Central nervous system (brain and spinal cord)

Myelin sheath of healthy nerve

Axon

In multiple sclerosis, the myelin sheath, which is a single cell whose membrane wraps around the axon, is destroyed with inflammation and scarring.

Author - Editor: Professor of Medicine Desire’ Dubounet, D. Sc. L.P.C.C.
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A demyelinating disease is any condition that results in damage to the protective covering (myelin sheath) that surrounds nerve fibers in your brain and spinal cord. The myelin is made of long chain fatty acids past C17 that form the insulation of nerves from contacting each other and shorting out the nerve transmission. Just like rubber is the insulation of a wire, myelin is the insulation of the nerves. When the myelin sheath is damaged, nerve impulses slow or even stop, causing neurological problems.

**Causes of Demyelination like ALS, Multiple Sclerosis etc**

Multiple sclerosis (MS) is the most common demyelinating disease. In this disorder, your immune system attacks the myelin sheath or the cells that produce and maintain it. This causes inflammation and injury to the sheath and ultimately to the nerve fibers that it surrounds, and may result in multiple areas of scarring (sclerosis).

Some Long Chain Fatty acids are like C21 plus are called nervonic acids because they are so involved with nerves. Long Chain Fatty acids are heat sensitive and some are destroyed at temperatures of 106 °Fahrenheit or 41 Celsius. This is the temperature where a fever does damage, because it damages the myelin, thus the nerves. So excess child fevers past 105.5 F or 41 C can leave scars that make for demyelination later. Treat fevers early with natural medicine and you will minimize the risk.

**Every woman with breast implants develops MS like demyelination later in life. Yes, Everyone.** Why, well because when an inanimate (Non-living) thing is inserted into the body the white blood cells attack it. There is an acute over attack if there is an allergic immunoglobulin cascade. But there is chronic attack on any non-living thing. Breast implants are large dead things. The over active immune system makes the white blood cells attack other things like the sensitive myelin.

**Auto-immune immune attack of an over active confused white blood cell army can make demyelination. Excessive daily life stress can cause or aggravate the demyelination. If you hate your life the immune system can attack you.**

**If measles is not treated properly in early life there is a tendency to develop MS later in Life.** When we get a childhood disease we need to let the immune system do its thing and stop the fever naturally by not panicking at 40 C degrees or 104 F. At 40.5 C or 105 F then we must call emergency and while waiting use alcohol bath or cool water.

**Toxicity from SInthetic sweeteners and chemicals can create demyelination risk.**
Other causes
Other types of demyelinating disease and their causes include:

- Optic neuritis — inflammation of the optic nerve in one or both eyes
- Devic disease (neuromyelitis optica) — inflammation of the optic nerve and spinal cord
- Transverse myelitis — inflammation of the spinal cord
- Acute disseminated encephalomyelitis — inflammation of the brain and spinal cord
- Adrenoleukodystrophy and adrenomyeloneuropathy — rare, inherited metabolic disorders
- ALS linked to chromosome 9 disorder

MS, ALS and other demyelinating diseases may result in vision or hearing loss, headache, seizures, muscle spasms and weakness, loss of coordination, paralysis, and loss of sensation.
An OverActive Immune System develops DeMyelination in all Women with Breast Implants, Yes ALL

I hate my life
So My Immune System Attacks My Body

Aspartame: a neurotoxin never tasted so sweet.
Headaches, Muscle spasms, Irritability, Heart palpitations, Loss of taste, Joint pain, Dizziness, Weight gain, Tachycardia (heart racing), Breathing difficulty, Tinnitus (ringing in the ears), Blurred vision, Seizures,

Vertigo, Nausea, Blindness, Slurred Speech, Fatigue, Numbness.
Rashes, Insomnia, Hearing loss, Depression,
Memory Loss, ALS Demyelination

DANGER
Multiple Sclerosis is a slowly progressing disease of the brain, the spinal cord, and the optic nerves. The term multiple sclerosis (MS) comes from the multiple areas of scarring (sclerosis) that represent many patches of demyelination in the nervous system. Communication between the brain and other parts of the body is disrupted. Its effects can range from relatively benign in most cases to somewhat disabling to devastating. It is an unpredictable disease and its symptoms may mysteriously occur and then disappear.

The pathogenesis of MS remains unknown. Although inflammation, demyelination and axonal injury are all involved, the primary pathogenic process is not clear. On-the-job exposure to organic solvent, heavy metals and toxins may increase one's risk of developing MS. There are numerous testimonials supporting the replacement of the common dental mercury (amalgam) filling in MS patients with drastic improvement in their health status.

Infection with a bacteria known as C. pneumoniae may increase the risk of developing MS. Recently, a new microbe, named Nanobacteria, has come under suspicion as a trigger for MS, as well as other illnesses such as heart disease, diabetes, arthritis, and kidney stones.

Viruses have long been studied for their relationship to MS. Recent research in Norway proposed a trigger connection between exposure to a virus such as Epstein-Barr at a critical age - between thirteen and twenty - and the development of the disease. Immunization with the synthetic hepatitis B vaccine may also be associated with an increased risk of developing MS. The measles virus has also been implicated.

The cause of ALS is not fully known, and scientists do not yet know why ALS strikes some people and not others. An important step toward answering this question was made in 1993 when scientists supported by the National Institute of Neurological Disorders and Stroke (NINDS) discovered that mutations in the gene that produces the SOD1 enzyme were associated with some cases of familial ALS. Although it is still not clear how mutations in the SOD1 gene lead to motor neuron degeneration, there is increasing evidence that mutant SOD1 protein can become toxic.

Since then, over a dozen additional genetic mutations have been identified, many through NINDS-supported research, and each of these gene discoveries has provided new insights into possible mechanisms of ALS.

For example, the discovery of certain genetic mutations involved in ALS suggests that changes in the processing of RNA molecules (involved with functions including gene regulation and activity) may lead to ALS-related motor neuron degeneration. Other gene mutations implicate defects in protein recycling. And still others point to possible defects in the structure and shape of motor neurons, as well as increased susceptibility to environmental toxins. Overall, it is becoming increasingly clear that a number of cellular defects can lead to motor neuron degeneration in ALS.

Another research advance was made in 2011 when scientists found that a defect in the C9orf72 gene is not only present in a significant subset of ALS patients but also in some patients who suffer from a type of fronto-temporal dementia (FTD). This observation provides evidence for genetic ties between these two neurodegenerative disorders. In fact, some researchers are proposing that ALS and some forms of FTD are related disorders with genetic, clinical, and pathological overlap.

In searching for the cause of ALS, researchers are also studying the role of environmental factors such as exposure to toxic or infectious agents, as well as physical trauma or behavioral and occupational factors. For example, studies of populations of military personnel who were deployed to the Gulf region during the 1991 war show that those veterans were more likely to develop ALS compared to military personnel who were not in the region.
About 5 to 10 percent of all ALS cases are inherited. The familial form of ALS usually results from a pattern of inheritance that requires only one parent to carry the gene responsible for the disease. Mutations in more than a dozen genes have been found to cause familial ALS.

About one-third of all familial cases (and a small percentage of sporadic cases) result from a defect in a gene known as “chromosome 9 open reading frame 72,” or C9orf72. The function of this gene is still unknown. Another 20 percent of familial cases result from mutations in the gene that encodes the enzyme copper-zinc superoxide dismutase 1 (SOD1).

Lately, MS has come to be considered an autoimmune disease, that is, a disease in which the body does not recognize its own cells and produces antibodies against them. In MS, tests reveal the specific antibodies attacking the myelin cover of the nerve fibers.

Some researchers have found a connection between MS and allergies. Studies made at NY University Medical Center noticed that the changes in the nervous system of patients with MS resembled the changes caused by allergies and elimination of all allergens helps to reduce MS attacks.

Those with multiple sclerosis should avoid excessive body heat elevation such as sauna, whirlpool, sun bathing or spending time outdoors in high heat.

![Diagram of Multiple Sclerosis](image)

**Treatment**

Corticosteroids such as prednisone taken by mouth or methylprednisolone given intravenously for short periods to relieve acute symptoms have been the main form of therapy for decades. Treatment with high-dose steroids for MS and other disorders may impair long-term memory, according to a report in the medical journal Neurology. The good news is that mental function usually returns to normal a few days after stopping the drug.

Injectable beta-interferon, a relatively new MS treatment, reduces the frequency of relapses. Other promising treatments still under investigation include other interferons, oral myelin, and glatiramer to help keep the body from attacking its own myelin. The benefits of plasmapheresis and IV gamma globulins haven’t been established, and these treatments aren’t practical for long-term therapy. Treatment with Marinol, a synthetic cannabinoid chemical, can reduce the pain often experienced by people with MS.

A clinical trial has shown that injections of colchicine (an anti-inflammatory compound extracted from the herb meadow saffron) can be effective in relieving symptoms and in promoting general stamina. Oral colchicine can also be used. While there are side effects, including gastrointestinal symptoms, they can
usually be managed by altering the dose. As existing drugs for MS can be quite toxic, the use of colchicine is a promising alternative and patients should be able to take it safely throughout their lives.

Considering that MS could be an inflammatory disease provoked by bacteria and viruses, we offer special treatment for nanobacteria and postvaccination syndrome.

Some doctors also believe that MS can be benefited by anti-candida treatment. We advocate the anti-candida treatment and offer the protocol including the anti-Candida diet, Nystatin and natural antifungal remedies, anti-allergy shots, and homeopathic remedies. Although it is controversial in MS, in situations where all else has failed and the patient is in the early stages of the disease, trial therapy may be warranted.

In case of chemical and heavy metal toxicity, treatment of chemical sencitivity and chelation may be helpful.

Biomedical treatment

It is difficult to know with any certainty which supplements, in what dosages, and in what combinations would be helpful for a certain patient with MS. It is possible that someone's condition may get worse by stopping their existing medicines and using natural supplements exclusively. It is also possible that certain natural supplements may lead to a reduction of their medication dosages. Therefore, physician control and supervision is necessary if you decide to follow a natural treatment.

When asked about the role of nutrition in MS, most conventional medical doctors claim there is no benefit from diet changes. I disagree. There does also seem to be evidence that diet plays a part. There is a high correlation between a high animal-fat diet and development of the disease. Elimination of hydrogenated fats (margarines and spreads) may also give a great relief to the MS patient.

Researchers have also reported that symptoms improve when food intolerances (allergies) are eliminated. In my experience, the most common hidden food allergies appear to be grains, especially wheat and corn, milk, yeast and soy. Many patients benefit by following Gluten free/Casein free diet. Testing and treatment of these allergies may unlock the door to recovery for many MS sufferers. Genetically modified (GM) food could also be a trigger.

Supplements which are very effective in both prevention and treatment of MS include cod liver oil (omega-3), flaxseed and evening primrose oil, borage and black currant oils, amino acids (N-acetylcysteine, glutathione, phosphatidylcholine, etc), minerals (zinc, selenium, manganese, magnesium) and B-vitamin complex, especially inositol, B1, folinic acid and B12 (methylcobalamin). The latter should be taken as a sublingual tablets for enhanced absorption or given in injections.

The above mentioned oils are anti-inflammatory fatty acids that also help build strong nerves. The proper zinc/copper combination is important to improve levels of a major antioxidant, superoxide dismutase. Dosage should be adjusted with their blood levels.

