



PROTECT YOUR FAMILY FROM MULTIPLE SCLEROSIS



DIRECT-MS

prevent the diagnosis

ESCAPE THE STORM

LOWER THE RISK OF MULTIPLE SCLEROSIS
WITH SCIENCE-BASED NUTRITIONAL STRATEGIES



What is DIRECT-MS?

DIRECT-MS (DIet REsearch into the Cause and Treatment of Multiple Sclerosis) is a federally registered charity that was established in 1998 by persons directly affected by MS. Fuelled by a passion to provide reliable science-based information on nutrition and MS to all those affected by MS, the founders of DIRECT-MS committed the focus of the organization to two main goals:

- To provide reliable, science-based information on the role that nutritional factors play in MS so as to allow those affected by MS to make an informed decision on whether or not to use dietary strategies for managing the disease and for preventing it in close relatives.
- To fund scientific research which properly tests the effectiveness of dietary strategies for slowing or halting MS progression and for preventing it in the first place.

As a grass-roots charity, DIRECT-MS is completely volunteer-driven with very low overhead costs and no paid staff. 98% of the funds raised through donations go directly to funding scientific research. Funds raised through sponsorship of casinos are used for producing information booklets such as this one.

Origins



Over eight years ago my oldest child received the devastating diagnosis of Multiple Sclerosis. Having been a research scientist for 30 years I decided to plunge into the scientific literature to determine the most likely factors which cause MS and to use this information to develop an effective therapy for my son. I also sought an effective therapy for preventing my other children and future grandchildren from contracting MS.

I discovered abundant scientific evidence that strongly indicates that various nutritional factors play major roles in the onset and progression of MS. A summary of these findings and my science-based recommendations for using nutritional strategies to slow or halt MS progression are found in the booklet "Take Control of Multiple Sclerosis". It can be obtained free of charge from DIRECT-MS (see back cover).

Importantly, it became clear that a few simple nutritional strategies are effective for greatly lowering the risk of MS. These MS prevention strategies and the scientific logic behind them are described in this booklet.

Ashton Embry (PhD), August, 2003

Preventing Multiple Sclerosis

One of the greatest fears of those with multiple sclerosis is that one or more of their children will also get MS and such a fear is not unrealistic. First-degree relatives (children, siblings) of persons with MS have a much greater risk of contracting MS than the general population has. Thus it seems reasonable to expect that the topic of Prevention of Multiple Sclerosis would be a very important one for MS researchers, neurologists and MS societies.

Sadly this topic is not being addressed and no advice on how one can lower the risk of contracting MS is available from the medical community or from the main charities that raise money for MS. Consequently, DIRECT-MS, which puts the interests and well being of persons with MS first, has made Prevention of Multiple Sclerosis one of its primary areas of research.

This booklet presents advice on the use of nutritional strategies for greatly lowering the risk of MS. This advice is based completely on scientific information that is available in medical journals. We would emphasize that this booklet is provided as general medical/scientific information and is not intended as a substitute for the medical advice of physicians.

What is Multiple Sclerosis?

- Multiple Sclerosis is a serious neurological disease characterized by a wide variety of impairments that often become progressively worse with time. Sadly many people with MS eventually become confined to a wheelchair because they have not been able to significantly slow or halt disease progression.
- MS is classified as an autoimmune disease. The basic disease process of an autoimmune disease such as MS is that a person's own immune system attacks specific parts of the body.



The Disease Process

Over the past 30 years a great deal of scientific research has uncovered the basic disease process of multiple sclerosis. This knowledge is critical for understanding the probable causal agents of MS and for developing strategies to lower the risk of contracting MS.

In MS, the immune system attacks tissue in a person's central nervous system and that is why it is classed as an autoimmune disease. The specific tissue that is the target of the immune attack is myelin, a fatty substance which wraps around and insulates the nerve axons of the

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central nervous system. With the loss of myelin the nerve axons themselves eventually are damaged and destroyed. The axons deliver instructions from the brain to all the parts of the body and their loss causes such messages to be delayed and blocked. This translates into the multiple disabilities that characterize MS.

