

THESIS

**THE ROLE OF HERBAL AND NATURAL PRODUCTS IN MULTIPLE
SCLEROSIS: POSSIBILITIES AND PRECAUTIONS**

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The Hypotheses

1. Based on their active constituents and therapeutic actions, certain herbal and natural remedies could be used to alleviate and manage specific symptoms produced by the prescription drugs used to treat MS.
2. There are both natural and herbal remedies that hold some promise for retarding the progress of MS.
3. Based on their active constituents and therapeutic action, certain herbal and natural remedies could be used to alleviate and manage specific symptoms that are associated with MS.

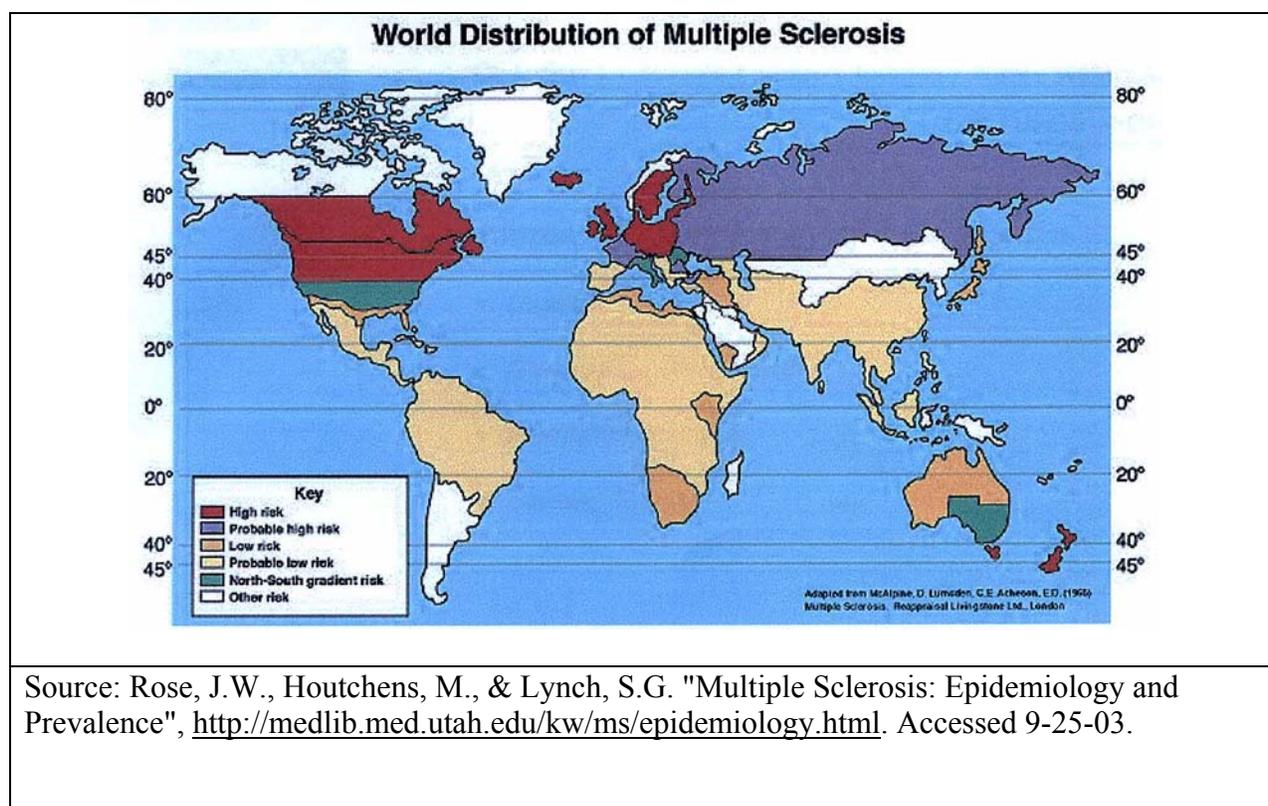
What is Multiple Sclerosis (MS)?

Definition of MS. It is often difficult to state precisely what MS *is* because, not only do the symptoms vary from person to person, but also because there are different types of MS. In general, MS is a chronic inflammatory disorder of the central nervous system (CNS), brain, and spinal cord.¹ It is clear is that MS affects the myelin, which is the fatty material that insulates axons or nerves. In addition, recent studies have suggested that the disease actually does damage to the axons.

Acting like the covering over electrical wires, myelin allows the nerves to transmit impulses rapidly. When impulses can be transmitted quickly and efficiently, movements are performed smoothly, rapidly, and in a coordinated manner with very little conscious effort. MS is one of a broad category of demyelinating (loss of the myelin) diseases that affect the CNS. When myelin is lost, it becomes increasingly difficult for a person to move in a rapid and coordinated manner. Also, after the myelin is lost, the sites at which the loss has occurred become sclerotic, or hardened, scarred areas. In MS there tends to be many such sites within the CNS. Therefore, the name of the disease, *multiple sclerosis*, is quite appropriate, as it literally means "many scars".²

Prevalence and Onset. MS affects approximately 350,000 people in the United States and 2.5 million people worldwide. In the United States, prevalence estimates vary between 5 and 119 per 100,000 population.³ Females appear to be affected more frequently than males. For example, 1.4 to 3.1 times as many women than men are affected.⁴ In addition, MS seems to vary by geographic location. For example, a higher incidence of MS is found in the northernmost

latitudes of the northern and the southern hemispheres. The figure on the next page illustrates that MS is not distributed equally around the world.



Generally, the prevalence of MS increases the further one travels from the equator in either hemisphere. (See figure above) However, contrary to expectations based on geography, the Lapp population in Scandinavia appears quite resistant to the disease and Native Americans (in North America) infrequently suffer from MS. It is not clear what factors may account for these observations. Finally, worldwide, with respect to race, MS appears to affect Caucasian populations to a greater degree than it does Asian or African populations.⁴ For example, MS is uncommon in Japan, China, and South America. Further, it is virtually unknown among the indigenous people of equatorial Africa and among the native Inuit in Alaska. However, an explanation for these discrepant observations has not been put forth.

Symptoms of MS can begin between 10 and 60 years of age. However, symptoms usually begin between 20 and 40 years of age, with a mean age of 32.³ Almost 70% of individuals with MS manifest symptoms between ages 20 and 40.⁴

Types of MS. Just as there are different forms of cancer, there are also different forms of MS.

While there are several types or forms of MS, the classification varies somewhat. Schapiro (1998) suggests that the most current classification is:

- A *Relapsing-Remitting* course is characterized by clearly defined acute attacks, followed by either full recovery or some residual neurologic signs/symptoms or deficits. Between relapses there is no progression of the disease.
- The *Primary Progressive* type is characterized by a clear progression of disability from the onset. There are few plateaus or remissions and only temporary or minor improvements.
- The *Secondary Progressive* type of MS usually begins with a relapsing-remitting course. This is followed by progression at a variable rate that may include occasional relapses and minor remissions.
- A *Progressive-Relapsing* pattern of MS demonstrates progression from the onset but without clear or acute relapses. This form of MS is most commonly observed in individuals who develop the disease after the age of 40.

The above classification is based upon clinical manifestations, and as such, is empirical and not necessarily based upon any differences in biologic pathophysiology. The classification system serves a critical function both for the health care provider and for the patient, in that, the different types of MS suggest different management strategies and expectations.

Anatomy, Physiology, and Pathology

The Nervous System. Two major divisions comprise the nervous system: the CNS and the peripheral nervous system (PNS). As noted in the previous chapter, the brain and spinal cord together are called the CNS. The nerves that extend to outlying or peripheral parts of the body are collectively known as the PNS.

The Brain. The brain consists of four major divisions, the brainstem, cerebellum, diencephalon, and cerebrum. The three areas of the brainstem, the medulla oblongata, pons, and midbrain, are generally responsible for two-way impulse conduction between the brain and spinal cord or between the brain and other regions of the body. For example, parts of the brain stem contain nerves that control eye movement as well as the centers that are involved in breathing and heart rate. The cerebellum is responsible for muscle coordination and for the maintenance of equilibrium and posture. The hypothalamus and the thalamus comprise the diencephalon. The hypothalamus controls the function of most of the internal organs, hormone secretion, appetite, wakefulness, and pleasure. The thalamus relays sensory impulses to the cerebral cortex areas of the brain. Finally, the cerebrum is responsible for mental processes of all kinds including sensations, consciousness, memory, and the voluntary control of movements.⁵

Nerves and Nerve Cells. Two types of cells are found in the nervous system: neurons and glia, or neuroglia. Neurons or nerve cells conduct impulses. Glia, which are specialized connective tissue cells, support neurons.