Alpha Lipoic acid (ALA) is a powerful antioxidant and has been helpful in a mouse study and recently showed biochemical marker improvement in a human trial. Alpha Lipoic Acid (ALA). (Lipoic acid in multiple sclerosis: a pilot study. Multiple Sclerosis. 2005 Apr;11(2):159-65.)

DHEA has been used successfully in the treatment of many autoimmune disorders including MS, Lupus and fibromyalgia. DHEA regulates the immune system and maintains the metabolic and structural integrity of the nervous system.
Manganese, especially given with B vitamins, may enhance nerve impulses and alleviate muscle weakness. Magnesium will help soothe the muscle spasms often associated with MS.

Vitamin E and other antioxidants (vitamin A, beta carotene, vitamin C, pycnogenol, etc.) are also beneficial. Coenzyme Q10 is a catalyst in providing cellular energy and it's also a strong nerve protector.

Dosages depend on the severity of the illness and the patient's tolerance for these supplements.

**Herbs**

The Chinese use an herbal supplement called Bushen Gusui to enhance healing. Ordinarily, its use has been for treatment of kidney disorders. It is available in a pill form. In clinical study it was effective at improving symptoms and signs of MS patients and reducing recurrence frequency in 88.37% of the patients. Bushen Gusui could obviously inhibit inflammatory reaction of the brain and spinal cord as well as demyelination, and simultaneously inhibit the activity of serum IL-2, IL-6, TNF in comparing with model group. (Clinical and experimental study on multiple sclerosis with bushen gusui tablet, Zhongguo Zhong Xi Yi Jie He Za Zhi. 2001 Jan;21(1):10-4).

Curcumin and Turmeric are also showing promise for MS symptoms. Did you know that in India and China, where people enjoy a spicy diet and consume a lot of Curcumin, there is a lower rate of Multiple Sclerosis? Maybe it's time to spice up your life!

Ginkgo biloba and Siberian ginseng have shown intriguing preliminary evidence of efficacy. Garlic is also a potentially useful remedy for MS patients.

**Enjoy yoga**

Subjects with MS participating in either a 6-month yoga class or exercise class showed significant improvement in measures of fatigue compared to a waiting-list control group (Neurology. 2004 Jun 8;62(11):2058-64.)

Specific reflexology treatment was of benefit in alleviating motor; sensory and urinary symptoms in multiple sclerosis patients (Multiple Sclerosis. 2003 Aug;9(4):356-61.) Recently, European and American doctors have reported successful results with the use of ozone therapy. So, as you can see, there are plenty of reasons to adopt a more positive, hopeful attitude in dealing with this serious disease.

> 2012 ICD-9-CM Diagnosis Code 341.9

**Demyelinating disease of central nervous system, unspecified**

- Short description: Cns demyelination NOS.
- ICD-9-CM 341.9 is a billable medical code that can be used to specify a diagnosis on a reimbursement claim.
- You are viewing the 2012 version of ICD-9-CM 341.9.
Signs and Symptoms Consistent with Demyelinating Disease

Overview

Signs & Symptoms Consistent with Demyelinating Disease [with links to information and resources for your patients]

Visual
• Blurred vision
• Unilateral loss of vision
• Oscillopsia
• Diplopia

Motor
• Trunk/limb weakness
• Spasticity
• Hyperreflexia
• Gait disturbance
• Balance problems

Sensory
• Numbness
• Paresthesias
• Dysesthesias
• Lhermitte’s sign
• “MS hug”
• Trigeminal neuralgia
• Allodynia
• Hyperpathia
• Proprioception deficits

Cerebellar
• Tremor
• Ataxia
• Incoordination

**Genitourinary**
• Urgency/frequency/retention
• Incontinence
• Frequent UTI
• Constipation
• Impotence
• Anorgasmia
• Dyspareunia

**Neuropsychiatric**
• Impairment of memory, concentration, attention, and/or processing speed
• Depression
• Irritability
• Anxiety

**Other symptoms**
• Prominent intractable fatigue with no other cause
Homeopathy for Demyelination Disorders

Human body has a very intricate nervous system, which is composed of a network of nerves. The nervous system, which consists of the motor nervous system, the sensory nervous system and the autonomic nervous system, performs several important functions in the human body. So any problem connected to the nervous system demands a thorough examination to ascertain the diseases and prescribe the medicine to the patient.

Any dysfunction to the nervous system can lead to serious neurological complaints like paralysis, apoplexy, epilepsy, hysteria etc.. A demyelinating disease or disorder is caused due to the damage to the protective covering called myelin sheath surrounding the nerve fibers in the brain and spinal cord. The nerve impulses stop or slow down when myelin sheath is damaged and the patient suffers from a host of neurological problems.

There are many types of demyelinating diseases. Some of the common ones are multiple sclerosis, neuromyelitis optica, optic neuritis, transverse myelitis and acute disseminated encephalomyelitis. Of these multiple sclerosis is the most common nervous disorder. It happens due to the inflammation and injury to myelin sheath. This results in inflammation of the nerve fibers causing multiple areas of sclerosis or scarring.

Homeopathic remedies for Neurological Diseases

Homeopathy has excellent remedies for neurological disorders. This is because homeopathic treatment is centered on a person and his or her pathological condition. Moreover, homeopathic medicines are prescribed after taking into account the patient’s constitutional type like the physical, emotional, and psychological makeup and his or her medical history. An experienced homeopath determines all the factors, including miasmatic tendency of the patient before deciding any treatment. Some of the remedies for demyelinating diseases are:

**Causticum**: This is an effective remedy for multiple sclerosis which manifests itself in chronic paralytic affections. The symptoms are tearing, drawing pains and severe weakness. The other indications are the total paralysis of body parts like vocal cords, tongue, eyelids, face, bladder and extremities. The patient experiences impaired vision and dark spots in the centre of the vision and restless legs with weak ankles during nights.

**Gelsemium**: This is the best known curative homeopathic treatment for motor paralysis. It acts on nervous system and acts best when there is dizziness, trembling, drowsiness, and paralysis of throat, larynx, and extremities. It also asks for strong indications of motor nervous problems like muscle cramps, lack of muscle coordination, watery urine, chilliness, tremulousness, partial bladder paralysis, heavy eyelids and blurry vision.

**Oxalic acid**: Oxalic acid is an effective medication for multiple cerebral and posterior spinal sclerosis. The indications are lancinating, shooting and jerking pains in different parts of the external body. The other symptoms are muscular prostration, numbness, tingling sensation, and back ache.

**Phosphorus**: This is the best curative for atrophy and softening of brain and spinal cord, which
cause prostration, trembling, numbness and complete paralysis. The symptoms are locomotor ataxia. Moreover, paralysis of motor sensory nervous may result in paralysis from tips of fingers to toes. The patient experiences vulnerability to light, sound, touch and thunders.
Aspartame...  
*The Chameleon Drug! How It Happens:*

Methanol, from aspartame, is released in the small intestine when the methyl group of aspartame encounters the enzyme chymotrypsin (Seligman 1984, page 143). Free methanol begins to form in liquid aspartame-containing products at temperatures above 86 degrees F, also within the human body.

The methanol is then converted to formaldehyde. The formaldehyde converts to formic acid, ant sting poison. Toxic formic acid is used as an activator to strip epoxy and urethane coatings. Imagine what it does to your tissues!

Phenylalanine and aspartic acid, 90% of aspartame, are amino acids normally used in synthesis of protoplasm when supplied by the foods we eat. But when unaccompanied by other amino acids we use [there are 20], they are neurotoxic.

That is why a warning for Phenylketonurics is found on EQUAL and other aspartame products. Phenylketonurics are 2% of the population with extreme sensitivity to this chemical unless it’s present in food. It gets you too, causing brain disorders and death defied! Finally, the phenylalanine breaks down into DKP, a brain tumor agent.

In other words: Aspartame converts to dangerous byproducts that have no natural countermeasures. A dieter’s empty stomach accelerates these conversions and amplifies the damage. Components of aspartame go straight to the brain, damage that causes headaches, mental confusion, seizures and faulty balance. Lab rats and other test animals died of brain tumors.

Do you want to bet your brain on its safety?  
Monsanto says “Aspartame is the most tested product in history.” Are you sure?

On 12/29/96 80 MINUTES reported on 164 studies. ALL of the 74 studies paid for by NutraSweet showed it was healthy as rain. 83 of the 90 studies by independent labs found problems. During the Reagan Administration, FDA commissioner Arthur Hull Hayes approved NutraSweet without the postscripts of his own Board of Inquiry, then took a lush consultant contract with NutraSweet’s public relations firm while he was under investigation for accepting gratuities. Think it this way: Money paid under the table put the little blue envelopes on the table!

COKE and PEPSI KNEW IT WAS POISON... BEFORE they started to use it!

The Congressional Record of May 7, 1985 printed 6 pages of objections prepared by the National Soft Drink Association: “Aspartame is uniquely unstable... as the temperature increases the ratio of degradation becomes more pronounced... at 104 degrees for 20 weeks less than 10% of the original aspartame remained... soft drinks displayed at a service station may reach 120 degrees.” EVERY KNOWN BREAKDOWN PRODUCT OF ASPARTAME IS A POISON! Formaldehyde cocktail anyone?

**Diseases Aspartame Causes and/or Mimics:**

- Fibromyalgia
- Arthritis
- Multiple Sclerosis (MS)
- Parkinson’s Disease
- Lupus
- Multiple Chemical Sensitivities (MCS)
- Diabetes and Diabetic Complications
- Epilepsy
- Alzheimer’s Disease
- Birth Defects
- Chronic Fatigue Syndrome
- Lymphoma
- Lyme Disease
- Attention Deficit Disorder (ADD)
- Panic Disorder
- Depression
- and other Psychological Disorders.

**Symptoms:**

- Abdominal Pain
- Anxiety attacks,
- Arthritis like pain
- Asthmatic Reactions
- Bloating
- Blood Sugar Control Problems
- Brain Cancer (Pre-approval studies in animals)
- Breathing difficulties, burning eyes or throat
- Burning Urination, Chest Pains, chronic cough
- Chronic Fatigue, Confusion, Death
- Depression
- Diarrhea
- Dizziness
- Excessive Thirst or Hunger
- Fatigue, feel unreal, flushing of face, Hair Loss (Baldness)
- Inability to concentrate, Infection Susceptibility
- Insomnia, Irritability, Itching, Joint Pains, laryngitis
- Marked Personality Changes
- Memory loss, Menstrual Problems or Changes
- Muscle spasms, Nausea or Vomiting, Numbness or Tingling of Extremities
- Other Allergic-Like Reactions
- Panic Attacks, Phobias, poor memory
- Rapid Heart Beat, Rash, Seizures and Convulsions
- Slurring of Speech, Swallowing Pain, Tachycardia, Tremors, Tinnitus, Vertigo, Vision Loss, and Weight gain.

Aspartame is NOT a “food additive.” It IS a dangerous neurotoxin that MUST be removed from our food chain. 

BUT, WE MUST DO IT!

Aspartame and ALS  
(also known as Lou Gehrigs Disease)

Aspartame damages the cardiac conduction system and causes sudden death. The article below (Team Targets Sudden Cardiac Death) might as well have been written about this toxin because it describes the problem this killer causes.