Studies suggest that the MS disease process begins in childhood and that it is often 20-30 years before it becomes clinically apparent. Such a long lag time between the start of the disease process and its recognition characterizes many chronic diseases including cancer and heart disease.

One key to preventing MS is to stop the disease process from taking hold. It appears this is best done during the childhood years.



MS - The Genetic Factor

It is now firmly established that genetics play a significant role in MS and that only people who carry specific genes are susceptible to contracting MS. However not everyone who is genetically susceptible to MS actually falls victim to the disease and this demonstrates that one or more environmental factors also play major roles in MS onset.

Studies have shown that numerous genes are involved in MS susceptibility with one or more genes related to the immune system being very important. It appears that perhaps only .5% of the North American/European population is susceptible to MS and in high risk areas such as Canada about one third to one half of those susceptible (one in five hundred) actually contracts the disease.

Notably women are twice as susceptible to MS as men are. The most likely explanation for this is the occurrence of genetic differences between the sexes related to hormone production.



Risk of MS for Children and Siblings

Because genetics play a significant role in MS, the children and brothers and sisters of persons with MS have a much higher chance of being diagnosed with multiple sclerosis than the general population does. It has been determined that the risk of a brother or sister of a person with MS contracting the disease is about 4%. This is about 40

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times the risk of the general population. Because of the higher female risk, sisters are more susceptible than brothers and sisters of females with MS have the highest sibling risk.

Children of persons with MS also have a relatively high risk which is about 3% (1 in 30). Once again the genetic factor of increased risk of females plays a big role here. It has recently been estimated that daughters of mothers with MS who carry a specific immune-related gene have a risk of 10%, a frighteningly high number.

Given the greatly elevated MS risk of close loved ones of persons with MS, we believe it is most important that every effort be made to greatly lower that risk. The science-based preventative measures for MS discussed in this booklet provide a means for accomplishing this critical task.



Preventing MS by Changing the Environment

There is no doubt that environmental factors play a major role in the onset and progression of the MS disease process and such factors can be regarded as the cause of MS. They have been discussed in detail

THE BEST STRATEGY FOR GREATLY LOWERING THE RISK OF MS IS TO CHANGE ONE'S EXPOSURE TO ONE OR MORE OF THE ENVIRONMENTAL FACTORS THAT CAUSE MS.

in the DIRECT-MS booklet "Taking Control of Multiple Sclerosis" which can be obtained free of charge from DIRECT-MS or downloaded from the DIRECT-MS website: <http://www.direct-ms.org>

Environmental factors drive MS by either promoting autoimmune reactions or by decreasing the capacity to suppress such harmful reactions. It is most important to identify these factors because MS risk reduction is best accomplished by changing one's exposure to one or more of these factors.

Four Causal Factors of MS

The main environmental factors identified as likely drivers of the MS disease process are:

Infectious Agents

Common viruses and bacteria activate myelin-attacking immune cells.

Food Types

Dairy, gluten grains and legumes also can potentially activate myelin-attacking immune cells.

Vitamin D Deficiency

A deficiency in vitamin D hinders immune suppression.

Fish Oil Deficiency

A deficiency in fish oil also hinders immune suppression.



Autoimmune Activators

Destructive autoimmune reactions occur in a genetically susceptible person because their immune system recognizes parts of myelin as “foreign” and potentially harmful. This case of “mistaken identity” occurs because proteins in the myelin can closely resemble various foreign proteins found in viruses, bacteria and foods that the immune system has previously encountered. Thus when the immune system defends the body against such foreign proteins as it is supposed to, it also attacks the very similar looking “self proteins” in myelin.



Infectious Agents

It has been found that a number of common childhood infectious agents such as Epstein-Barr virus (infectious mononucleosis) and Herpes virus 6 (roseola) contain proteins that closely resemble proteins in myelin. It is likely these types of infections that begin the MS disease process in childhood.