Neurons have three parts: the cell body, one or more branching projections, dendrites, and one elongated projection, the axon. Dendrites transmit impulses to the cell body or the axons; axons transmit impulses away from the cell body or the dendrites. The axon is surrounded by a white

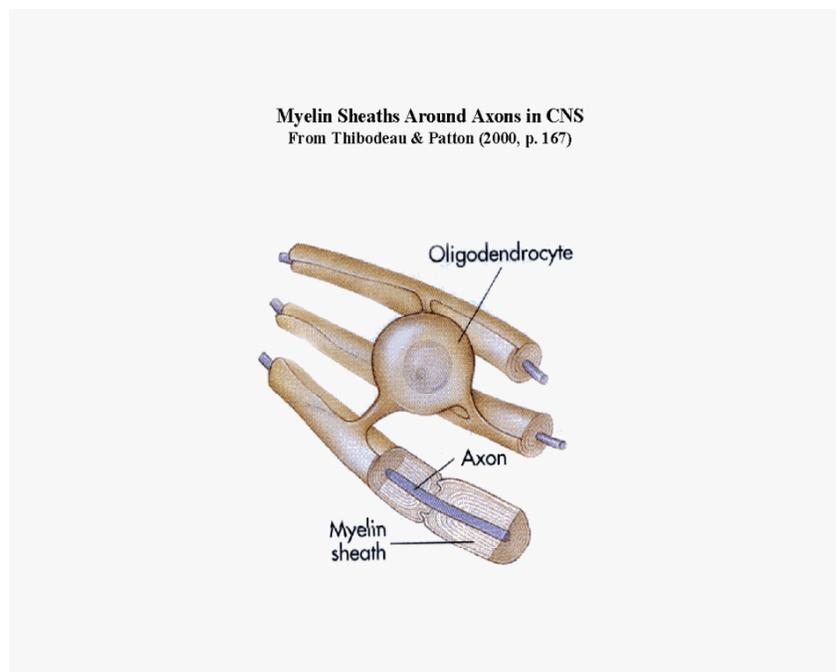
fatty substance known as myelin that is formed by Schwann cells that wrap around some axons outside of the CNS.

There are three types of neurons.

- Sensory neurons transmit impulses to the spinal cord and brain from all parts of the body.
- Motor neurons transmit impulses away from the brain and spinal cord to two kinds of tissue, muscle, and glandular epithelial tissue.
- Interneurons conduct impulses from sensory neurons to motor neurons.

Glia, which are supporting cells, hold the neurons together and provide protection to them.

They vary in shape and size. For example, the threadlike branches of astrocytes attach to neurons and to small blood vessels, holding these structures close to each other. Smaller than astrocytes, microglia usually are stationary, but when the brain tissue becomes inflamed or degenerates, they enlarge, move about, and act as microbe-eating scavengers. Finally, oligodendrocytes have two functions. One function is to hold nerve fibers together. A second function is to produce the white fatty myelin sheath that envelops the nerve fibers located in the brain and the spinal cord.⁶ (See figure below)



Nerve Impulses. A nerve impulse is often defined as "a self-propagating wave of electrical disturbance that travels along the surface of a neuron's plasma membrane."⁷ It must be initiated by a stimulus, e.g., pressure, temperature, or a chemical change, in the neuron's environment.

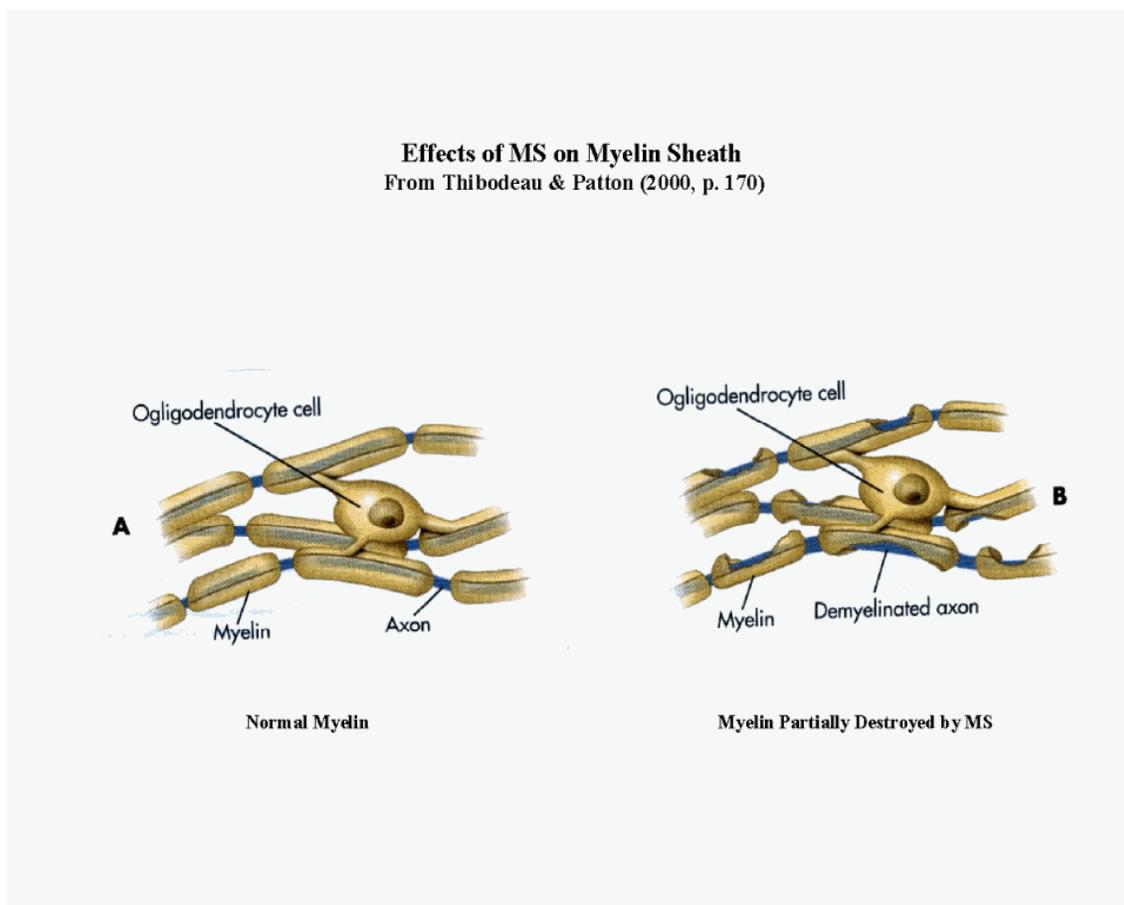
The outer membrane of a resting neuron, because of an excess of sodium ions (Na^+), has a slightly positive charge. The inside has a slightly negative charge. When a section of the membrane is stimulated, its Na^+ channels open quickly and Na^+ rushes inside. The inside becomes then becomes positive and the outside of the membrane becomes negative. Although this section of the membrane recovers almost immediately, the electrical disturbance stimulates the Na^+ channels in the next section of membrane to open. What results is a self-propagating wave of disturbance, a nerve impulse, which travels in one direction across the neuron's surface.

The role of myelin in fostering rapid impulses is critical. If the impulse encounters a section of membrane covered with insulating myelin, it "jumps" around the myelin. This process is called saltatory conduction. This type of impulse movement is much faster than is possible in nonmyelinated sections of a membrane.⁷

MS and the Nervous System. It is important to note that while MS directly affects only the CNS, the disease has indirect effects on other systems and their functions because all of the components of the nervous system are interrelated.⁸ Because MS is characterized by myelin loss and destruction and is accompanied by varying degrees of oligodendrocyte cell injury and death, MS is really a disease of the oligodendrocytes, as it is this type of glia cell that produces myelin. The result of the loss of myelin and the destruction of oligodendrocytes is demyelination of the white matter of the CNS. (See figure on following page) Hard, plaque-like lesions replace the

destroyed myelin and inflammatory cells then invade the affected areas. When myelin around the nerves is lost, one or all of the following can result:

- Conduction is blocked at the site of the lesion.
- Slower conduction time occurs along the affected nerve.
- There is an increased subjective feeling of fatigue probably because of increased compensation for neurologic deficits.⁹



Plaque-like lesions can occur anywhere within the white matter of the CNS, but the most frequently affected sites are the optic nerves, the brainstem, the cerebellum, and the spinal cord.⁹

The result can be weakness, lack of coordination, visual impairment, and/or speech disturbances.