Tragic reports from Iraq reveal high incidence of sudden death from heart attacks, cerebral and cardiac thromboses, fatal blood clots. In the USA sudden cardiac death, SCD, has become the number one killer, claiming 460,000 a year, according to the CDC. Often it is athletes in prime condition who fall while playing; three Japanese athletes died on one day. Their conditioning is similar to the robust state of troops trained for combat, but both are falling like snowflakes.

Is there a connection? The government sent boatloads of diet drinks to the Gulf where they sat in the Arabian sun for weeks decomposing into formaldehyde cocktails, which the troops drank constantly to avoid dehydration. In September the peer-reviewed journal Neurology published ground-breaking studies by scientists at the Department of Veterans Affairs - concluding that Gulf War veterans, most in their 20’s and 30’s during the war, are contracting ALS at nearly three times the expected rate for
their age group. Amyotrophic Lateral Sclerosis, also known as Lou Gehrig's disease, is a horrible neurological affliction occurring to people in their 60s which gradually destroys all mobility, even the ability to swallow. Nevertheless the victim remains mentally alert, a prisoner in a private hell, his body a degenerating cage, awaiting the inevitable. The sequence is gradual, total: incapacity, humiliation, loss of physical control, paralysis, death. A ghastly reward for patriotism!

James Bowen, M.D. experienced terrible Lou Gehrigs symptoms and was being progressively destroyed, but as an MD and biochemist his research revealed that these symptoms are frequently associated with aspartame poisoning. He discontinued aspartame/NutraSweet/Equal and recovered most of his abilities and he believes many Desert Storm victims are similar aspartame victims, and if they discontinue this recognized neurotoxin in time they may well recover. Dr Bowen describes aspartame poisoning as minute doses of nerve gas that eradicates brain and nerve function. Dr. Russell Blaylock says in Health & Nutrition Secrets To Save Your Life: "In the case of diet drinks in aluminum cans, the very toxic brain aluminum fluoride compound co-exists with multiple toxins found in aspartame, thus creating the most powerful government approved toxic soup imaginable."

Dr. Bowen has explained how the destruction works. Aspartic acid, the excitotoxic component of aspartame does not cross the blood brain barrier, but is secreted into the cerebral spinal fluid by the choroid plexus located in the ventricles of the brain. There, in the brain's lower area and upper terminus of the spinal cord is where Lou Gehrigs, Parkinson's Disease and Multiple Sclerosis damage is most prominent. These critical locations are bathed in the toxin as it removes from the blood. From the third to fourth ventricle there is a narrow canal called sylvian aqueduct which fills with this secretion and washes the roof of the hypothalamus. This accounts for aspartame damage to the hypothalamus. Electrical as well as chemical activity powers hypothalamic generators, cell masses specializing in involuntary behavior control. These centers fire circuits which signal the body to eat, drink, become aroused. This power originates in a quarter ounce of gray matter and damage to the hypothalamus produces serious and diverse problems including sexual dysfunction. Aspartame attacks the hypothalamus.

Neurotoxins cross the blood brain barrier but neuroexcitotoxins such as aspartic acid do not. Two excellent medical texts on the deadly effects of aspartame are: Aspartame Disease: An Ignored Epidemic by H. J. Roberts, M.D., author of many books on diagnosis and recognized as "The Best Doctor in the USA" by the medical magazine Practice 84 and Excitotoxins: The Taste That Kills by neurosurgeon Russell Blaylock, M.D. Dr. Blaylock is a Clinical Assistant Professor of Neurosurgery at the Medical University of Mississippi. He practiced neurosurgery for 24 years. He serves on the editorial staff of the Journal of the American Nutraceutical Assn and on the editorial board of the Medical Sentinel, official journal of the Association of American Physicians and Surgeons. Lou Gehrign or ALS are discussed in both doctors books.

Dr. Bowen says the medical view of thromboses has been updated. The effects of inflammation of the blood vessels, especially autoimmune inflammations in producing thromboses is evident. Aspartame which converts into methyl alcohol, formaldehyde, formic acid, diketopiperazine is corrosive to blood vessels. To combat dust and heat the troops chew gum constantly, and Wrigley in full knowledge of its deadliness continues to add aspartame to all of its gums. They have been repeatedly notified but care not what happens to the victims. A tablet of nitroglycerin under the tongue transports immediately to the brain and interrupts a heart attack, so the aspartame in saliva from gum goes straight to the brain, with deadly effect. The U. S. Air Force magazine, Flying Safety, explained the aspartame as in a single stick of gum can cause flicker vertigo and other problems in pilots. That's one stick. Imagine the cumulative consequence of several sticks daily for months with diet sodas all day long.

Aspartame as a chemical hypersensitization agent interacts with vaccines and environmental chemicals amplifying their toxicity. Coalition warriors fired thousands of tons of depleted uranium rounds which on impact smashed into millions of radioactive microscopic particles to be inhaled or absorbed thru the skin. Once in the body aspartame magnifies this deadly radioactive killer which destroys the lungs and remains lethal for millions of years, and so we are seeing an epidemic of unexplained pneumonia among coalition troops.

War is hell, but the everlasting devastation from radioactive weapons and systematic daily poisoning
with Donald Rumsfeld's toxin (he was CEO of NutraSweet's parent company and called in his chips to get it approved) will make this war a killer of generations. Read more about Donald Rumsfeld in the Artificially Sweetened Times

On the front page of USA Today, 10/13/2003 is "Army Probes Soldier Suicides". It says the suicide rate is very high in Iraq. Phenylalanine in aspartame lowers the seizure threshold and depletes serotonin. Lowered serotonin triggers SUICIDAL TENDENCIES, and manic depression, insomnia, panic attack, anxiety, mood swings, and paranoia. Dr. Bowen when on aspartame kept wanting to commit suicide. When aspartame victim, Mary Reiff, joined me on a TV program I asked why her wrists had been slit. She said: "When I was on aspartame I kept wanting to commit suicide but didn't know why. Once off of it, those tendencies disappeared, as did my seizures and blindness." Mary Reiff had been declared legally blind. The wood alcohol or methanol in aspartame converts to formaldehyde and formic acid in the retina of the eye and destroys the optic nerve.

Also on the front page of USA was is "Obesity Explodes From Teens to 20's". Many drink diet sodas in a misguided effort to keep their weight in check. Aspartame causes a craving for carbohydrates resulting in the opposite. The epidemic of obesity in America coincides exactly with the approval of aspartame 20 years ago. If you read the protest of the National Soft Drink Association on you will see Dr. Richard Wurtman's affidavit that aspartame makes you crave carbohydrates. It is a neurotoxic drug, not an additive.

FDA and CDC you know what is happening to the troops and why. You sold out the consumer public and the military by lying about aspartame. Post marketing research has shown these problems for years, yet you have turned your back on the those you purport to protect. Is your loyalty to industry worth the mass poisoning of the people in 100 countries, as Dr. Bowen told you in a letter years ago?
SCIO Eductor Treatments for Demyelination Diseases

MYELINATION NERVOUS ACID NATURAL FORMULA:

Olive, 25%
Safflower, 25%
Sunflower, 30%
Goji Berry Oil 10%
Nutmeg oil 1 or 2 %—Pharmaceutical grade

Following oils combined and added at near equal amounts to make the rest: Sesame Seed, Wheat germ, Borage, Apricot Kernel, Linseed, Garlic, Carrot, Lettuce, Cod liver, Evening Primrose, Red & Blackcurrant, Rose Hip, Tea Tree, Pumpkin Seed, Lecithin, Hazelnut.

Trace: Extracts from:
Orange oil & Lemon oil

10 drops 3 X a day UNDER TONGUE
use on salad or bread
DO NOT HEAT
SCIO/Eductor
Treatment for Demyelination Diseases

Use 3 min of Neurological repair in Timed Treatments then the AFE QRB treatments of Inflammation or Degeneration for 30 minutes three times a week,

Use Disease Dictionary, and Body Viewer with these therapies

Do Stress Reduction, avoid SINthetic Foods, Avoid Sugar, Tobacco, and Artifical Sugars

Use Fatty Acids, Correct Anemia, Degex

Multiple Sclerosis Natural Treatment,
Nerve fibers inside and outside the brain are wrapped with many layers of insulation called the myelin sheath. Much like the insulation around an electrical wire, the myelin sheath permits electrical impulses to be conducted along the nerve fiber with speed and accuracy. When myelin is damaged, nerves don’t conduct impulses properly. Multiple sclerosis is a disorder in which the nerves of the eye, brain, and spinal cord lose patches of myelin. IgG antibodies to the myelin oligodendrocyte glycoprotein appear to participate in the more severe type of MS.

Children who spend more time in the sun have a lower risk for developing multiple sclerosis as adults. Something in relation to sunlight and/or vitamin D exposure during childhood may play a protective role. High-salt diets could speed the onset and progression of autoimmune diseases like multiple sclerosis and rheumatoid arthritis in individuals already genetically predisposed to develop such conditions.

Natural treatment for multiple sclerosis MS
At this point it is very difficult to know with any certainty which supplements, in what dosages, and in what combination(s) would be helpful for multiple sclerosis, if at all. We also have little idea how these supplements interact with medicines currently used for multiple sclerosis. My aim is to just mention the research regarding the role some nutrients may play in this condition. If you have MS, make your doctor aware of some of these preliminary studies, and perhaps he or she would want to monitor you while you give them a try. There is no definite proof yet that these supplements will help. Much more research is needed before natural options are considered. It is possible that someone’s condition may get worse by stopping their existing medicines and using natural supplements exclusively. It is also possible that certain natural supplements may lead to a slight reduction of the necessary pharmaceutical medication dosage. If you do plan to use these supplements, keep the dosages low at first until you have a grasp on how they are influencing your condition or whether they are interfering or improving the actions of the pharmaceutical medicines.

Vitamin D supplementation may be of benefit. There appears to be an association between vitamin D levels and MS relapse rate. It may be possible that supplementation could have an impact on the course of this disease. Perhaps increased sun exposure may help to protect against the risk of developing this condition. Pregnant women with higher levels are less likely to develop MS in the years after giving birth. Nov. 20, 2012, Neurology online.

Alpha lipoic acid has been helpful in a mouse study and recently showed biochemical marker improvement in a human trial. A dose of 10 to 25 mg of R lipoic acid may be appropriate. Most R lipoic capsules come in 50 mg, so, opening a capsule and taking a portion is one option. Carnitine has been found helpful in reducing fatigue.
Curcumin blocks the progression of multiple sclerosis in a laboratory study. Fish oil capsules have been thought to be helpful along with consuming more cold water fish with omega 3 fatty acids but studies have shown mixed results.

Arch Neurol. 2012. ω-3 fatty acid treatment in multiple sclerosis (OFAMS Study): a randomized, double-blind, placebo-controlled trial. Patients were administered 1350 mg of eicosapentaenoic acid and 850 mg of docosahexaenoic acid daily or placebo. After 6 months, all patients in addition received subcutaneously 44 μg of interferon beta-1a 3 times per week for another 18 months. No beneficial effects on disease activity were detected from ω-3 fatty acids when compared with placebo as monotherapy or in combination with interferon beta-1a. Magnetic resonance imaging disease activity was reduced as expected by interferon beta-1a.