There is little doubt that common childhood infectious agents are important initiators and drivers of the MS disease process. However very little can be done about exposure to such infectious agents at present. Hopefully vaccines will someday be developed to prevent such infections that can have devastating consequences far in the future. Until then other strategies are needed for preventing MS.

Food Types

Three specific food types have been implicated in MS and closely related autoimmune diseases such as rheumatoid arthritis and type 1 diabetes:

- Dairy (milk, cheese)
- Grains that contain gluten (wheat, rye, barley)
- Legumes (beans, peas)

Like the infectious agents, these food types contain proteins that can potentially activate myelin-attacking, immune cells. The foods that contain proteins that can promote autoimmune reactions are dairy, gluten grains (wheat, rye, barley) and legumes (beans). These are the most common foods in western society and it would be very difficult, although not impossible, for a child to avoid eating them especially if there were no immediate adverse health consequences. Because, as will be described, simpler ways exist to prevent MS, such hard-to-implement food avoidance is not the recommended strategy for preventing MS. However it must be noted that reduced exposure or complete avoidance of dairy products would be helpful for ensuring substantially reduced risk of MS.

Autoimmune Suppressors

The immune system has a suppressor side that is designed to quickly shut down harmful autoimmune reactions before they cause any damage. The environmental factors that negatively affect the suppressor side of the immune system are major factors in MS because they allow autoimmune reactions to go unchecked.



Fish Oil Deficiency

- Fish oil is a nutrient that is very important for immune suppression.
- Notably it has been found that in areas where MS is common there is widespread deficiency in fish oil.
- Feeding of omega 3 polyunsaturated fat (fish oil) to laboratory animals protects them against an MS-like disease.

Fish oil deficiency is widespread in western society because such “omega 3 fats” are nearly absent in meat from grain-fed, farm animals and consumption of fish, especially by children, is not common. One obvious prevention strategy for MS is to ensure an adequate intake of fish oil from infancy onward. This can be done by supplementation with fish oil (for example cod liver oil) and eating fish. This topic is discussed in more detail farther on in the booklet.

Vitamin D Deficiency

- Vitamin D is a very effective immune suppressant. It is derived mainly from the action of sun-derived ultra-violet radiation on the skin.
- MS most commonly occurs where vitamin D supply is low and many persons with MS have a marked deficiency of vitamin D.

In high latitude areas (above 40 degrees), which include the northern USA, all of Canada and most of Europe, vitamin D deficiency is common because very little, if any, is generated from sun exposure in the winter months. This is why MS prevalence increases with increasing latitude. The best strategy for greatly lowering the risk of MS seems to be ensuring an adequate intake of vitamin D from childhood onward. In the following pages scientific evidence that demonstrates that adequate vitamin D is indeed an effective preventative agent for MS is presented.

Vitamin D

Vitamin D is known as the sunshine vitamin because by far the main source of the vitamin for most people is sunshine. When skin is exposed to sunshine, the ultraviolet B (UVB) radiation portion of the sun's rays reacts with cholesterol in the skin to produce vitamin D. The vitamin D is then transported to the liver where it is transformed and released into the blood to allow it to reach all parts of the body. Various types of cells throughout the body use the circulating vitamin D (25D) to produce an active hormone that

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influences important cellular functions. One of these functions is to allow calcium to be absorbed into circulation and this is why vitamin D is so important for bone health. Another very critical function of vitamin D, through the action of the produced vitamin D hormone, is the regulation of the immune system. Various types of immune cells have a vitamin D hormone receptor on them and the hormone influences the actions of the immune cells. It is this function that links vitamin D to multiple sclerosis.

Vitamin D and Multiple Sclerosis

There is a great deal of diverse scientific evidence which links vitamin D to multiple sclerosis.