Etiology

The specific cause of MS has not been identified. However, several plausible causes have been put forth. It may be that it is a combination of several factors that produces the disease.

The Autoimmune Theory. Generally, the immune system is responsible for destroying foreign substances in the body such as viruses and bacteria. How this is accomplished is varied and complex. The immune system is comprised of different cells, made and stored in different parts of the body, whose function is to protect the body. These cells produce immunomodulating substances. However, the combinations of cells and substances that are formed are unlimited. *B cells* are produced in the bone marrow. *T cells*, which are produced in the thymus gland and the tonsils, communicate with and regulate each other. In addition, certain cells, *T suppressor cells*, act to suppress reactions while *T Helper cells* help to facilitate reactions. Other types of cells, *macrophages*, prepare a target for destruction. The importance of all of these cells is that they create the "immune reaction" which is usually life-saving. However, at times the system malfunctions and creates an autoimmune problem.¹⁰

In an autoimmune disease, for some unknown reason, the body's own immune system begins to attack normal body tissue. In some autoimmune diseases, such as AIDS, a virus attacks the immune system and renders it inactive. The autoimmune theory of MS suggests that in MS the immune system appears to be overactive. Specific types of white blood cells are dispatched to attack the myelin as if it were a virus or a form of bacteria.¹¹

MS is not a hereditary disease, however, a hereditary factor may make an individual more susceptible to its development. For example, approximately 10-20% of individuals with MS have the disease somewhere in their extended family. This is a higher rate than would occur by chance. Without the presence of the disease in the extended family, the expected rate of

occurrence is approximately .2%. An individual does not inherit MS but perhaps does have a higher chance of inheriting an immune system that may become overactive. The specific cause of this overactivity is not known. Many environmental factors, psychological states, activities, medications, etc., can influence the body's immune response.¹²

The Viral Theory. Interest in a theory suggesting that exposure to a virus may lead to an immunopathologic condition that then results in MS has grown. The mechanism put forth is "molecular mimicry" between viral and CNS proteins. In MS, a structural correspondence between viral peptides and myelin antigens has been established.

A second possibility is that autoimmunity results from the super antigenic stimulation of *T cells* by viral or bacterial proteins. Super antigens may bind to specific *T cell* receptor proteins producing the stimulation of a large number of *T cells*. This, in turn, may result in the *T cells* becoming reactive to myelin or to the oligodendrogliaocyte antigens.

The data regarding a viral cause is not consistent. And, a viral protein or a group of viruses have not been reliably identified in the cerebrospinal fluid (CSF) of individuals with MS.¹³

Clinical Symptoms and Diagnosis

Clinical Symptoms. As was noted in an earlier chapter, the neurologic deficit that occurs in MS depends upon the exact location of the lesion. Because symptoms depend on the location of the area of scarring, no two cases of MS are exactly alike. And, symptoms vary greatly from one individual to another.

There are certain signs and symptoms that tend to occur in the early stages of the disease. These usually include double or blurred vision, numbness, weakness in one or two extremities, instability in walking, tremors, problems with bladder control, and heat intolerance.¹⁴

As the disease progresses, these early signs and symptoms may become worse and/or new ones may appear. In this stage of the disease, increased weakness may occur along with spasticity that results in gait problems. Loss of balance and the slowing of rapid repeating movements can also occur. In addition, the sensory system may become increasingly involved resulting in numbness, pain, and a decrease in vibratory sensation. The incomplete emptying of the bladder, frequent urination, or incontinence may result in repeated urinary tract infections. If the optic nerves have been affected, a number of visual field defects may occur. During the progression of the disease, fatigue may be an increasing problem and sexual dysfunction may occur. Finally, cognitive and emotional abnormalities may be evident including emotional lability, depression, and anxiety.¹⁴

Diagnostic Procedures. It is important to note that there are no specific tests or procedures to diagnose MS. The diagnosis of MS is a clinical decision based upon the presence of findings that rule out other diseases and point to MS as the most likely cause of the presenting problems. Other demyelinating diseases that should be ruled out include encephalomyelitis, transverse

myelitis, sarcoidosis, systemic lupus erythematosus, and Vitamin B-12 deficiency.¹⁵ However, a health care provider can use number of studies to confirm a suspected diagnosis of MS.

CSF studies that indicate an increase in immunoglobulin concentration can confirm a demyelinating disease of the nervous system. Increases occur in more than 90% of individuals with MS.¹⁶

Evoked potentials studies can be used to provide evidence of the separation of lesions in space. The most commonly used evoked potentials for diagnosing MS are Visual Evoked Responses (VER), Brain stem Auditory Evoked Responses (BAER), and Somatosensory Evoked Responses (SSER). The SSER is used to identify reduced conduction in the central sensory pathways and to distinguish peripheral lesions from central ones. Approximately 75% of individuals with MS exhibit an abnormal VER; 30% of individuals with MS exhibit an abnormal BAER; SSER indications are found to be abnormal in more than 80% of individuals with a definite case of MS.¹⁶

Finally, Magnetic Resonance Imaging (MRI) is useful for confirming a diagnosis of MS and for understanding the ways in which demyelinating plaques develop in individuals with MS. There are three criteria for the MRI diagnosis of MS.¹⁶

- Lesions that abut the lateral ventricles
- Lesions with a diameter greater than 0.6 cm
- Lesions that are present in the posterior cranial fossa (A fossa, generally, is a pit, groove, cavity, or depression with varying depths depending on its location.)

Herbal and Natural Products and the Disease Process

Current Medications Used to Retard the Disease Process. A standard method of treating MS itself is the use of beta interferons, particularly 1b (Betaseron) and 1a (Avonex).¹⁷ In general, in response to a foreign stimulus, the body makes proteins known as interferons. There are several types of interferons. Beta interferon is used for MS because it seems to calm the immune system (another type of interferon, gamma, tends to stimulate the immune system). As noted in the Etiology chapter, the autoimmune theory of MS suggests that the immune system appears to be overactive. Therefore, using beta interferons that calm the immune system, rather than gamma interferon that stimulates it, makes sense given the assumptions of the autoimmune theory.

It is important to note, however, that, in spite of the accepted use of beta interferons, they do not cure MS. Rather, they seem to decrease the relapse rate, increase the time between attacks, and decrease the severity of attacks. In addition, their use seems to decrease the amount of damage detected on follow-up MRI scans.¹⁷

Unfortunately, while both types of beta interferons have beneficial uses, they also have severe side effects. The possible side effects include fever, nausea, and skin reaction at the sight of injection. If interferons are used in an attempt to manage the disease process and if side effects occur as a result, specific herbal remedies may be used in an attempt to alleviate them.

Matricaria recutita (German Chamomile) may be useful if nausea occurs while taking one of these medications. A volatile oil, (-)-alpha-bisabolol is thought to reduce the activity of pepsin in the gastrointestinal tract and thus may help to alleviate nausea.¹⁸ However, it should not be used if the individual is known to be allergic to any member of the Compositae family, e.g. arnica, yarrow, feverfew, tansy, artemesia.¹⁹ In addition, excessive doses should not be used because they may interfere with anticoagulant activity due to the coumarin constituents in Chamomile.