Int J Neurosci. 2013. Association of fish consumption and omega 3 supplementation with quality of life, disability and disease activity in an international cohort of people with multiple sclerosis. Emergency Practice Innovation Centre, St Vincents Hospital, Fitzroy, Australia We surveyed a large cohort of people with MS recruited via Web 2.0 platforms, requesting information on type of MS, relapse rates, disability, health-related quality of life, frequency of fish consumption and omega 3 supplementation, including type and dose, using validated tools where possible. We aimed to determine whether there was an association between fish consumption and omega 3 supplementation and quality of life, disability and disease activity for people with MS. Of 2469 respondents, 1493 (60%) had relapsing-remitting MS. Those consuming fish more frequently and those taking omega 3 supplements had significantly better quality of life, in all domains, and less disability. For fish consumption, there was a clear dose-response relationship for these associations. There were also trends towards lower relapse rates and reduced disease activity; flaxseed oil supplementation was associated with over 66% lower relapse rate over the previous 12 months.

Flavonoids may be helpful. Ginkgo biloba has shown intriguing preliminary evidence of efficacy. Nicotinamide has been studied in rodents. Yoga is helpful in improving muscle and neural function.

Warmer temperatures might reduce the ability of people with MS to complete mental tasks and process information, National Multiple Sclerosis Society; Oct. 23, 2013, Brain Imaging and Behavior, online.

Alpha lipoic acid and multiple sclerosis
The purpose of this study was to determine the pharmacokinetics, tolerability and effects on matrix metalloproteinase-9 (MMP-9) and soluble intercellular adhesion molecule-1 (sICAMP-1) of oral Alpha Lipoic acid in patients with multiple sclerosis. Thirty-seven multiple sclerosis subjects were randomly assigned to one of four groups: placebo, Alpha Lipoic acid 600 mg twice a day, Alpha Lipoic acid 1200 mg once a day and Alpha Lipoic acid 1200 mg twice a day. Subjects took study capsules for 14 days. We found that subjects taking 1200 mg had substantially higher peak serum ALA levels than those taking 600 mg and that peak levels varied considerably among subjects. We also found a significant negative correlation between peak serum Alpha Lipoic acid levels and mean changes in serum MMP-9 levels. There was a significant dose response relationship between Alpha Lipoic acid and mean change in serum sICAM-1 levels. We conclude that oral Alpha Lipoic acid is generally well tolerated and appears capable of reducing serum MMP-9 and sICAM-1 levels. Caution: High dosages of may cause heart rhythm problems. Use less than 50 mg of R alpha lipoic acid. I'm fascinated by the possibilities of nutritional substances in altering the course of chronic medical conditions for which modern medicine does not have good options. Although this study in no way says ALA will be a cure or long term benefit for those with multiple
sclerosis, it does open the door for further exploration. I think the dose of 1200 mg is extremely high, and I would not recommend more than 50 mg a day of R-Alpha Lipoic Acid for long term use.

Alpha lipoic acid inhibits human T-cell migration: implications for multiple sclerosis.
J Neurosci Res. 2004
We have demonstrated previously the ability of the antioxidant alpha lipoic acid to suppress and treat a model of multiple sclerosis, relapsing experimental autoimmune encephalomyelitis (EAE). We describe the effects of ALA and its reduced form, dihydrolipoic acid (DHLA), on the transmigration of human Jurkat T cells across a fibronectin barrier in a transwell system. ALA and DHLA inhibited migration of Jurkat cells in a dose-dependent fashion by 16-75%. ALA and DHLA reduced matrix metalloproteinase-9 (MMP-9) activity by 18-90% in Jurkat cell supernatants. These data, coupled with its ability to treat relapsing EAE, suggest that ALA warrants investigation as a therapy for multiple sclerosis.

Nicotinamide
Boosting concentrations in the nervous system of a vital compound called NAD, by giving its chemical precursor, nicotinamide has shown considerable therapeutic potential in a mouse model of multiple sclerosis. In mice with the MS-like disease EAE, nicotinamide treatment profoundly prevents the degeneration of axons already showing signs of degeneration. Daily under-the-skin injections of nicotinamide in the EAE mouse also prevents inflammation of the axons and loss of myelin -- the underlying problem in MS -- and delays the onset and severity of disability. Nicotinamide had beneficial effects even when treatment was delayed until 10 days after the induction multiple sclerosis-like disease, when most of the animals had clear signs of neurologic disability, hinting that it may have an impact at later stages of multiple sclerosis. The Journal of Neuroscience, September 20, 2006.

Carnitine and multiple sclerosis
Levocarnitine administration in multiple sclerosis patients with immunosuppressive therapy-induced fatigue.
Mult Scler. 2006.
The aim of this prospective open-labelled study was to collect and study serum carnitine levels in MS patients with and without disease-modifying treatment-induced fatigue syndrome. Treatment consisted of oral carnitine, 3-6 g daily. For 63% of patients treated with immunosuppressive or immunomodulatory therapies, oral l-carnitine adjunction decreased fatigue intensity, especially in patients treated with cyclophosphamide and interferon beta.

Comments: In the real world, 500 mg or maximum 1000 mg of l-carnitine should be sufficient.

Fish oils, DHA
Omega-3 fatty acids in inflammation and autoimmune diseases.
Among the fatty acids, it is the omega-3 polyunsaturated fatty acids (PUFA) which possess the most potent immunomodulatory activities, and among the omega-3 PUFA, those from fish oil-eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA)--are more biologically potent than alpha-linolenic acid (ALA). Animal experiments and clinical intervention studies indicate that omega-3 fatty acids have anti-inflammatory properties and, therefore, might be useful in the management of inflammatory and autoimmune diseases. Coronary heart disease, major depression, aging and cancer are characterized by an increased level of interleukin 1 (IL-1), a proinflammatory cytokine. Similarly, arthritis, Crohn's disease, ulcerative colitis and lupus erythematosis are autoimmune diseases characterized by a high level of IL-1 and the
proinflammatory leukotriene LTB(4) produced by omega-6 fatty acids. There have been a number of clinical trials assessing the benefits of dietary supplementation with fish oils in several inflammatory and autoimmune diseases in humans, including rheumatoid arthritis, Crohn’s disease, ulcerative colitis, psoriasis, lupus erythematosus, multiple sclerosis and migraine headaches. Many of the placebo-controlled trials of fish oil in chronic inflammatory diseases reveal significant benefit, including decreased disease activity and a lowered use of anti-inflammatory drugs.

Docosahexaenoic acid-enriched fish oil attenuates kidney disease and prolongs median and maximal life span of autoimmune lupus-prone mice. 


The therapeutic efficacy of individual components of fish oils in various human inflammatory diseases still remains unresolved, possibly due to low levels of n-3 fatty acids docosahexaenoic acid and eicosapentaenoic acid or lower ratio of DHA to EPA. Our data indicate that DHA, but not EPA, is the most potent n-3 fatty acid that suppresses glomerulonephritis and extends life span of systemic lupus erythematosus-prone short-lived B x W mice, possibly via inhibition of IL-18 induction and IL-18-dependent signaling.

**Vitamin D as prevention or treatment**

Vitamin D3 appears to be helpful in several diseases, including multiple sclerosis. High doses of vitamin D may be required for therapeutic efficacy. Patients with multiple sclerosis can take enough vitamin D to double their blood levels of vitamin D without the concern of causing hypercalcemia or hypercalciuria.

Serum concentrations of 25-OH vitamin D in patients with systemic lupus erythematosus (SLE) are inversely related to disease activity: is it time to routinely supplement patients with SLE with vitamin D?

Ann Rheum Dis. 2010 Jun. Department of Medicine ‘B’ and Centre for Autoimmune Diseases, Sheba Medical Centre, (Affiliated to Tel-Aviv University) Tel-Hashomer 52621, Israel.

In a cohort of patients with SLE originating from Israel and Europe vitamin D serum concentrations were found to be inversely related to disease activity.

Children whose mothers have low exposure to sunlight during their first three months of pregnancy may have a higher risk of developing multiple sclerosis later in life. Low vitamin D levels have long been linked to a higher risk of MS. Experts suspect an expectant mother’s lack of exposure to sunlight - the main source of vitamin D - may affect the fetus’s central nervous system or immune system, and predispose it to developing MS later in life. BMJ, 2010.

**Vitamin D intake and incidence of multiple sclerosis MS.**


Dietary vitamin D intake was examined directly in relation to risk of multiple sclerosis in two large cohorts of women: the Nurses' Health Study (NHS; 92,253 women followed from 1980 to 2000) and Nurses' Health Study II (NHS II; 95,310 women followed from 1991 to 2001). Diet was assessed at baseline and updated every 4 years thereafter. During the follow-up, 173 cases of multiple sclerosis with onset of symptoms after baseline were confirmed. The pooled age-adjusted relative risk (RR) comparing women in the highest quintile of total vitamin D intake at baseline with those in the lowest was 0.67. Intake of vitamin D from supplements was also inversely associated with risk of multiple sclerosis; the RR comparing women with intake of ≥400 IU/day with women with no supplemental vitamin D intake was 0.59. No association
was found between vitamin D from food and multiple sclerosis incidence. These results support a protective effect of vitamin D intake on risk of developing multiple sclerosis.

People born in May in the northern hemisphere have a higher than average risk of developing multiple sclerosis. An analysis of data from studies of more than 42,000 people in Canada, Britain, Denmark and Sweden showed that May babies have a 13 percent increased chance of suffering from the illness later in life, but that having a November birthday decreased the average odds by 19 percent. The effect was similar in all the countries but most prominent in Scotland, which has the highest rate of multiple sclerosis MS in the world. Although the scientists cannot explain the correlation between birth month and MS, they suspect it could be linked to exposure to sunlight and the mother's vitamin D levels, which could influence the child's development.

**Exercise benefit**
Subjects with multiple sclerosis participating in either a 6-month yoga class or exercise class showed significant improvement in measures of fatigue compared to a waiting-list control group. There was no relative improvement of cognitive function in either of the intervention groups.

**Association with HDL cholesterol**
Dr. Bianca Weinstock-Guttman from the State University of New York at Buffalo analyzed clinical, demographic and HDL data on 186 MS patients whose average age was 50 years. At the start of the study, almost 20 percent of the participants had low HDL levels while close to 50 percent had high levels. Over the next 6 years, an association between the level of HDL cholesterol and the level of disability became apparent. Patients with greater disability were almost twice as likely to have low HDL levels compared to patients with less disability. Dr. Bianca Weinstock-Guttman thinks high HDL levels are associated with lower inflammation. April 2009.

**Avoid smoking since it makes it worse**
Smoking cigarettes increases the risk of MS, but the substance that makes cigarettes addictive, nicotine, doesn't seem to be at fault. It's not clear why cigarette smoking might increase MS risk, although there are many theories. Cyanide is one of the many harmful compounds found in cigarette smoke and it's known to damage nerve tissue. Smokers' greater vulnerability to infections, which have been linked to MS risk, could also be a factor.

**Multiple sclerosis symptoms and signs, diagnosis**
The term multiple sclerosis comes from the multiple areas of scarring (sclerosis) that represent many patches of demyelination in the nervous system. The possible neurologic signs and symptoms of multiple sclerosis are so diverse that doctors may miss the diagnosis when the first symptoms appear. Multiple sclerosis symptoms often include reduced or abnormal sensations, weakness and fatigue, visual changes, clumsiness, loss of bladder control, and so on. Symptoms of multiple sclerosis might appear in any combination and be mild or severe. They are usually experienced for unpredictable periods of time.