- MS in genetically similar populations systematically becomes more common as vitamin D supply decreases with increasing latitude. This is the main reason that MS is 4 times more common in Canada than in the southern USA.
- People in occupations which involve plentiful sun exposure have a lower incidence of MS
- Children with more sun exposure have a lower risk of MS
- MS rates are very low in local populations that eat a lot of fish, the only dietary source of abundant vitamin D.
- Vitamin D injections prevent and arrest an MS-like disease in laboratory animals
- Immunological studies show that vitamin D can suppress autoimmune reactions
- There is a close correlation between seasonal changes in MS disease activity and seasonal changes in vitamin D supply

Natural MS Prevention in Australia

Studies of variations in the rates of MS in different parts of Australia demonstrate very clearly that adequate sun exposure and consequent vitamin D supply is a very effective way to prevent MS.

The different rates of MS occurrence in Australia, expressed as number of MS cases per 100,000 people, are shown on the map on the opposing page. It is obvious that MS occurrence systematically increases with increasing latitude from 11/100,000 in tropical Queensland to 74/100,000 in temperate Tasmania. The accompanying graph shows that the increasing rates of MS correlate almost perfectly with the decreasing amounts of ultraviolet radiation and consequent vitamin D supply.

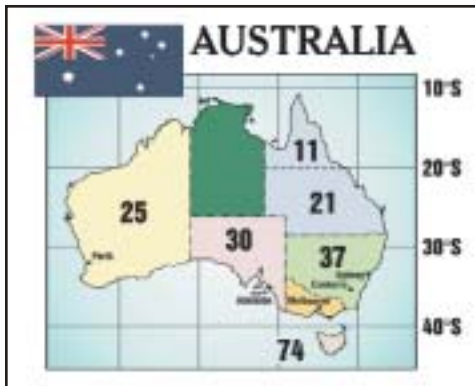
Australia is genetically homogeneous (mainly British and Irish descent) and other risk factors for MS such as infectious agents and diet are also constant. Thus the very large reduction (85%) of MS in the low latitude areas of Australia can only be explained by the increased ultraviolet radiation and consequent higher vitamin D supply.

In support of this, a very recent study in Tasmania, which has the highest rate of MS in Australia, showed that increased sun exposure during childhood was associated with an 80% decreased risk of MS. Thus those children in this high risk area of Australia who had more sun exposure were much less likely to contract MS.

The Australian data leave little doubt that adequate vitamin D, especially in childhood, can greatly lower the risk of MS.

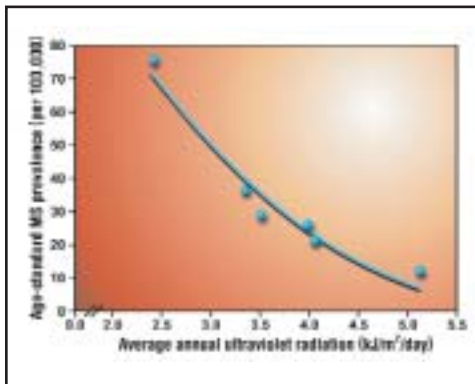
Rates of MS in Australia

The numbers on the graph represent the number of MS cases for each 100,000 population. Note the 7 fold increase of MS occurrence with increasing latitude from tropical Queensland (11) to temperate Tasmania (74). The greater the sun exposure, the less common MS is.



Ultraviolet Radiation Supply vs MS Prevalence

This graph shows that there is a very close inverse correlation between the rate of MS and ultraviolet radiation supply. The greater the ultraviolet radiation supply the less common MS is.



Natural MS Prevention in Newfoundland

Canada has a very high rate of MS with almost all areas having a rate of least 100-200/100,000. The only area in Canada which has places with anomalously very low rates is the province of Newfoundland. Newfoundland is a large island on Canada's east coast and is a very low sunlight area due to its high latitude and frequently overcast skies. Like Australia, persons of Irish and British

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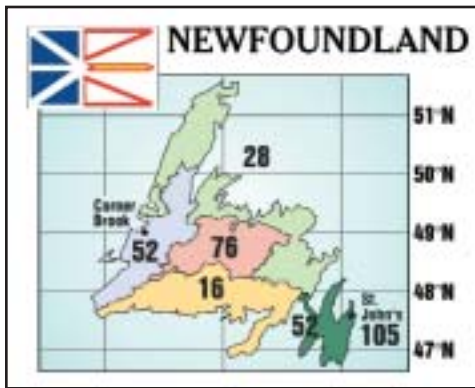
descent dominate the population. Given this, and the low supply of ultraviolet light, one might predict high rates of MS over the entire island if UVB and consequent vitamin D supply were required to lower the risk of MS.