Also, Chamomile is reputed to affect the menstrual cycle therefore the excessive use of it during pregnancy or lactation should be avoided.²⁰

Achillea millefolium (Yarrow) may be used to reduce fever. The antipyretic actions take place through the alkaloids/bases that include betonicine and stachydrine (pyrrolidine), trigonelline (pyridine), betaine and choline (bases). Other alkaloids include achiceine, achilleine, and moscatine/moschatine.²¹ Yarrow should not be used if the individual is known to be allergic to any member of the Compositae family.¹⁹ In addition, excessive doses should not be used because they may interfere with anticoagulant activity due to the coumarin constituents in Yarrow. Finally, Yarrow is reputed to affect the menstrual cycle therefore the excessive use of it during pregnancy or lactation should be avoided.²²

The type of skin reaction at the site of the injection should determine what herbal remedy is used. *Hamamelis virginiana* (Witch Hazel) is believed to possess astringent and anti-inflammatory properties. The active constituents in the leaves and bark of Witch Hazel include tannins, flavonoids, phenolic acids, such as gallic, and volatile oils. Because of the presence of hamameltannin (one of the tannins) in the bark, the bark is thought to be more powerful than the leaves.²³ The hamameltannin, tannin, and gallic acid are the constituents that probably produce the astringent and styptic actions.²³ Witch Hazel preparations have been approved by the German E Commission for minor skin injuries, localized inflammation of skin and mucous membranes, hemorrhoids, as well as varicose veins.

No particular contraindications are documented, however, ingestion of large amounts of Witch Hazel is not recommended in light of the presence of tannin constituents.²⁴ Tannins may inhibit the absorption of minerals and B vitamins²⁵. The volatile oil contains small amounts of

safrole, a known carcinogen, however, the small amount probably does not pose a significant threat.²³

If infection is present in a wound, Hypericum or St. Johns Wort should be used. Externally, oily preparations of St. Johns Wort are used to treat inflammation of the skin, wounds, and burns. The anti-inflammatory action may be due to the high flavonoid content, particularly hyperoside, quercitrin, rutin, and isoquercitrin.²⁶ Or, a mixture of St. Johns Wort and Calendula should be considered.²⁷ In excessive doses, photosensitization has been observed in animals. However, in humans a similar reaction is unlikely with the use of therapeutic dosages. Because of the possibility of photosensitization, using St. Johns Wort along with tetracyclines, sulfonamides, and other photosensitizers should be avoided.²⁸

Although The German Commission E has approved the use of Calendula flowers for external use on wounds and burns,²⁹ it should be used with extreme caution. The flowers are antimicrobial probably as the result of the terpene alkaloids, lactone, and flavones that are present in the essential oil. Flavonoids in the flowers demonstrated positive antimicrobial activity against *Staphylococcus aureus*.³⁰ The main issue for individuals is that antiviral and immunostimulating effects have been reported possibly due to Calendula's high-molecular weight polysaccharides that stimulate immune system activity.³¹ Stimulation of the immune system may exacerbate MS. Therefore, Calendula should only be used externally and the individual's condition should be monitored closely.

No side effects or contra-indications are reported for the proper use of Calendula. However, it is reputed to affect the menstrual cycle. The triterpenoid constituents may act as spermicides, antiblastocyst, and abortion agents.³² Pregnant women should avoid the use of Calendula for these reasons.

Another topical product can also be used in the management of skin reactions. Used as an emollient, *Aloe barbadensis* (Aloe Vera) contains several anthraquinone glycosides, chrysophanic acid, volatile oils, mucilage, tannins, a saponin, and polysaccharides. A combination of several of these substances probably accounts for the healing action of the gel.³³

Conclusions. Currently, powerful prescription medications, known as beta interferons, are often employed to retard the progress of MS. However, they often result in side effects. There are prescription medications that can combat the side effects of beta interferons but they too can have side effects. German Chamomile and Yarrow, viable alternatives to combat the nausea and fever that can accompany the use of beta interferons, have few side effects if therapeutic doses are administered and the use of anticoagulants is monitored.

Because beta interferons often require injection, skin reactions at the site may occur. The use of Witch Hazel, St Johns Wort, and Aloe Vera may be used safely without risk of further side effects. While Calendula is a useful antiseptic remedy, individuals with MS should use it cautiously because, in theory, it may stimulate the immune system. If such stimulation does occur, it has the potential of exacerbating MS attacks or even provoking relapses.

Herbal and Natural Remedies Used to Affect the Disease Process. Several herbal and natural products may be used to benefit individuals with MS. It is important to note that these products will not *cure* MS but may help prevent further damage to the myelin sheath, nerve processes, or axons.

Antioxidant Vitamins. Free radicals, or oxidants, are chemicals that occur naturally in the body but do damage to the body's cells. The role of free radicals in the disease process is

complex and has generated a great deal of research. Preliminary evidence suggests that free radicals play a role in MS as well as other neurological disorders.³⁴

Antioxidants protect the body from the effects of free radicals. With respect to MS, antioxidants may help to reduce further injury to the myelin sheath and/or axons. It is important to note that antioxidants may stimulate the already overstimulated immune system in individuals with MS. Therefore, antioxidants pose a theoretical risk to these individuals. Individuals with MS who want to increase their intake of antioxidant vitamins should use dietary sources of fruits and vegetables first. If dietary supplements are used, they should be in low doses.

Good sources of antioxidant vitamins are readily available in food. For example, vitamin A also known as retinol, is found in animal products, eggs, and fish oils. Beta carotene, a water soluble pigment found in orange and yellow vegetables and fruits, is a good source of vitamin A. Beta carotene is converted into vitamin A in the liver.³⁵ In vitamin E, the tocopherols act as antioxidants. They protect cell membranes from being catabolized. Vitamin E is found in vegetable oils, wheat germ, nuts, and green leafy vegetables.³⁵ Finally, Vitamin C, ascorbic acid, is found in green peppers, citrus fruits, strawberries, tomatoes, broccoli, turnip greens and other greens, sweet and white potatoes, and cantaloupe. Most other fruits and vegetables contain some vitamin C; fish and milk contain small amounts.

Toxicity does not normally occur, since vitamin C is water soluble and is regularly excreted by the body. Recent studies have shown, however, that excessive doses of vitamin C (i.e., more than the RDA) can lead to toxicity. The most common manifestations of vitamin C toxicity are kidney stones, and in very rare circumstances, anemia (caused by interference with vitamin B12 absorption). Diarrhea is also a possible (but uncommon) symptom associated with increased intake of vitamin C.³⁶

Vitis vinifera (Grape Seed Extract). This herbal remedy contains tannins, oligomeric proanthocyanidins, flavonoids, stilbenes, fruit acids, and phenylacrylic acid derivatives. The oligomeric proanthocyanidins are similar to an antioxidant, pycnogenol. In one study, the antioxidant effect of these constituents was more potent than vitamin C and vitamin E succinate.³⁷ The benefits and cautions for grape seed extract are similar to those for antioxidant vitamins.

Selenium. Selenium, which is a trace mineral found in the body, is an important part of antioxidant enzymes that protect cells against the effects of free radicals. The compounds that contain selenium, glutathione-peroxidase, protect lipids that comprise the myelin sheath from damage caused by biochemical reactions. It is believed that the activity of these compounds is reduced in individuals with MS. However, selenium may also stimulate certain immune cells, which may pose a risk to individuals with MS.³⁴ Therefore, individuals should not take high levels of supplements.

Rather than taking supplements, which may pose a risk of overdose, individuals with MS should concentrate on consuming foods that contain selenium. It can be found in some meats and seafood. Animals that eat grains or plants that were grown in soil high in selenium have higher levels of it in their muscles. The amount of selenium in the soil varies by region. For example, in the United States soil in the high plains of northern Nebraska and the Dakotas have very high levels of selenium. On the other hand, the soil in parts of China and Russia has very low levels. Other foods that are high in selenium include Brazil nuts (very high levels), canned tuna, beef or calf liver, and cooked cod.³⁸

Taking high doses of selenium supplements can cause problems. High levels in the blood can result in selenosis the symptoms of which include gastrointestinal upset, hair loss, white blotchy

nails, and nerve damage. The latter presents serious problems for the individual with MS.

Therefore selenium supplements should not be taken without consulting a health care provider who is knowledgeable about MS.³⁸

Oenothera Biennis (Evening Primrose Oil). This herb contains oenotherin, a bitter principle, as well as mucilage.³⁹ The active constituents of the seeds are oils containing omega-6 fatty acids including linoleic acid (LA) and a derivative, gamma-linolenic acid (GLA). LA helps to ensure the fluidity and flexibility of cell membranes and can have an effect on the proteins within the membranes. Through various metabolic processes these fatty acids also play a role in platelet aggregation and inflammatory processes.⁴⁰ GLA may suppress immune function and therefore may theoretically be useful in MS. However, no clinical trials have been conducted.