While multiple sclerosis often worsens slowly over time, affected people usually have periods of relatively good health (remissions) alternating with debilitating flare-ups (exacerbations). Fatigue is the most common symptom of multiple sclerosis and is associated with a reduced quality of life. It is described as the worst symptom of their disease by 50-60% of patients. Yoga helps reduce fatigue in patients with multiple sclerosis. Brain fog occurs in
multiple sclerosis with problems in thinking or being able to focus clearly.

Erectile dysfunction is a common symptom with multiple sclerosis. Although Viagra may help, the risk of permanent blindness is a concern. Natural options and formulas are available by Ray Sahelian, M.D.

Investigators in Japan have found that MS symptoms were more common in the warmest (July and August) and coldest (January and February) months.

Using special MRI images, scientists found that the thalamus -- which acts as a "relay center" for nervous-system signals -- had atrophied in many patients who had suffered an initial neurological episode that often comes before a MS diagnosis.

J Autoimmun. Feb 10 2014. The diagnosis of multiple sclerosis and the various related demyelinating syndromes: A critical review. Several variants of MS (and CNS demyelinating syndromes in general) have been nowadays defined in an effort to increase the diagnostic accuracy, to identify the unique immunopathogenetic profile and to tailor treatment in each individual patient. These include the initial events of demyelination defined as clinically or radiologically isolated syndromes (CIS and RIS respectively), acute disseminated encephalomyelitis (ADEM) and its variants (acute hemorrhagic leukoencephalitis-AHL, Marburg variant, and Baló's concentric sclerosis), Schilder's sclerosis, transverse myelitis, neuromyelitis optica (NMO and NMO spectrum of diseases), recurrent isolated optic neuritis and tumefactive demyelination. The differentiation between them is not only a terminological matter but has important implications on their management. For instance, certain patients with MS and prominent immunopathogenetic involvement of B cells and autoantibodies, or with the neuromyelitic variants of demyelination, may not only not respond well but even deteriorate under some of the first-line treatments for MS. The unique clinical and neuroradiological features, along with the immunological biomarkers help to distinguish these cases from classical MS. The use of such immunological and imaging biomarkers, will not only improve the accuracy of diagnosis but also contribute to the identification of the patients with CIS or RIS who, are at greater risk for disability progression (worse prognosis) or, on the contrary, will have a more benign course.

Possible triggers
Multiple sclerosis is one of the most common causes of neurological disability in young and middle-aged adults. About 400,000 Americans, mostly young adults, have it. The pathogenesis remains unknown. Although inflammation, demyelination and axonal injury are all involved, the primary pathogenic process is not clear. On-the-job exposure to organic solvents may increase a person's risk of developing multiple sclerosis. Infection with a common bacteria known as C. pneumonia may increase the risk of developing multiple sclerosis. Immunization with the synthetic hepatitis B vaccine may be associated with an increased risk of developing multiple sclerosis. Those with multiple sclerosis should avoid excessive body heat elevation such as sauna, whirlpool, sun bathing or spending time outdoors in high heat.

Infection with Epstein-Barr virus (EBV), resulting in infectious mononucleosis, which primarily effects adolescents and young adults, more than doubles the risk of developing multiple sclerosis (MS) later in life. Elevated serum levels of Epstein-Barr virus (EBV) antibodies can be seen in multiple sclerosis patients decades before the clinical onset of disease.

Cerebrospinal fluid from multiple sclerosis patients commonly contains varicella zoster virus DNA. The use of immune suppressive therapy could more easily lead to viral reactivation and to the development of viral diseases in multiple sclerosis patients.

MS patients who smoke have a speedier progression of the disease.

A woman's risk of developing MS during her lifetime is doubled if she was obese at age 18. Neurology, 2009.
Multiple Sclerosis Cause - sun exposure?
A 27-year-old white woman with a history of multiple sclerosis was found dead lying on a lounger, clad in a bathing suit. She had been sunbathing for 4 hours. Autopsy findings consisted of numerous variably sized demyelinated plaques involving the periventricular cerebral white matter and cerebellum. Elevation of core temperature in patients with multiple sclerosis leading to transient or permanent adverse neurologic signs and symptoms has been documented for several decades. This case illustrates that a modestly increased core body temperature, even from a usually innocuous activity such as sunbathing, may be fatal in such patients.

Multiple Sclerosis Treatment - Medical therapy
Injectable beta-interferon, a relatively new multiple sclerosis treatment, reduces the frequency of relapses. Other promising multiple sclerosis treatments still under investigation include other interferons, oral myelin, and glatiramer to help keep the body from attacking its own myelin. The benefits of plasmapheresis and intravenous gamma globulins haven't been established, and these treatments aren't practical for long-term therapy.

Corticosteroids such as prednisone taken by mouth or methylprednisolone given intravenously for short periods to relieve acute symptoms have been the main form of therapy for decades. Treatment with high-dose steroids for multiple sclerosis and other disorders may impair long-term memory, according to a report in the medical journal Neurology. The good news is that mental functioning usually returns to normal a few days after stopping the drug.

Multiple sclerosis treatment with cannabinoids may help prevent episodes of urge incontinence. Treatment with Marinol, a synthetic version of cannabinoid chemicals found in marijuana, can reduce the pain often experienced by people with multiple sclerosis.

Pregnancy
Pregnant women being treated with beta-interferon, a drug used to fight multiple sclerosis and other diseases, face an increased risk of miscarriage or having a low birthweight baby.

While women with MS have a somewhat heightened risk of certain pregnancy complications, by and large, their pregnancies are as healthy as other women's unless being treated with certain medications.

MS Human Research
Bee sting therapy found ineffective against multiple sclerosis. A 24-week study of 26 patients with relapsing-remitting or relapsing secondary progressive multiple sclerosis has found no benefit from bee-sting therapy. Live bees were used to administer bee venom three times per week. The treatment did not reduce disease activity, disability, or fatigue and did not improve quality of life.

To evaluate the effect of reflexology on symptoms of multiple sclerosis in a randomized, sham-controlled clinical trial. Seventy-one multiple sclerosis patients were randomized to either study or control group, to receive an 11-week treatment. Reflexology treatment included manual pressure on specific points in the feet and massage of the calf area. The control group received nonspecific massage of the calf area. The intensity of paresthesias, urinary symptoms, muscle strength and spasticity was assessed in a masked fashion at the beginning of the study, after 1.5 months of treatment, end of study and at three months of follow-up. Fifty-three patients
completed this study. Significant improvement in the differences in mean scores of paresthesias, urinary symptoms and spasticity was detected in the reflexology group. Improvement with borderline significance was observed in the differences in mean scores of muscle strength between the reflexology group and the controls. The improvement in the intensity of paresthesias remained significant at three months of follow-up. Specific reflexology treatment was of benefit in alleviating motor; sensory and urinary symptoms in multiple sclerosis patients.

**Emails**

Q. Could bee propolis help someone who suffers from multiple sclerosis? What about a multiple sclerosis diet?
   
   A. We don't know. We haven't seen any studies regarding the association between bee propolis and multiple sclerosis although flavonoids in bee pollen could theoretically be beneficial. As to a multiple sclerosis diet, again I really don't know at this time what foods would help or not help.

Q. My husband has been diagnosed with Multiple Sclerosis five years ago. It took a toll on his body and mind. My husband is taking an injection of Avonex once a week. Needless to say, our love life went from great to almost non existent. A friend talked to me about your product Passion Rx and suggested we should give it a try. I thought, at worst the only thing I could lose would be the cost of the product. So I placed an order, I received my Passion Rx and started giving it to my husband, who at first was reluctant to take it. Much to our surprise, he started feeling the positive effects of Passion Rx approximately one week later. He was taking one capsule every other day. We now enjoy a healthy, longer lasting and full filling love life once more. Thank you for putting forth the effort of finding natural remedies, that people who do have to be on medication can also take.

Q. Dear Dr. Sahelian, the information you provide on your website in very informative and outstanding! I have recommended your website to so many people within the last week you would think I'm making a profit. ! The reason I am writing is to inquire if Inositol would be a good supplemental for people who are suffering from Multiple Sclerosis. I read through the multiple sclerosis research that has already been performed but didn't see any clinical trials that have been conducted with diseases such as multiple sclerosis. I await an answer from your Superb Team.
   
   A. Thank you for the positive feedback. In March 2007 we searched Medline and could not find any clinical trials using inositol for the treatment of multiple sclerosis.


Q. This question is in regards to High Dose Thiamine to treat Multiple Sclerosis; The Dr. Klenner Protocol; using Thiamine and Niacin; with vitamin B12 and Vitamin C etc. My friend is a 58 year old lady with advanced multiple sclerosis has tried everything. Vitamins; Minerals; antibiotics
prescriptions; nothing has helped her; she is on LDN today, Low Dose Naltrexone. I do not recommend LDN to people because no research done. I was informed of The Dr. Klenner Protocol by a rep. from Twin Lab. I think Dr. Sahelian has the best website; easy to read and very informative. I was taking Sam-d and i didn't feel right; so I read the article reduced my dose and I am fine.

A. I am not familiar with the Dr. Klenner protocol for the treatment of multiple sclerosis with vitamins.

Q. I was researching MS and read your website, that "I am not familiar with the Dr. Klenner protocol for the treatment of multiple sclerosis with vitamins." If that is still true, here is what I've found. I hope this helps you and others. P. Brumm, From the Townsend Letter for Doctors & Patients, May 2003Letter to the Editor. Dr. F.R. Klenner's Protocol for MS. "Since the publication of my article Multiple Sclerosis Treated with Injectable Vitamin B1 and Liver Extract in the TLfDP in the Feb/March 2000 issue, I have received hundreds of calls from doctors and patients wanting more information on this safe, effective, and inexpensive treatment which reverses and cures Multiple Sclerosis. Dr. F.R. Klenner's medical paper was published in the June and July 2000 edition of the TLfDP. Dr. H.T.R. Mount's medical paper on the successful treatment of MS with vitamin B1 and liver extract was also published in the Feb/March 2000 issue of the TLfDP. It is interesting to note these two MDs were treating MS in the 1940s and '50s with the same two essential ingredients -- injectable B1 and liver extract -- yet they were unaware of each other. Dr. Klenner in Reidsville, North Carolina and Dr. Mount in Ottawa, Ontario. Dr. Mount felt paralysis was a contraindication to his type of therapy, whereas Dr. Klenner was treating MS patients with paralysis intensively and successfully with vitamins A, C, E and all of the B vitamins and other metabolites in addition to the vitamin B1 and liver extract injections."