A map of the varying rates of MS in Newfoundland is on the opposing page. The rate in the capital city of St John's, 105/100,000, is what one would expect given the low ultraviolet light supply. In the northern and southern coastal areas the rates are less than 30/100000 and these are similar to those found in the areas of Australia with a high supply of ultraviolet radiation.

There is a good explanation for the occurrence of such very low rates of MS in cool temperate Newfoundland. The areas of low MS rates

Rates of MS in Newfoundland

The numbers represent the number of MS cases for each 100,000 population. Anomalously very low rates of MS equal to those found in sunny, low latitude areas are found along the north and south coast of Newfoundland. The inhabitants of these areas are protected from MS by a very high supply of vitamin D, not from the sun, but from abundant fish in their diet.



in Newfoundland are almost entirely inhabited by people who live in fishing villages on the coast and their diets include a very high intake of fish. Fish is the only food source with large amounts of vitamin D.

Thus the people in the fishing villages of Newfoundland are being protected from MS by a “tropical” supply of vitamin D, not from the sun, but from their diets. The combination of the data from Australia and that from Newfoundland demonstrates that an adequate supply of vitamin D either from the sun or from food can greatly lower the risk of MS.

Obtaining Sufficient Vitamin D and Fish Oil

Abundant scientific data indicate that sufficient vitamin D and fish oil will greatly lower the risk of MS and prevent it from occurring in most, if not all, susceptible persons. The children and siblings or persons with MS have a high risk of MS and thus it is important to ensure they are getting an adequate supply of vitamin D and fish oil.

Because sun exposure can increase the risk of skin cancer, an adequate supply of vitamin D is best obtained by taking a supplement. Bottles of 400 IU pills can be purchased and for children two pills a day (800 IU) will be sufficient for those up to 10 years of age. People over 10 should use 2000 IU a day to ensure they have enough vitamin D all year around. These amounts are all within the accepted safety range for vitamin D intake.

Another source of vitamin D is cod liver oil. Each teaspoon has about 400 IU and thus two teaspoons a day for those 10 and under and five teaspoons for those over ten will suffice. Many brands of cod liver oil offer flavoured (e.g. mint, lemon) varieties that completely eliminate the somewhat fishy taste of the oil.

The great advantage of using cod liver oil is that the amounts taken also supply sufficient fish oil. If vitamin D pills are used then a separate fish oil supplement which is devoid of vitamin D (salmon oil) is recommended. For those ten and under, 2 gram of omega 3 fatty acids (EPA and DHA) (10 ml of fish oil) a day is sufficient. For those over ten, 4 grams of omega 3 fatty acids (20 ml) are optimal. Again such amounts of fish oil are well within safety limits.

Measuring Your Vitamin D Level

Because very high levels of circulating vitamin D can be problematic, it is important to find out what your level is. This can be done by a simple blood test that may well be covered as part of your health plan.

The level of circulating vitamin D (25D), which is the best indicator of a person's vitamin D status, is almost always measured as either nanomols per liter (nmol/l) or as micrograms per milliliter (mcg/ml). The conversion factor for mcg/ml to nmol/l is 2.5.

The optimal level for circulating vitamin D is 100-130 nmol/l (40-50 mcg/ml) and this is at the high end of the normal range. Notably, many people in sunny, tropical areas where MS is almost non-existent, have circulating vitamin D levels in this range and maintenance of such a level all year around will greatly lower the risk of MS.

Notably in areas with high rates of MS (eg. Canada) most people have circulating vitamin D levels of half or less the optimal range at some time during the year.