In a few cases diarrhea, belching, abdominal bloating, and headaches have been reported, but on the whole, treatment with evening primrose oil appears to be well tolerated.⁴¹ Caution should be used if an individual is using phenothiazines as it may have the potential to bring about temporal lobe epilepsy.⁴²

Conclusions. While several herbal and natural remedies will not *cure* MS, they may be able to *prevent* further damage to the myelin sheath, nerve processes, or axons. Vitamins A, E, C, and selenium are antioxidants that may serve such a function in the body. However, because antioxidants pose a theoretical threat in that they may overstimulate the immune system, an individual with MS should obtain them from food whenever possible and avoid taking excessive doses of supplements. The same problem exists, in theory, with grape seed extract. However, if caution is exercised, these herbal and natural remedies have the potential of retarding the progress of MS. Finally, linoleic acid, found in evening primrose oil, contains fatty acids that are

an element of myelin. As evening primrose oil has few side effects, individuals with MS may find that it alters the course of MS. Further research is needed to explore its effects. It must be emphasized that individuals with MS should consult a health care provider prior to taking any herbal or natural product.

Herbal and Natural Products and Symptom Management in MS

Introduction. While there are medications that can help to retard the course of MS and others designed to treat acute attacks, there are no drugs that *cure* MS. The most serious challenge faced by individuals with MS is the management of the debilitating symptoms that can occur during the course of the disease.

Primary symptoms are those that are caused directly by demyelination within the brain and spinal cord. For example, if myelin is lost in the part of the brain or spinal cord that controls strength, the individual will develop weakness in the corresponding muscles. Or, if myelin is lost in the part of the brain that controls sensation, the individual will develop numbness, pain, burning, or itching. Myelin may be lost in several parts of the brain or spinal cord causing multiple primary symptoms.⁴³

In addition, individuals who experience primary symptoms may also suffer from complications that are a direct result of these symptoms. These are known as secondary symptoms. For example, individuals who develop weakness or stiffness, as a primary symptom due to the loss of myelin in a specific part of the brain, may then experience decreased movement at the joints, known as contractures. The decreased movement could then lead to breakdown of the skin. In this case both the decreased movement and the skin breakdown are characterized as secondary symptoms.⁴⁴

Finally, living and trying to cope with a chronic illness can alter the way in which individuals experience life, manage daily stresses, and maintain a self-image. Depression, anger, vocational problems, and/or marital problems may be the result. These types of symptoms are called tertiary symptoms.⁴⁴

Therefore, while it may be important to modify the underlying disease process, if it is appropriate to do so, the debilitating symptoms may be even more important to manage. The effective management of secondary and tertiary symptoms will allow the individual with MS to function at a higher level and to live a quality life in spite of the progressive nature of MS.

Urinary Dysfunction and Urinary Tract Infections (UTI). The urinary system works with the lungs, skin, and intestines to keep the chemicals and water within the body in balance. It removes a type of waste, urea, from the blood. Urea is produced when foods containing protein, such as meat, are broken down in the body. Adults eliminate about a quart and a half of urine each day, depending on factors such as the amount of foods and fluid consumed, and how much fluid is lost through sweating and breathing.

Two kidneys, purplish-brown organs located below the ribs toward the middle of the back, remove liquid waste from the blood in the form of urine, keep a stable balance of salts and other substances in the blood, and produce erythropoietin, a hormone that aids the formation of red blood cells. The kidneys remove urea from the blood through nephrons, tiny filtering units. Each nephron consists of a ball formed of small blood capillaries, called a glomerulus, and a small tube, the renal tubule. During this glomerular stage, blood flows through the capillaries forcing the smaller molecules through the wall into the first part of the renal tube. This is called filtrate. The larger protein molecules and blood corpuscles remain in the blood.

The filtrate moves down the proximal tube that secretes metabolites, salts, and waste products. Facilitated by tiny projections, microvilli, potassium, glucose, and amino acids are reabsorbed back into the blood. The loop of Henle and the distal tube aid in the re-absorption of water and the maintenance of the acid/alkaline balance of the body.

Two narrow tubes, the ureters, carry the unwanted salts, urea, and water as urine from the kidneys to the bladder. Muscles in the ureter walls continually tighten and relax forcing urine downward, away from the kidneys. The bladder is a triangle-shaped, hollow organ located in the lower abdomen. Its walls relax and expand to store urine, and contract and flatten to empty urine through the urethra the tube that allows urine to pass to the outside of the body. Two circular muscles help keep urine from leaking by closing tightly like a rubber band around the opening of the bladder.^{45, 46}

At a certain point, when the bladder becomes full of urine, the bladder is stretched and the nerve endings in its wall are stimulated. These nerve endings send a signal to a reflex center in the spinal cord, which then relays a signal on to the brain. The result is the need to urinate. The reflex center sends a signal to the bladder telling it to contract and another signal to the urethral sphincter muscle telling it to relax. This combination of signals allows urine to flow from the bladder.⁴⁷

Individuals with MS are at an increased risk for developing UTIs for several reasons. First, MS can affect the pathways between the reflex center and the brain. Therefore, some individuals with MS do not fully empty their bladder when they void. As a result, a certain amount of urine stays in the bladder at every urination and bacteria begins to grow. Second, individuals with MS may have a decreased ability to sense the pain and discomfort that ordinarily accompanies a UTI. As a result, a UTI might not be noticed until it has become a more significant problem. Finally, some of the medications often used in MS (methotrexate and steroids, such as prednisone and dexamethasone) may decrease the body's ability to ward off infections.⁴⁸

Infections may occur in the bladder (an infection of the lower urinary tract), or more seriously, in the kidneys (the upper urinary tract). Symptoms of a lower UTI include pain with

urination, the frequent need to urinate, a cloudy colored urine, and (more rarely) blood in the urine. Symptoms of an upper urinary tract infection include symptoms of a lower urinary tract infection as well as side pain or back pain, fever, and chills.

Although UTIs can occur in both men and women, they occur much more frequently in women. The increased prevalence among women may be a result of their shorter urethra, the structure that carries urine from the bladder to the outside of the body. The shorter urethra in women may allow bacteria to ascend more easily into the bladder. Approximately 30% of healthy women have had a urinary tract infection in their life. Among people with MS, the number is much higher.⁴⁹

It is believed that *Vaccinium macrocarpon* (Cranberry) acts on UTIs by preventing bacteria from adhering to the cells that line the urinary tract. If the bacteria, known as *Escherichia coli*, do not adhere to the cells, they will be excreted in the urine. Fructose, a type of sugar, and proanthocyanidin are the active constituents that prevent adherence. Because there are few side effects with its use, cranberry juice or tablets can be an excellent method of *preventing* UTIs for individuals with MS. It should be noted that once a UTI has developed, a health care provider should be consulted to *treat* it, as serious consequences can occur if a UTI is not addressed quickly.⁵⁰

The German E Commission has approved the use of *Tropaeolum major* (Nasturium) for infections of the urinary tract. One of the active constituents, a glucosinolate called glucotropaeolin, when fermented and combined with water, forms a sulfur compound. It is thought that this substance possesses antibiotic properties. This compound is eliminated via the respiratory system or is collected and eliminated in the urine. Therefore, infections in either the respiratory or urinary tract are particularly amenable to the antibiotic properties of this

compound.⁵¹ If taken properly, no health hazards or side effects are known. However, higher doses of the fresh plant or its volatile oils may lead to mucous membrane irritation of the gastrointestinal tract. Also, long-term contact with the fresh plant can produce skin irritation.⁵²

Pressure Sores. Too much pressure on an area of the skin over a period of time causes pressure sores, or decubitus ulcers. An individual with MS may have decreased skin sensation a result of the demyelination of the nerves in the brain or spinal cord.⁵³ As a result of the diminished sensation, the individual does not perceive the normal discomfort that occurs when she/he has been in a single position too long. Pressure sores, which generally appear on the buttocks, develop with little or no pain, continue to enlarge, and result in large holes in the skin that may expand into the underlying muscle. If such sores occur, they can be life threatening. Therefore, it is important to examine the skin frequently and avoid stressing the skin.