A. Thanks for writing, it would be nice to have actual double blind studies to see if this protocol is of benefit.

Q. I just wanted to drop a brief positive comment on the Source Naturals Vitamin B Coenzyme product in relation to Multiple Sclerosis. I love this product. After reading an article on multiple sclerosis and nicotinamide, I tried taking a couple different brands of nicotinamide. I didn't care for them. Then, I saw that NAD (nicotinamide adenine dinucleotide 10 mg) was available in the Vitamin B Coenzyme product. I found this product immediately very beneficial. Is it just the natural vitamin B effects? Or is the NAD providing direct protection against my multiple sclerosis symptoms? That's hard to say, of course. But I have found this product invaluable, and I haven't had a multiple sclerosis attack since I've been on it. Also, I feel I've used it to "fend off" attacks. That said, I haven't had an MRI in quite a while. When you're doing well, you aren't motivated to get them. All of this could be coincidental. However, you may want to research this product and consider recommending on your multiple sclerosis page under your comments on nicotinamide. According to the article on nicotinamide, the protection provided by NAD was dose dependent, and would require tons more than the small 10 mg I am taking to match what the mice were given. Still, I can't deny the positive benefits it seems to provide, even if my comments are anecdotal and unproven by a trial. I cut the coenzyme B vitamin tablet into quarters, so I can take a quarter every few hours. It's a sort of makeshift time-release pill. Finally, I also take SAM-e with the coenzyme B vitamin. Too much SAM-e gives me insomnia, so I moderate to a couple days on, and a couple off. But the combination of SAM-e with the coenzyme B vitamin makes my body extremely efficient. I have a high metabolism and can burn through food fast, but this combination allows me to maintain balance which appears to be good for reducing my multiple sclerosis.
Q. Does dimethylglycine supplement help with multiple sclerosis?

A. We have not seen any studies using DMG supplements for the treatment of multiple sclerosis.

I stumbled upon your website this morning as I was reading more about bee pollen which I have been taking on and off for some time. I have decided to reintroduce it into my daily therapies. I just wanted to send along a note that I have had had MS since July 7, 2007 and have had fantastic results with NO PROGRESSION whatsoever. My therapy from day one has been a proper diet, exercise and supplements. I have never taken any MS drug - nor do I plan to. Every year my MRI is improving. My latest MRI in May 2009 showed no new spots and I have regenerated multiple lesions in my brain, which doctors here in Canada said was impossible. If you would like to connect, I would love to share my story. I have MRI's to prove my story as well. This is one of my missions in life to educate others experiencing MS. I decided to be the person to give them the other side that medical doctors do not usually do - providing the ability to heal yourself. I commend you for taking the extra time and initiative to test all supplements and therapies.

Thank you for the website. It is a good source of information, covering alternatives. Even though MS is difficult to control, doing nothing is not an option. I was diagnosed with MS in July of 2007 and wonder what you think of Chinese herbal concentrates via Sunrider products (Nuplus and Quinary powders)? Although I am using Copaxone, I am also trying to come up with a health plan.

I am not familiar with Nuplus or Quinary powders.

I have recently been diagnosed with Multiple Sclerosis. My doctor has suggested I supplement my diet with 8mg/day of octacosanol. He understands that it may help regenerate myelin sheaths. Is there any evidence of this?

A search on Medline in 2010 did not reveal any such studies.

My own successful program for MS consists of the prescription drug Copaxone combined with 7-keto DHEA, SAM-e, Alpha Lipoic Acid OR Padma Basic (I typically don't take these two together since the Padma thins the blood quite a bit over time), and nicotinamide [Vitamin B3] and Vitamin B1 (combined with several other B vitamins) in the Source Naturals Coenzymated B Complex product. But anyone considering the above supplement program should discuss with their physician.

When I was first diagnosed I read that the herb ashwagandha can have a beneficial effect and so I have taken this herb periodically but particularly during relapses for many years. I'm a sample size of just one, but my experience is that when I take ashwagandha it helps with nerve conductivity and energy. If I am experiencing some minor paralysis in my left arm and leg, this symptom is relieved after taking the herb for a period of days. Generally I continue taking the herb until the relapse has fully remitted. After 15 years, I feel that the frequency of relapses has been reduced and their severity has been mitigated. Perhaps your other readers may have similar experiences with the use of this herb? I would certainly be interested to know if that were true. In any event, it may be worth some consideration as a possible herbal treatment.
Great Results

Homeopathic

Cobra Venom 6x
Viscum Alb 6x
and other agents for treating
degeneration and neurological
demyelination

Use It or Lose It?
You’ve all heard the phrase “use it or lose it” before. But should it be applied to patients with chronic, debilitating illnesses? That’s an ongoing debate in the PatientsLikeMe forums. Take for example this discussion of cognitive difficulties in our Multiple Sclerosis Forum.

On the one hand, there’s the argument that brain exercises such as word games can help you recover or improve cognitive skills. For people who like the idea of challenging themselves to stay as sharp as possible, the phrase can be a motivating call-to-action. Others, however, are bothered by the phrase as they feel it implies that cognitive decline is the patient’s fault. Or that it makes it seem like “using” can stop the “losing,” which could be misleading in many cases.

Overall, this controversy is one that can help friends, family and the public at large be more sensitive to those with cognitive challenges due to their health condition. “Brain fog” is a common symptom of numerous chronic diseases, including multiple sclerosis and fibromyalgia. While there’s a natural instinct to encourage loved ones, it’s important to remember that every patient’s journey is an individual one, and no amount of “using it” can necessarily prevent cognitive symptoms.

What everyone seems to agree on, however, it that brain games and memory exercises certainly can’t hurt. What do you think? Join the discussion in our forum or share your thoughts in the comments section.
My mom has MS & I thought this information on multiple sclerosis & essential oils was so exciting and I wanted to be able to share it with you. I asked the authors permission and she said I could share it as I saw fit. So here it is:

Experiences with Multiple Sclerosis
~By Deb Carasiti and Terri Pace

We are happy to share what we have learned from Deb’s daughter, Candice, regarding her experiences with Multiple Sclerosis.

Back in 2006, Candice was diagnosed with Multiple Sclerosis. She refused to believe that her body had somehow betrayed her. Candice was diagnosed with relapse and remitting type and for that we were lucky! She went on medications, but when she found out where they came from, she was horrified and wanted to stop taking them. I suggested she try products from dōTERRA®. Since then (April 12, 2012), she has not taken any medicine and she feels incredible.

Here’s what she did:
Get on the Lifelong Vitality Program, of three supplements including essential fatty acids. 80% of the brain and myelin sheath are made up of fatty acids. Taking xeOmega (essential fatty acids and 9 essential oils) helps promote a healthy myelin sheath and brain functioning.
Essential Oils & Blends used include Frankincense, Lemon, Clove, Melaleuca, Balance, onGuard and Deep Blue (for inflammation). Not everyone is the same, so find what works for you.
Read more on www.everythingessential.me; there is a short video available which was helpful.
Other notes about Inflammation and Candida as sources of MS:
A 2011 study suggested that Cinnamon may have a role in reducing the kind of chronic inflammation that leads to various neurodegenerative diseases, such as Alzheimer’s disease, Parkinson’s disease, multiple sclerosis, brain tumor, and meningitis. Candida releases over 70 toxins by itself and, along with toxins from bacteria and the environment, can cause symptoms related to toxicity, such as muscle or joint pain, fatigue and other symptoms attributable to the body’s response to toxicity. Conditions like fibromyalgia, multiple sclerosis and rheumatoid arthritis may, in fact, be due to chronic candiditis.

Other Suggested Protocols:
First and foremost, get on Lifelong Vitality!
Do the Candida Cleanse with the Terrazyme, Zendocrine capsules, then the GX and PB Assist.
Eliminate white flour and white sugar; reduce acidic foods in diet
Use oils regularly which reduce inflammation. There are many; see the anti-inflammatory column of the ME book in appendix B

Saturday, 18 January 2014

DE-FLAMES 2: Putting out the flames

Stopping the slow burn of progressive MS? The DE-FLAMES study. #MSBlog #MSResearch

"Thank you for responding so positively to yesterday's post; it clearly needs some more explanation."

"Why combination therapies? There are two ways MS damages and or kills nerve fibres and their processes or axons. The first is by cutting them as part of acute inflammation; the so called inflammatory scissors. The second is a delayed slow process that takes months to years to play out and is called the slow burn. We think inflammation damages nerves and axons and leaves them vulnerable to degenerate in the future. The inflammation also changes the environment in the nervous system that contributes to this slow burn. What we need to do is protect nerves from this slow burn and change the environment. To change the environment we need to switch off inflammation and ongoing autoimmune response that can attack new areas. This is why we need at the base of the pyramid an anti-inflammatory therapy. When then need to add on a drug to protect the damaged vulnerable nerves from dying in the hope that they can be repaired by natural repair mechanisms within the nervous system. The repair includes remyelination, regrowth of nerve processes and adaptation and plasticity of the brain. The latter is when 'normal areas' take-over, or help augment, the function of damaged areas. The brain and spinal cord has reserve or extra capacity to do this. This reserve capacity is not limitless and with time
and increasing damage it runs out of capacity and progressive MS ensues. This is why we now know that progressive MS is not a process that starts late, it is there from the outset, hence the need for treating progressive disease throughout the course of the disease."

"What about primary progressive MS (PPMS)? We now know that PPMS and SPMS are the same disease and that PPMSers simply miss out on the relapsing phase of the disease. In my opinion they are unlucky, because relapses are a way of picking up MS earlier and treating it. By the time someone with PPMS presents they have run out of reserve capacity in at least one neurological system. I also beginning to realize that progressive MS affects different neurological systems at different rates. In other words reserve capacity may be exhausted in the motor system of the lower limbs first, but there is still reserve capacity in other systems that needs protecting, for example cognition or upper limb function. This is why the lessons learnt in relapse-onset disease are very relevant to people with PPMS. This is why Novartis, Roche and Teva are doing trials in PPMS; we are involved in all three of these programmes. I have therefore updated the slide to include the PPMS trials. You also need to
realize that this slide is about MS@UCLP and is only a small fraction of the global activity that is occurring in the field of progressive MS, which includes both PPMS and SPMS."

"The DE-FLAMES Trial above is looking at a putative neuro-protective agent, with a dual mode of action, that will added onto a 1st-line DMT in RRMS. We want to target RRMS as this is where MSers have the most to gain. Our primary outcome will be a reduction in brain atrophy; brain atrophy is an integrator of end-organ damage and correlates with disease progression, reduced quality of life and cognitive impairment."

"The question we would like to ask you is if you had RRMS would you be willing to take and additional drug on top of an anti-inflammatory DMT to see if we can slow the progressive phase of MS? We know that 1st-line licensed DMTs are not effective at slowing down brain atrophy."
Mayo Clinic (Rochester, MN) scientists have found that by administering certain human monoclonal antibodies directed against oligodendrocytes to mice with a chronic demyelinating disease, damage to the nervous system can be repaired. Previously, it was believed that damage to myelin was permanent and repair to the nervous system was not possible. In humans, damage to the myelin sheath can be caused by traumatic injury or by diseases such as multiple sclerosis, transverse myelitis, and other demyelinating or genetic conditions. The study appears in the June 6 edition of Proceedings of the National Academy of Sciences.

The researchers gave mice intracerebral injections of Theiler's murine encephalitis virus, which causes demyelination in the nervous system similar to the damage multiple sclerosis causes in humans. After the onset of demyelination, the mice were treated with two natural human monoclonal antibodies that bind to cells making myelin. This treatment promoted remyelination to an equivalent or greater extent than human intravenous immunoglobulin (IVIg), an established treatment for immune-mediated diseases.

"Clearly, our study shows that the two natural human antibodies, when introduced into mice that had nervous system damage, safely caused substantial repair to the myelin and the nervous system," says Moses Rodriguez, a Mayo Clinic neurologist and the principal author of the study. "This is a significant step forward in our understanding of the nervous system and the immune system. Whereas we know that the immune system can have a protective effect on the body, we now are beginning to discover that the immune system may be harnessed to effect repair to the nervous system in the mouse model.”