If a test result reveals that one's level exceeds 130 nmol (50 mcg/ml) then it is best to stop using any supplementation until a future test reveals a level below 100 nmol/l (40mcg/ml).

Summary

Multiple Sclerosis is an autoimmune disease which can result in serious disabilities. Because genetics play a significant role in MS, close relatives of persons with MS are at high risk of contracting MS.

MS CAN BE PREVENTED BY RELATIVELY SIMPLE NUTRITIONAL STRATEGIES.

It is worthwhile for them to use a few simple nutritional strategies to greater lower and likely eliminate, their risk of MS.

Two nutritional factors that are implicated in MS by abundant data are deficiencies in vitamin D and fish oil. Data from areas where MS rates vary from low to high indicate that a high supply of vitamin D either from sun exposure or the consumption of fish will greatly lower the risk of MS.

Persons at high risk of MS should ensure they have a high intake of vitamin D and fish oil. For children ten years old and younger, a daily supplement of 800 IU of vitamin D and 2 grams of omega 3 fatty acids (10 ml fish oil) will very likely provide protection from MS.

For persons over ten, a vitamin D supplement of 2000 IU and 4 grams of omega 3 fatty acids (20 ml fish oil) are recommended. The most convenient way to get an adequate supply of both these nutrients is to use flavoured cod liver oil.

MS can be prevented by relatively simple nutritional strategies.



DON'T WAIT FOR A RAINY DAY TO PREVENT MULTIPLE SCLEROSIS. USE THESE PREVENTATIVE STRATEGIES TODAY.



Required Research

The first research project that is being promoted and funded by DIRECT-MS is a clinical trial that will test the effectiveness of nutritional strategies for slowing or halting MS progression. This planned research is discussed in the booklet “Take Control of Multiple Sclerosis”.

Clearly there is an urgent need to test the concept that adequate vitamin D and fish oil greatly lower the risk of MS and essentially prevent it from being contracted in most cases. Overall there is no more important goal in MS than establishing a reliable way to prevent MS.

DIRECT-MS is planning on promoting and funding a proper clinical trial, which tests the effectiveness of adequate vitamin D and fish oil for preventing MS, once the first study is underway. All contributions to DIRECT-MS will go towards a Prevention Study once the Nutrition/ MS progression study is funded.

We need your help.

Can the nutritional strategies discussed in this booklet prevent MS? Probably! However, only through proper scientific research will we know for sure if these nutritional strategies are as effective as we presently believe.

You can help support our goal of funding a proper clinical trial that will test the effectiveness of nutritional strategies for preventing MS by making a tax deductible donation to DIRECT-MS today.

Making a Donation

All of us connected with DIRECT-MS would be most appreciative of any size of donation you wish to give. You can help support our goal of funding proper clinical trials that test the effectiveness of nutritional strategies for both preventing and halting MS progression by making a donation today. It is emphasized that all donations are tax deductible in Canada and USA and a tax receipt will be sent to you promptly.

Also we would stress that your entire donation will go towards the planned research projects. No salaries or expenses are paid at DIRECT-MS. Our small overhead costs of less than a \$1000 a year are completely covered by donations from our directors. All costs related to the dissemination of information, such as this booklet, are covered by funds obtained from hosting casinos.

You can make an online donation with a credit card through a link on the home page of our website <http://www.direct-ms.org> or you can send a cheque to:

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Calgary, Alberta
Canada, T2L 1R7

We are very grateful for your support and you can be sure your entire donation will go towards helping persons with MS and their loved ones.

Additional Information and Resources

Detailed scientific information on the relationship between MS and nutritional factors is available on the DIRECT-MS website: <http://www.direct-ms.org>

A support site for those using dietary strategies to control MS is at <http://www.ms-diet.org> Many recipes are available on this site and people from around the world share their experiences with using dietary strategies for MS.

Please do not hesitate to contact us if you have any comments or questions regarding the use of dietary strategies for MS.

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DIRECT-MS

prevent the diagnosis



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