The use of foam mattresses, pads, or sheepskin can be used to disperse weight and to cushion the skin. In addition, application of ointments or creams that will stimulate the tissue or peripheral nerves may be useful. For example, one of the active constituents in *Symphytum officinale* (Comfrey), allantoin, stimulates tissue repair and wound healing through cell proliferation. It also is believed to have an effect on cellular multiplication in degenerating and regenerating peripheral nerves. This may be helpful to stimulate skin sensation and help to avoid pressure sores.⁵⁴ In addition, the tannin provides additional antiseptic and astringent action. Finally, the mucilage and asparagine provide anti-inflammatory healing action.⁵⁵

While Comfrey can be prepared as a cream or decoction to be used externally, the internal administration of it should not be used due to presence of pyrrolizidine alkaloids. These alkaloids are known to have caused hepatotoxicity. However, the amount of these alkaloids that is

absorbed through the skin is relatively low, therefore, it is generally safe to use for *preventing* pressure sores. It is important to note that Comfrey should not be applied if the skin is broken.⁵⁶

Pain. Approximately twenty percent of individuals with MS report that pain is a problem. The predominant type of pain is a burning pain, similar to a toothache, which occurs most often in the extremities. This type of pain, which results from what is often called "short-circuits" in the tracts that carry sensory impulses between the brain and spinal cord, is caused mainly by the demyelination that characterizes MS.⁵⁷

Because the pain that occurs is often directly related to nerve damage, it is not the same kind of pain that occurs as a result of injury, broken bones, or muscle strain. Therefore, standard pain medications may not be helpful. Some individuals have found that *Capsicum spp.* (Cayenne) preparations, applied externally, provided some relief from specific types of neuralgia⁵⁸ and, therefore, may be useful for pain related to MS especially since there are few side effects.

The main constituents of Cayenne are capsaicinoids, primarily capsaicin, flavinoids, including apiin, luteolin-7-O-glucoside, volatile oils, carotinoids, particularly capsanthin, alpha-carotin, and violaxanthine, and steroid saponins, in the seeds.⁵⁹ All of its pain-relieving benefits are attributed to the glycoside capsaicinoid, or capsaicin⁵⁸ that is a lipophilic vanilloid whose action is primarily on receptors in the peripheral terminal of the nociceptors that respond to painful stimuli. Once stimulated, the receptor opens cation channels which then results in the transmission of sensory input through unmyelinated C-fibers. This impulse causes a neuropeptide, substance P, to be released from the sensory nerves that mediate pain.⁶⁰ Therefore, even though the condition that produces the pain still exists, the perception of the pain does not reach the brain.

Although the pain that may accompany MS can be severe and bothersome, it is not predictive of a poor prognosis.⁶¹ It may lead to anxiety and/or insomnia, however. A standard infusion that includes one part each of *Melissa officinalis* (Lemon Balm), *Humulus lupulus* (Hops), *Matricaria recutita* (Chamomile), and *Valeriana officinalis* (Valerian) may provide relief from anxiety and sleeplessness.⁶²

The German Commission E has approved Lemon Balm for nervous agitation and sleeping problems.⁶³ It contains volatile oil such as citral a and b, citronnellal as well as several others, glycosides, caffeic acid derivatives, flavonoids, and triterpene acids. There are no side effects, contraindications, or drug interactions with its use.⁶³

The German E Commission approved the use of Hops when mood disturbances, e.g., restlessness and anxiety, or sleep disturbances are present.⁶⁴ The *British Herbal Compendium* suggested the use of Hops for conditions such as excitability, restlessness, sleep disorder, and lack of appetite.⁶⁵

The constituents that comprise Hops include acylpholorglucinols, alpha-bitter acids (including humulones), beta-bitter acids (including lupulones), a complex array of volatile oil, but mainly monoterpenes and sesquiterpenes, resins, phenolic acid, tannins, and flavonoids.⁶⁶ The 2-methyl-3-buten-2-ol, a bitter acid degradation product is believed to be the sedative principle in Hops.⁶⁷

Although the German E Commission did not report any contraindications, the sedative action of Hops may combine with other sedative drugs or alcohol to produce a stronger effect.^{68, 69} Allergic reactions have been reported but only following external contact with the herb and oil.⁶⁸

German Chamomile contains volatile oil, flavonoids, hydroxycoumarins, and mucilages.⁷⁰ A flavonoid, apigenin, is a ligand for the central benzodiazepine receptors exerting anxiolytic actions and slight sedative effects.⁷⁰

Chamomile should be used with caution if the individual is known to be allergic to any member of the Compositae family, e.g. arnica, yarrow, feverfew, tansy, artemesia.¹⁹ In addition, excessive doses should not be used because they may interfere with anticoagulant activity due to the coumarin constituents in it. Also, Chamomile is reputed to affect the menstrual cycle therefore the excessive use of it during pregnancy or lactation should be avoided.²⁰

The German E Commission approved Valerian for restlessness and for sleep disorders based on nervous conditions.⁷¹ According to the World Health Organization several uses of Valerian are supported by clinical data including its use as a mild sedative and sleep-promoting agent.⁷² In addition to sedative actions, Valerian is said to possess mild anodyne (pain relieving), hypnotic, antispasmodic, carminative, and hypotensive properties.⁷³

Traditionally, it has been used as a gastrointestinal antispasmodic as well as for a wide variety of physical conditions that are associated with anxiety, stress, and nervous complaints.⁷⁴ The constituents in Valerian include the pyridine type of alkaloids, iridoids such as valtrates and didrovaltrate, volatile oils that include several monoterpenes and sesquiterpenes, and other constituents such as caffeic and chlorogenic acids, choline, tannins, gum, and resin.⁷³

While the sedative action of Valerian has been confirmed in several studies, the search for the constituent that is primarily responsible for the action is ongoing. It is now believed that the essential oils make a minor contribution to this activity. Recently, attention has focused on valerenic acid and its derivatives as the active constituents.⁷⁵ The hypothesis is that inhibitory gamma-aminobutyric acid (GABA) receptors are stimulated in the central nervous system by

Valerian extract. However, the exact action is not known and, in the final analysis, may involve more than one mechanism.⁷⁴

The evidence of the effects of Valerian (*Valeriana officinalis* only) on insomnia was reviewed. The authors conducted systematic literature searches to locate randomized, placebo-controlled, double-blind trials that measured the effect of Valerian monopreparations on sleep in human participants. Data were extracted in a standardized manner and the Jadad score was used to assess methodological quality. They located nine trials that met the selection criteria. The findings of the studies were contradictory. There was great inconsistency between trials in terms of patients, experimental design and procedures, and methodological quality. The authors concluded that the evidence for Valerian as a treatment for insomnia is inconclusive and that there is a need for rigorous trials to determine its efficacy.⁷⁶

On the other hand, the German E Commission noted that the approved modern therapeutic uses of Valerian seems to be defensible based on the history of its use in well established systems of traditional and conventional medicine, extensive phytochemical investigations, many in vitro and in vivo experiments with animals.⁷⁷ However, the clinical trial evidence involving humans leaves lingering doubts because of the methodological problems inherent in the trials.

Valerian seems to be safe and free of side effects when taken in the usual therapeutic doses. Therefore, it may provide an alternative for individuals with MS who desire a non-addictive alternative to synthetic drugs such as benzodiazepines.