The mechanism mediating repair by these antibodies is unclear at present, and an understanding of the process is further confounded by the fact that not all surface-binding antibodies have this effect. However,
the authors discuss two possible scenarios—a direct effect on myelin production by the interaction of the antibody with the cell surface, or an indirect effect, in which the presence of antibody on the surface signals the removal of damaged cells, allowing renewal to proceed.

Funding for the first stage of research was provided by the National Institutes of Health, the National Multiple Sclerosis Society, the Mayo Foundation, and Acorda Therapeutics. Acorda Therapeutics is a biotechnology company that develops therapeutic products for spinal cord injury and other central nervous system conditions. Acorda is planning to complete the preclinical work necessary before human clinical trials can be designed. This work includes scaling up manufacturing of the antibody to produce quantities sufficient for human clinical trials, and conducting formal toxicity and pharmacokinetic studies.

Ron Cohen, Acorda's president and CEO, states, "Acorda is proud of its collaboration with Dr. Rodriguez and Mayo Clinic. The identification of this human monoclonal antibody is a significant step forward in its development as a potential therapy for people with demyelinating conditions, such as multiple sclerosis."

For more information: Moses Rodriguez, Department of Neurology, Mayo Medical and Graduate Schools, Rochester, MN 55905. Email: rodriguez.moses@mayo.edu.

Demyelinating disease

Classification and external resources

Photomicrograph of a demyelinating MS-Lesion.

Immunohistochemical staining for CD68 highlights numerous
A **demyelinating disease** is any *disease* of the *nervous system* in which the *myelin* sheath of *neurons* is damaged. This damage impairs the conduction of signals in the affected nerves. In turn, the reduction in conduction ability causes deficiency in sensation, movement, cognition, or other functions depending on which nerves are involved.

Some demyelinating diseases are caused by *genetics*, some by *infectious* agents, some by *autoimmune* reactions, and some by unknown factors. *Organophosphates*, a class of chemicals which are the active ingredients in commercial insecticides such as *sheep dip*, *weed-killers*, and flea treatment preparations for pets, etc., will also demyelinate nerves. *Neuroleptics* can also cause demyelination. Lysophosphatidylcholine causes demyelination and is in unnaturally high amounts in foods with lecithin treated with the enzyme phospholipase (enzyme-modified foods) and as lysolecithin in products such as make up and personal care products. (See lysophosphatidylcholine.) The precise mechanism of *demyelination* is not clearly understood but there is good evidence that the body's own immune system is at least partially responsible. *Acquired immune system* cells called *T-cells* are known to be present at the site of lesions. Other immune system cells called *Macrophages* (and possibly *Mast cells* as well) also contribute to the damage.
Causes

Some demyelinating diseases are caused by genetics, some by infectious agents, some by autoimmune reactions, some by exposure to chemical agents, and some by unknown factors.

Evolutionary considerations

The role of prolonged cortical myelination in human evolution has been implicated as a contributing factor in some cases of demyelinating disease. Unlike other primates, humans exhibit a unique pattern of postpubertal myelination, which may contribute to the development of psychiatric disorders and neurodegenerative diseases that present in early adulthood and beyond. The extended period of cortical myelination in humans may allow greater opportunity for disruption in myelination, resulting in the onset of demyelinating disease. Furthermore, it has been noted that humans have significantly greater prefrontal white matter volume than other primate species, which implies greater myelin density. Increased myelin density in humans as a result of a prolonged myelination may therefore structure risk for myelin degeneration and dysfunction. Evolutionary considerations for the role of prolonged cortical myelination as a risk factor for demyelinating disease are particularly pertinent given that genetics and autoimmune deficiency hypotheses fail to explain many cases of demyelinating disease. As has been argued, diseases such as multiple sclerosis cannot be accounted for by autoimmune deficiency alone, but strongly imply the influence of flawed developmental processes in disease pathogenesis. Therefore, the role of the human-specific prolonged period of cortical myelination is an important evolutionary consideration in the pathogenesis of demyelinating disease.

Signs and symptoms

Symptoms that present in demyelinating diseases are different for each condition. Below is a list of symptoms that can present in a person with a demyelinating disease:

- Blurred double vision
- Ataxia
- Clonus
- Dysarthria
- Fatigue
- Clumsiness
- Hand paralysis
- Hemiparesis
- Genital anaesthesia
- Incoordination
- Paresthesias

- Ocular paralysis
- Impaired muscle coordination
- Weakness (muscle)
- Loss of sensation
- Impaired vision
- Neurological symptoms
- Unsteady gait
- Spastic paraparesis
- Incontinence
- Hearing problems
- Speech problems

**Diagnosis**

Below are various methods/techniques used to diagnose Demyelinating Diseases.

- Exclusion of other conditions that have overlapping symptoms[8]
- **Magnetic Resonance Imaging** (MRI) is a medical imaging technique used in radiology to visualize internal structures of the body in detail. MRI makes use of the property of nuclear magnetic resonance (NMR) to image nuclei of atoms inside the body. This method is unreliable because MRIs assess changes in proton density. “Spots” can occur as a result of changes in brain water content.[8]
- **Evoked potential** is an electrical potential recorded from the nervous system following the presentation of a stimulus as detected by electroencephalography (EEG), electromyography (EMG), or other electrophysiological recording method.[8]
- **Cerebrospinal fluid analysis** (CSF) can be extremely beneficial in the diagnosis of central nervous system infections. A CSF Culture examination may yield the Microorganism that caused the infection.[8]
- **Quantitative proton magnetic resonance spectroscopy** (MRS) is a non-invasive analytical technique that has been used to study metabolic changes in brain tumors, strokes, seizure disorders, Alzheimer’s disease, depression and other diseases affecting the brain. It has also been used to study the metabolism of other organs such as muscles.[8]
- **Diagnostic Criteria** refers to a specific combination of signs, symptoms, and test results that the clinician uses in an attempt to determine the correct diagnosis.[8]
Treatment

Treatment typically involves improving the patient's quality of life. This is accomplished through the management of symptoms or slowing the rate of demyelination. Treatment can include medication, lifestyle changes (i.e. quit smoking, adjusting daily schedules to include rest periods and dietary changes), counselling, relaxation, physical exercise, patient education and, in some cases, deep brain thalamic stimulation (in the case of tremors). The progressive phase of MS appears to be driven by the innate immune system, which may directly contribute to the neurodegenerative changes that occur in progressive MS. Until now, there are no therapies that specifically target innate immune cells in MS. As the role of innate immunity in MS becomes better defined, it may be possible to better treat MS by targeting the innate immune system.

Treatments are patient-specific and depend on the symptoms that present with the disorder, as well as the progression of the condition.

Prognosis

Prognosis depends on the condition itself. Some conditions such as multiple sclerosis depend on the subtype of the disease and various attributes of the patient such as age, sex, initial symptoms and the degree of disability the patient experiences. Life expectancy in Multiple sclerosis patients is 5 to 10 years lower than unaffected people. MS is an inflammatory demyelinating disease of the central nervous system (CNS) that develops in genetically susceptible individuals after exposure to unknown environmental trigger(s). The bases for MS are unknown but are strongly suspected to involve immune reactions against autoantigens, particularly myelin proteins. The most accepted hypothesis is that dialogue between T-cell receptors and myelin antigens leads to an immune attack on the myelin-oligodendrocyte complex. These interactions between active T cells and myelin antigens provoke a massive destructive inflammatory response and promotes continuing proliferation of T and B cells and macrophage activation, which sustains secretion of inflammatory mediators. Other conditions such as central pontine myelinolysis have about a third of patients recover and the other two thirds experience varying degrees of disability. There are cases, such as transverse myelitis where the patient can begin recovery as early as 2 to 12 weeks after the onset of the condition.

Epidemiology

Incidence of demyelinating diseases vary from disorder to disorder. Some conditions, such as Tabes dorsalis appear predominantly in males and begins in mid-life. Optic neuritis on the other hand, occurs preferentially in females typically between the ages of 30 and 35. Other conditions such as
multiple sclerosis vary in prevalence depending on the country and population.[15] This condition can appear in children as well as adults.[11]

Type

Demyelinating diseases can be divided in those affecting the central nervous system and those presents in the peripheral nervous system, presenting different demyelination conditions.

The disorders affecting the CNS include:

- **Multiple sclerosis**, together with Devic's disease and other disorders with immune system involvement called inflammatory demyelinating diseases.
- CNS **Neuropathies** like those produced by Vitamin B12 deficiency
- **Central pontine myelinolysis**
- **Myelopathies** like Tabes dorsalis (syphilitic Myelopathy)
- **leukoencephalopathies** like Progressive multifocal leukoencephalopathy
- **Leukodystrophies**

These disorders are normally associated also with the conditions **Optic neuritis** and Transverse myelitis, which are inflammatory conditions, because inflammation and demyelination are frequently associated.

Demyelinating diseases of the peripheral nervous system include:

- **Guillain-Barré syndrome** and its chronic counterpart, chronic inflammatory demyelinating polyneuropathy
- **Anti-MAG peripheral neuropathy**
- Charcot-Marie-Tooth Disease
- **Copper deficiency**
- **Progressive inflammatory neuropathy**

Research

Research is being conducted in a variety of very specific areas. The focus of this research is aimed at gaining more insight into how demyelinating disorders affect the central nervous system and peripheral nervous system,[16][17][18][19][20] how they develop and how these disorders are affected by various external inputs.[21][22][23][24][25] Much of the research is targeted towards learning about the mechanisms by which these disorders function in an attempt to develop therapies and treatments for individuals affected by these conditions.
Insights

Currently it is believed that N-cadherin plays a role in the myelination process. Experimentation has shown that N-cadherin plays an important role in producing a remyelination-facilitating environment.\[^{18}\] It has been shown in animal models that there is a direct correlation between the amount of myelin debris present and the degree of Inflammation observed.\[^{17}\]

Effects of environmental inputs

Experimentation has shown that manipulating the levels of thyroid hormone can be considered as a strategy to promote remyelination and prevent irreversible damage in Multiple sclerosis patients.\[^{19}\] N-cadherin agonists have been identified and observed to stimulate neurite growth and cell migration, key aspects of promoting axon growth and remyelination after injury or disease.\[^{21}\] It has been shown that intranasal administration of aTf (apotransferrin) can protect myelin and induce remyelination.\[^{23}\]

Much of the research referenced in this section has been conducted in 2012 and represents very new information about demyelinating diseases and potential therapies for them.

In Other Animals

Demyelinating diseases/disorders have been found worldwide in various animals. Some of these animals include mice, pigs, cattle, hamsters, rats, sheep, Siamese kittens, and a number of dog breeds (including Chow Chow, Springer Spaniel, Dalmatian, Samoyed, Golden Retriever, Lurcher, Bernese Mountain Dog, Vizsla, Weimaraner, Australian Silky Terrier, and mixed breeds).\[^{26}\][^27]

Another notable animal found able to contract a demyelinating disease is the Northern Fur Seal. Ziggy Star, a Northern Fur Seal, has been a patient at The Marine Mammal Center for the past several months and has been noted as the first case of such disease in a marine mammal. She will be transported to Mystic Aquarium & Institute for Exploration for lifelong care as an ambassador to the public.\[^{28}\]

See also

- Multiple sclerosis borderline
- The Lesion Project (multiple sclerosis)
- The Myelin Project
- Myelin Repair Foundation

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Natural Remedies For Lou Gehrig’s Disease (ALS)

Two years ago Carol was diagnosed with Lou Gehrig’s disease, ALS. In January of 2012 she started using these natural remedies for Lou Gehrig’s disease and below you can read as well as listen to her share her amazing results.

