry:** Also known as uva ursi; possible liver toxicity

**Bee pollen:** No definite therapeutic effects; rarely causes severe allergic reactions

**Beta-carotene:** *See* Vitamin A

**Bissy nut:** *See* Cola nut

**Black currant seed oil:** Contains gamma-linolenic acid; unknown safety, especially for long-term use

**Blue-green algae:** *See* Spirulina

**Borage seed oil:** Possibly immune-suppressing; contains gamma-linolenic acid; possible liver toxicity; may cause seizures

**Caffeine:** Improves mental alertness; may irritate urinary tract

**Cat's claw:** Possibly immune-stimulating

**Chamomile:** Possibly fatigue-producing

**Chaparral:** Possible liver toxicity

**Coenzyme Q10:** Immune-stimulating; may interact with warfarin (Coumadin)

**Coffee:** Contains caffeine; improves mental alertness; may irritate urinary tract

**Cola nut:** Also known as bissey nut; contains caffeine; improves mental alertness; may irritate urinary tract

**Comfrey:** Possible liver toxicity

**DHEA:** Variable immune effects; possible adverse effects

**Echinacea:** Not definitely effective for treating viral infections; immune-stimulating; possible liver toxicity when taken with medications that have possible liver toxicity

**Ephedra:** *See* Ma huang

**Garlic:** Possibly immune-stimulating; may inhibit blood clotting; may interact with warfarin (Coumadin)

**Germanium:** Sometimes recommended for MS; no known beneficial effects for MS; may cause kidney failure and death

**Ginkgo biloba:** Not effective for treating MS attacks; unstudied for other uses in MS; may inhibit blood clotting; may interact with warfarin (Coumadin); may provoke seizures

**Goldenseal:** Possibly fatigue-producing

**Guarana:** Contains caffeine; improves mental alertness; may irritate urinary tract

**5-HTP:** Possible toxic effects

**Kava kava:** May cause severe liver toxicity and should be avoided; possibly effective for treating anxiety; possibly fatigue-producing

**Licorice:** Possibly immune-stimulating; may interact with steroids; multiple possible toxic effects

**Lobelia:** Multiple possible toxic effects

**Ma huang:** Multiple possible toxic effects, including death; may interact with steroids

**Melatonin:** Possibly immune-stimulating

**Niacin:** *See* Vitamin B3

**Oligomeric proanthocyanidins:** Possibly immune-stimulating

**Passionflower:** Possibly fatigue-producing

**Propolis:** No definite therapeutic effects; unknown safety

**Psyllium:** U.S. Food and Drug Administration (FDA)-approved for constipation; should not be used by people with swallowing difficulties

**Pycnogenol:** Possibly immune-stimulating; safety of long-term use is unknown

**Pyridoxine:** *See* Vitamin B6

**Royal jelly:** No definite therapeutic effects; may rarely provoke asthma and cause severe allergic reactions

**S-adenosylmethionine:** *See* SAME

**Sage:** Possibly fatigue-producing

**St. John's wort:** Probably effective for treating depression; possibly fatigue-producing; may interact with multiple medications, including antidepressants and antiseizure medications

**SAME:** Also known as S-adenosylmethionine; possibly effective for treating depression

**Saw palmetto:** Possibly immune-stimulating

**Selenium:** Possibly immune-stimulating; greater than 400 micrograms daily may produce multiple toxic effects

**Siberian ginseng:** No definite therapeutic effects; immune-stimulating; possibly fatigue-producing; may inhibit blood clotting; may interact with warfarin (Coumadin)

**Spirulina:** Also known as blue-green algae; contains variable amounts of gamma-linolenic acid; safety of long-term use is unknown

**Stinging nettle:** Possibly immune-stimulating; possibly fatigue-producing; may interact with warfarin (Coumadin)

**Uva ursi:** *See* Bearberry

**Valerian:** Possibly effective for treating insomnia; possibly fatigue-producing; safety of long-term use is unknown

**Vitamin A:** Chemically related to beta-carotene; immune-stimulating; greater than 10,000 IU daily may produce toxic effects; may increase cancer risk in smokers

**Vitamin B3:** Also known as niacin; greater than 35 milligrams daily may produce toxic effects

**Vitamin B6:** Also known as pyridoxine; greater than 50 milligrams daily may produce toxic effects

**Vitamin C:** Not definitely effective for treating urinary tract infections or viral infections; immune-stimulating; greater than 2,500 milligrams daily may produce toxic effects; may interact with warfarin (Coumadin)

**Vitamin D:** Effective for preventing and treating osteoporosis; greater than 2,000 IU daily may produce toxic effects

**Vitamin E:** Supplements of vitamin E may be indicated with a high intake of polyunsaturated fatty acids; immune-stimulating; greater than 1,000 IU daily may produce toxic effects; may inhibit bleeding; may interact with warfarin (Coumadin)

**Vitamin K:** May interact with warfarin (Coumadin)

**Yohimbe or yohimbine:** Multiple possible toxic effects

**Zinc:** Possibly immune-stimulating

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