Muscle Spasticity and Weakness. Demyelination of nerves in MS can result in muscle spasticity, weakness, or both. In fact, spasticity or stiffness, is a common problem in MS because, since there are many nerves in the brain and spinal cord that regulate movement, when

demyelination occurs, there is a high probability that it will affect nerves that regulate muscle tone.⁷⁸ Muscle weakness, in individuals with MS, is usually the result of a problem with the transmission of electrical impulses to the muscles. Demyelination of nerves, usually in the spinal cord but occasionally the brain, can also be the cause of muscle weakness.⁷⁹

With respect to muscle spasticity, the first management step should be to eliminate problems that exacerbate it. For example, pain or skin breakdown, often stimulates spasticity and therefore should be addressed first. The second strategy should be a series of stretching exercises. A physical therapist, familiar with mobility problems inherent in MS, should be consulted because a basic stretching program can easily be conducted at home.⁸⁰

Prior to starting any exercise program to strengthen weak muscles, it is important to understand the source of the weakness. When it is the result of the poor transmission of electrical impulses, engaging in activities such as lifting weights, will only fatigue the nerves further and exacerbate the weakness. On the other hand, the use of an aerobic exercise machine, e.g., an exercycle or a rowing machine, can be quite beneficial to strengthen those muscles that can be strengthened in order to compensate for weaker ones. Consultation with a physical therapist is very important, as engaging in improper exercises can be harmful.⁸¹

A natural mineral, creatine, may hold some promise in alleviating muscle stiffness. The human liver, pancreas, and/or kidneys produce approximately two grams of creatine, an amino acid, per day. It is also derived from certain foods, such as meats and fish. However, one pound of beef has just two grams of creatine.⁸² In the body, creatine, which is transported in the blood and absorbed by the muscles where it is changed into a molecule, phosphocreatine, functions as a reservoir for quick energy. It seems to be especially important in tissues such as the voluntary muscles and the nervous system that, at times, require large amounts of energy. In some

neuromuscular disorders the level of phosphocreatine is lower than normal. It is thought that creatine supplementation may improve muscle strength in such disorders by bolstering the muscles' energy stores.⁸³

While no studies have specifically focused on MS, a Canadian study found that creatine can cause modest increases in muscle strength in a variety of neuromuscular disorders. While the pilot trial showed benefits from a ten gram "loading dose" for five days, followed by a five gram "maintenance dose" for five to seven days, the trial was short in duration. Finally, while creatine is generally well tolerated and holds some promise for the management of MS symptoms, a health care provider should be consulted prior to using it.⁸⁵

Bowel Dysfunction. The process of digestion involves both physical and chemical actions. Mechanical digestion begins in the mouth where the food is ingested and chewed by the teeth. Saliva, produced by the salivary glands, enters the digestive tract via ducts. The saliva contains an enzyme, salivary amylase, which begins the chemical digestion of carbohydrates and mucous. Mucous moistens the bolus so that it may be pushed via the pharynx and through the esophagus more easily. The bolus enters the stomach by passing through the cardiac sphincter after it has been chewed, swallowed and moved through the esophagus.

Peristaltic action in the stomach combines the bolus with hydrochloric acid and enzymes that are secreted by the stomach walls. The protease enzymes that start the digestion of proteins work optimally in the low pH environment of the stomach. The resulting semisolid mixture, chyme, is a continuation of the mechanical process of digestion that began in the mouth. The chyme then passes through the pyloric sphincter and into the small intestine.

Small amounts of chyme enter the duodenum (the first part of the small intestine) at a time. The chemical process of digestion continues here. The pancreas secretes digestive enzymes, sodium bicarbonate, insulin, and glucagon. The sodium bicarbonate neutralizes the acid chyme. At the same time, bile, produced by the liver and stored and secreted by the gallbladder, combines with the pancreatic juices to break down fats, protein, carbohydrates, and nucleic acids. The products of digestion such as proteins, carbohydrates, fats, water, salts, and vitamins are received, converted and stored by the liver. It is at this point that absorption into the blood and lymph vessels occurs.

The remainder of the material enters the large intestine through the ileocecal valve and moves into the cecum. While water recovery is an important process carried out in the large intestine, in it bacterial action continues the chemical digestive process. Further absorption occurs and synthesis of vitamins that are essential to the body takes place. The appendix, may lubricate the colon but does not play a major role in the digestive process. The digested material moves up the ascending colon, across (right to left) the transverse colon, and down the descending colon. At the lower left of the descending colon is the sigmoid colon, which ends at the rectum. As the rectum fills with stool, the nerve endings in the rectal wall transmit a message to an area of the spinal cord that is involved with bowel function. Normally, unabsorbed material passes out of the body at the anus as feces.^{86, 87}

Constipation, the most common bowel problem associated with MS, may have several causes. First, the demyelination that occurs in the brain or spinal cord may interfere with the nerve transmission that is crucial for normal defecation. A slow passage of stool through the bowel causes an increased amount of water absorption that results in hard, constipating stool. Second, because of bladder and urinary tract problems (discussed above), an individual with MS may

consciously limit the amount of fluid taken into the body. Water absorption in the colon will continue to occur using whatever fluid is available. If the fluid intake is insufficient, the result will be a hard, compacted stool that is difficult to pass. Finally, weakness, spasticity, or fatigue may cause an individual to limit physical activity, which will, in turn, slow bowel activity. Excessive amounts of fluid will be absorbed from the stool causing it to harden and become difficult to pass.⁸⁸

Eating balanced meals and maintaining physical activity are important for healthy bowel functioning. Adequate intake of liquid (eight to twelve cups per day) and a high fiber diet will help soften the stool and will decrease the amount of time that it requires for stool to pass through the intestinal tract. A high fiber diet includes raw fruits and vegetables, nuts and seeds, as well as whole grain breads and cereals.

Herbal remedies may be helpful if constipation cannot be alleviated by increased fluid intake or by dietary changes. For example, *Plantago ovata* (Psyllium) decreases the passage time of the bowel content by increasing the volume of the stool, resulting in a laxative effect. It also acts as a stool softener by increasing stool water content.⁸⁹ The active constituents are mucliages, chiefly arabinoxylans and glacturonosidorhamnoses, fatty oil, the iridoid aucubin, and proteic substances.⁸⁹ Psyllium should not be used by individuals who have abnormal narrowing in the gastrointestinal tract, obstruction of the bowel, or difficulties regulating diabetes mellitus.

There are several important precautions. Using too little fluid (less than 150 ml of water per 5 grams of the herb) with Psyllium can cause it to swell and may lead to obstruction of the esophagus or of the intestine. This may be a particular problem for older individuals.⁹⁰ It is important to note that absorption of other drugs taken with Psyllium may be delayed. Finally, insulin may needed to be adjusted downward when using Psyllium products.⁹⁰

The bulk material and mucins (swelling agents and mucilage) are responsible for the laxative effects of *Linum usitatissimum* (Flax). The specific active constituents include mucilages, including arabinoxylans, galactans, and rhamnoglacturonans, cyanogenic glycosides, fatty oil, proteins, lignans, and phenylpropane derivatives.⁹¹

Flaxseed should not be used if an obstruction of the intestine is present, if a stricture of the esophagus or gastrointestinal area is present, or if an acute inflammatory illness of the intestine, esophagus, or of the stomach has been diagnosed.⁹¹ In general, no health hazards or side effects are known if Flaxseed is administered properly, in therapeutic doses. However, using large quantities of it without a sufficient amount of fluid could result in an obstruction. Finally, the absorption of other drugs may be delayed if taken along with Flaxseed.

Cold Feet. Many individuals with MS experience cold feet. Skin temperature is maintained by the autonomic nervous system. Nerves that control the diameter of blood vessels and that sense temperature may be damaged during the course of MS. When this damage occurs, the individual perceives that his/her feet are cold. In most cases there is nothing wrong with the blood vessels in the legs or the feet. However, the perception of cold feet can be annoying to the individual.⁹²

An herbal remedy, such as Cayenne, can be used to help reduce the discomfort caused by cold feet. The main constituents of Cayenne are capsaicinoids, primarily capsaicin, flavinoids, including apiin, luteolin-7-O-glucoside, volatile oils, carotinoids, particularly capsanthin, alpha-carotin, and violaxanthine, and steroid saponins, in the seeds.⁵⁹ Cayenne seems to stimulate the surface capillaries and to bring blood to the surface, producing a feeling of warmth.⁹³ It is safe for internal consumption when it is not used in excessive doses. It can also be used externally.

For example, a few grains can be sprinkled in the socks or it can be applied as an ointment.⁹⁴

Cayenne is contraindicated on injured skin or near the eyes.

The German Commission E reported that in humans *Rosmarinus officinalis* (Rosemary Leaf) irritates the skin.⁹⁵ Because of this irritating effect, Rosemary oil improves circulation by increasing the blood supply when it is applied externally. The active constituents include caffeic acid derivatives, primarily rosmarinic acid; bitter diterpenes; flavonoids, including cirsimarin, diosmin, and hesperidin; triterpenes, including oleanolic acid, ursolic acid and their 3-acetyl esters; and volatile oil, particularly cineole, alpha-pinene, and camphor.⁹⁶ By increasing circulation to the feet, the application of Rosemary may provide some relieve to the annoying problem of cold feet.

No health hazards or side effects are pertinent if the proper administration of therapeutic doses is followed. Rosemary should not be used during pregnancy.⁹⁶

Conclusions. The symptoms that were discussed in the preceding section can be characterized as primary or secondary symptoms and are the ones that are the most amenable to the use of herbal or natural products. Tertiary symptoms such as depression, anger, vocational problems, and/or marital problems are also serious and, in fact, can be just as debilitating as the other problems that individuals with MS must face every day. However, herbal or natural products may not alleviate their distress. To address tertiary symptoms, counseling and or support groups may be more useful.

The pain that is reported by twenty percent of individuals with MS is a primary symptom because it is most likely caused directly by the nerve damage that characterizes MS. Cayenne may be useful in mediating the pain but not stopping it completely. The neuropeptide, substance

P, interferes with the perception of the pain. Obviously, individuals with MS might welcome even this temporary relief.

If the pain is persistent, it might very well lead to anxiety and sleeplessness, which can be characterized as secondary symptoms. A standard infusion of Lemon Balm, Hops, Chamomile, and Valerian could be useful in alleviating these problems. These four herbal remedies, acting together, would help to relax the individual and allow him or her to attain restful and needed sleep. There are few, if any side, effects in using this preparation although alcohol and other sedative drugs should be avoided.

Muscle spasticity/weakness can be either a primary or secondary symptom. When it results from the demyelination of the nerves, it is a primary symptom; when it is the result of pain or skin breakdown it is a secondary symptom. If it is the former, then the primary symptoms should be addressed first and, if possible, eliminated. As mentioned above, Cayenne should be tried for pain. And, while prevention of pressure sores through the use of foam mattresses and sheepskin, which can lead to skin breakdown, is one strategy, there are herbal remedies that might be useful in preventing skin breakdown as well. For example, the external use of Comfrey to help stimulate skin sensation, in order to prevent pressure sores, can be quite effective especially since its use is generally safe.

If, however, muscle spasticity/weakness is a primary symptom, another strategy should be employed. The use of creatine does hold promise for relieving muscle stiffness in neuromuscular disorders. However, since no study has focused on MS specifically, it should not be taken without consulting a health care provider.

Both UTIs and bowel dysfunction can be characterized as either primary symptoms or secondary symptoms. With respect to UTIs, if MS affects the pathways between the reflex center

and the brain, they are primary symptoms--a direct result of nerve damage. If, however, UTIs result from a decreased ability to feel pain, they can be thought of as a secondary symptom.

They result because the individual with MS has a diminished sense of pain and is not able to take action before a full-blown UTI occurs. With respect to bowel dysfunction, if it occurs because of compromised nerve transmission that interferes with normal defecation, it is a primary symptom.

Sometimes, however, an individual will limit water intake because of bladder or urinary problems or may limit physical activity because of pain or muscle weakness. If either of these occurs, the resulting bowel dysfunction can be characterized as a secondary symptom.

Whatever the cause, there are herbal remedies available to the individual with MS. To prevent UTIs the individual may safely use Cranberry, either in juice or tablet form. In addition, the antibiotic properties of the compound in Nasturium are particularly useful for infection in the urinary tract especially since it is relatively safe to use.

To prevent constipation, which is the most common bowel problem among individuals with MS, eating balanced meals and trying to stay physically active are the two most important management strategies. However, Psyllium and Flaxseed may be used to help alleviate constipation should it occur. There are no adverse health effects with either herbal remedy as long as an adequate amount of fluid is used with each. When using either, it should be remembered that the absorption of other drugs could be delayed. Consulting a health care provider is always a good idea if other drugs are being used.

Finally, the perception of cold feet can be thought of as a primary symptom because MS may damage the nerves that control the diameter of the blood vessels as well as those that sense temperature. Several herbal remedies can provide some relief to this annoying problem. When

applied externally, either Cayenne or Rosemary Leaf may help to increase circulation to the feet thus producing a feeling of warmth. Both are relatively safe to use when applied externally.

Discussion and Conclusions

MS, which affects 2.5 million people worldwide, is a chronic inflammatory disorder of the CNS. Myelin loss and destruction, to varying degrees, characterize it. The degree to which the damage occurs and the exact location of the damage often determine the course of the disease and the level of debilitation. As a result, MS varies from individual to individual.

The specific cause of MS has not been identified and, at this time, there is no known cure. There are powerful prescription drugs that are currently used to retard the disease process. However, these drugs, beta interferons, may have serious side effects. The first hypothesis that was proposed argued that, based on their active constituents and therapeutic actions, certain herbal and natural remedies could be used to alleviate and manage specific symptoms produced by the drugs that are used to treat MS. What this paper demonstrated is that there are relatively safe herbal remedies that can help minimize or even alleviate these side effects. German Chamomile can be used safely to combat nausea. Yarrow is useful to reduce fever without producing side effects. And, Witch Hazel, St. Johns Wort, and Aloe Vera can be used to treat any skin reactions that may occur at the site of the injection. Calendula may be used a well but additional research should be conducted to determine if the use of Calendula does, in fact, exacerbate MS by further stimulating the immune system.

A second hypothesis suggested that there are both natural and herbal remedies that hold some promise for retarding the disease process itself. What this paper demonstrated is that antioxidant vitamins, such as A, E, and C, if consumed in food or if taken in therapeutic doses, are beneficial and safe. The same is true of Grape Seed extract and Selenium. However, antioxidants pose a theoretical risk to individuals with MS in that they may further stimulate an already overstimulated immune system. Therefore, individuals should proceed with caution and should

consult with their health care providers prior to taking these remedies. Further research should be conducted to determine if these valuable remedies do in fact pose a real risk to individuals with MS.

Linoleic acid, a dietary supplement of polyunsaturated fatty acids, is found in Evening Primrose oil. Because such fatty acids are an element of myelin, using Evening Primrose oil might alter the course of MS. Although a modest, positive effect seems to exist, more research is required. This is especially important because there does not appear to be any risk of major side effects. This cannot be said of the beta interferons that are the current standard of care.

The most serious challenge faced by individuals with MS is the management of the debilitating symptoms that can occur during the course of the disease. While there are prescription medications that have been shown to alleviate several of these symptoms, they often have their own side effects.

The last hypothesis argued that based on their active constituents and therapeutic action, certain herbal and natural remedies could be used to alleviate and manage specific symptoms that are associated with MS. What this paper demonstrated is that there are natural and herbal remedies that can be used to alleviate the distress of these symptoms without causing harm or without creating other problems in the form of additional side effects. Cranberry and Nasturium help to prevent urinary tract infections while Comfrey can be useful in an effort to prevent pressure sores. The pain that accompanies MS often results in both anxiety and sleeplessness. Cayenne could be useful to reduce the amount of pain while an infusion of Hops, Valerian, Lemon Balm, and Chamomile relaxes the individual allowing restful sleep to take place. Psyllium and Flaxseed safely provide relief from constipation that often occurs. And, while cold feet are more annoying than debilitating, an individual who is bothered by this condition could

use Cayenne or Rosemary leaf to stimulate surface capillaries which produce a temporary feeling of warmth.

Studies have shown that creatine may be useful in alleviating muscle stiffness. However, no research has specifically focused on MS. As this natural mineral may cause modest increases in muscle strength, more research needs to be done.

Unfortunately, formal clinical trials, that are designed to demonstrate efficacy and safety, have not been conducted on many of the remedies discussed in this paper. As a result many individuals with MS are left with questions and concerns about using herbal and natural remedies.

Most individuals with MS can expect to live an average life span. However, they often must live with debilitating symptoms and face progressive deterioration as a result of MS. It would be helpful to them, their families, and their caregivers to have a full repertoire of remedies rather than just prescription drugs that often create additional problems and suffering. Herbal and natural products do seem to hold promise for retarding the disease process, managing the side effects of prescription drugs, and alleviating several of the symptoms that occur in MS.

It is critical that individuals with MS seek out health care providers who are open and are as knowledgeable as they can be about the use of natural and herbal remedies. Additional research should be conducted on these herbal and natural remedies in order to answer the many questions that individuals with MS have about them. And, perhaps more importantly, additional research would offer individuals and families more options that would improve the quality of life.

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