What is Lou Gehrig’s Disease (ALS)?

Amyotrophic lateral sclerosis (ALS), often referred to as “Lou Gehrig’s Disease” is a progressive neurodegenerative disease that affects nerve cells in the brain and the spinal cord. Motor neurons reach from the brain to the spinal cord and from the spinal cord to the muscles throughout the body. The progressive degeneration of the motor neurons in ALS eventually leads to their death.

When the motor neurons die, the ability of the brain to initiate and control muscle movement is lost. With voluntary muscle action progressively affected, patients in the later stages of the disease may become totally paralyzed.
This neurological degenerative disorder is almost always fatal & has no known cure or treatment. Usually patients are expected to only live 2 to 5 years after being diagnosed with ALS. But Carol has been taking the “Triangle of Life & TS-X” starting in January 2012 & has seen such improvement with her health that all of her Drs are amazed.

Before taking these natural remedies for Lou Gehrig’s disease, she was confined to a wheelchair, but is now getting up and doing housework, and driving. Incredible!

Last year she celebrated her Birthday in the hospital but this year she was home with family and friends filling the room with gratitude!

Natural Remedies For Lou Gehrig’s Disease (ALS)

Here is a list of what Carol is using and how to add these to your daily life and improve your health naturally.

TSX: SISEL has recently created a unique formulation known as TS-X (Telomere Support Extreme). This product fights the forces that degenerate us, while simultaneously supporting the systems that maintain and regenerate. TSX uses nutraceutical power from concentrated plant extracts proven to support telomeres, which are the protective end caps at the end of our chromosomes.

Triangle of Life Nutrition
Eternity supplement contains pure trans resveratrol naturally proven to have amazing cardiovascular benefits & increase cellular energy among 1,000’s of other health benefits.

Fucoydon contains Fucoidan, scientifically proven to be Mother natures most powerful anti-inflammatory.

These natural remedies have been used for Lou Gehrig’s disease & have helped people with many different diseases like Sarcoidosis, diabetes, Chronic Fatigue, arthritis, cancer, Raynaud’s and many more, live a better quality of life. Look under the testimonials tab above.

Simply put they give our body the nutrients it needs to heal itself. We are so honored and excited to share these supplements and this company with people and we hope you will consider looking into these supplements and how they may improve your quality of life.

This is an update from Carol as of 04/03/2013:

Hi Dani….how lovely to hear from you and thank you for your kind words. ALS is a very insidious disease. You have good days and then you can have many, many days where just taking a shower will exhaust you. That is why Sisel has been such a God send. I take TSX which I KNOW is helping with overall strength and supporting my organs. ALS is like being in a fight 24-7 with no time out to recuperate. It devastates the body so I believe the TOL is critical in supporting overall health. I am already past my “expiration date” so everyday is a gift. I am NOT in a wheelchair and I am still driving which gives me my independence.

Dani, I also believe the Body Shield is very important because with ALS, I don’t have the ability to detoxify like healthy people and I take the Protein shake everyday. I do not need to lose any weight but I MUST preserve muscle mass. With ALS the brain sends signals to destroy muscles. As I said, it is a constant battle. I am also on an IV of Glutathione every other day. Interestingly enough, the Brain Vitality has Glutathione in it so I double up on the Brain Vitality. I hope this helps you, Dani. I am so sorry that you know people with ALS. Thanks for all you do xoxoxo
TREATMENT OF ALS WITH CHINESE MEDICINE

by Subhuti Dharmananda, Ph.D., Director, Institute for Traditional Medicine, Portland, Oregon

Note: This article first appeared in March 1999, but additional information has been gained since then, particularly about the treatment method of Cheng Yongde, who specializes in treating ALS in China. In addition, drug therapies that had looked promising just a few years ago have turned out to be disappointing, making use of Chinese medicine of continued special interest.

BACKGROUND

ALS (amyotrophic lateral sclerosis) was first identified about 130 years ago. During the past 60 years it has been called Lou Gehrig's disease, named for the most famous of its victims (1903-1941), who had been a popular and vigorous baseball player until the disease struck. However, as memory of his life fades, the term ALS has become the preferred designation. This is a rare disease: in the U.S. it affects about 1-2 persons per 100,000 each year, with a cumulative total of about 25,000-30,000 living with the disease at any one time. It most often occurs in persons over 50 years of age (rarely before age 40), with more men than women affected. It is a degenerative disorder of the central nervous system that leads to weakening and wasting of the muscles. Depending upon which neurons are first affected, the disease will manifest differently among individuals, but eventually all four limbs become involved and there may be considerable cramping and stiffness that develops with the partial loss of nervous control over the muscles. A normal course of disease progression is to reach the point that respiration is affected within 5 years after the initial symptoms and diagnosis, causing death. There is about a 5% rate of survival past 12 years, and some people live more than 20 years, while others have rapid disease progression within just 2 years.

Riluzole was the first drug for ALS approved by the U.S. FDA. The drug inhibits glutamate release; glutamate is one of the major neurotransmitters and is an essential part of nervous system function. Excess levels of this amino acid are thought to be involved in ALS and some other neurological diseases, by causing nerve damage and death. Riluzole is far from an ideal therapy: it can have side effects (nausea, vomiting, or worsening of disease condition), it is quite expensive, and the survival effects are an average 2-3 month extension in life span. New drugs have been disappointing. For example, Myotrophin (insulin-like growth factor-I) had been used as an off-label application for ALS since 1991, apparently slowing the progression of muscle...
deterioration. Submitted for drug approval for ALS treatment five years ago, the FDA delayed granting approval because it did not have adequate evidence of efficacy and this drug appears to be out of further development for ALS, having displayed only modest results at best. Another example is BDNF (brain-derived neurotrophic factor), which appeared to slow the deterioration in breathing capacity, but further tests failed to confirm the result and research on it has been discontinued.

A growing body of research suggests that ALS, especially the hereditary type that appears at younger age, is associated with a defect in the enzyme called superoxide dismutase (SOD), an antioxidant system, in which the SOD produced by the body changes from an antioxidant (that is protective to nerves) to a pro-oxidant that damages the nerves. Thus, antioxidant therapies might help slow progression of the disease, at least in individuals with this genetic defect. The possibility of beneficial effects from antioxidants has been proposed, but has not been confirmed. Indeed, many people with ALS turn to taking nutritional supplements rich in antioxidants but do not report significant improvements; formal studies have yet to be undertaken.

Due to the limited impact of readily available therapies, patients and their families may opt to seek out Oriental medical assistance, which is becoming more accessible every year as the number of practitioners grows (now at about 15,000 in the U.S.). Practitioner experience with ALS, due to the rareness of the disease, has been limited; fortunately, there is some information from China available to help guide treatment strategies.

**ACUPUNCTURE**

Acupuncture is thought to influence physiological functions via the nervous system, and especially by promoting blood circulation (see: *Introduction to acupuncture*). Nervous system disorders, including various paralytic diseases, such as stroke, traumatic paraplegia, and progressive myodystrophies, are treated by acupuncture in China. It is thought that promoting the microcirculation (capillary bed circulation) to the spinal cord can enhance the natural regenerative capabilities that exist. From the traditional medicine point of view, acupuncture can open the blocked meridians, including the one running through the spinal column known as the *dumai* or governing vessel (*du* = govern, supervise, direct; *mai* = channel, vessel, meridian). Whether neurons are damaged by physical trauma, blocked circulation of blood (as occurs in stroke), or by biochemical processes (e.g., oxidation reactions, excess glutamate), the principle of treatment via acupuncture remains the same. Two techniques are especially relevant to central nervous system diseases: scalp acupuncture and spinal acupuncture. Both involve treatments on or along side the governing vessel, which runs up the spine to the head, running over the center of the scalp (see Figure 1).
Scalp acupuncture (see: Synopsis of scalp acupuncture) is applied in the treatment of all neurological disorders. Most experience with this technique has been in treatment of stroke, but scalp acupuncture has shown some promise in treating degenerative neurological diseases as well. Zhu's Acupuncture Medical and Neurology Clinic in San Jose, California (www.scalpacupuncture.org), headed by Zhu Mingqing, provides scalp acupuncture treatments. Many acupuncturists in the U.S. have learned this method of treatment and can administer it closer to the home of the person with ALS, who will need treatment regularly for many months. The scalp acupuncture technique is best applied while movement is still close to normal, as the effects are most dramatic when the person moves of the affected body parts while the scalp needles are being manipulated. While there are several zones for treatment on the scalp, a major focal point of this acupuncture technique is threading needles along the scalp on either side of the Governing Vessel at the top of the head near the point baihui (GV-20).

For spinal acupuncture, two doctors have given some detailed recommendations: Wang Leting (1894-1990), whose method is described in the book Golden Needle Wang Leting (1) and Cheng Yongde, a specialist in encephalatrophy, Parkinson's disease, and ALS, currently working at the Municipal Hospital of TCM of Haimen (near Shanghai) in Jiangsu Province. Cheng published an article on treating 46 patients with ALS in a 1998 issue of the Shanghai Journal of Acupuncture and Moxibustion, with a shortened version published in the English-language edition of that journal. An extended version of the article was published in the Zhejiang Journal of Integrating Traditional Chinese Medicine and Western Medicine in 1999.

THE METHOD OF WANG LETING
Spinal treatment focuses on points of the governing vessel on the back, mainly from fengfu (GV-16), a point on the neck about 1 inch into the hairline, down the spine to yaoyangguan (GV-3), at the lower lumbar region of the spine (between L4 and L5 of the lumbar vertebrae). Fengfu is the point at which the governing vessel is said to enter the brain.

Wang Leting performed acupuncture in many cases of stroke and paraplegia utilizing these spinal points. His work on paraplegia is relevant to ALS, because the basis for the treatment is not dependent on the precise cause of the disorder, but, rather, its location of the pathology in the spine. His main methods for treating paralytic disorders is to administer acupuncture to a group of points on the governing vessel as well as a group of the Hua Tuo points on either side. The set of points he recommends for treating the governing vessel includes baihui (GV-20) at the top of the head and changqiang (GV-1) just below the tip of the coccyx, and then this series along the spine:
This group of 13 points constitutes one treatment, which can be treated along with and alternated with other point sets that are deemed necessary, especially the *Hua Tuo* points. Administering acupuncture each day, alternating treatment between two sets of points so that the treatment on two consecutive days is not a repetition, is standard practice in China for treating serious diseases.

Wang preferred treating the *Hua Tuo* points slightly closer to the spine than their usual location, namely, at 0.3 *cun* rather than 0.5 *cun* lateral to the spine (see: *Hua Tuo*). He would treat every other vertebral site, starting with the lower edge of the second thoracic vertebra down to the 4th lumbar vertebra, a total of 16 points treated bilaterally. This needling on both sides of the governing vessel is supposed to have the effect of promoting qi circulation that crosses the damaged area. The same basic tactic was used in a recent clinical report on treating traumatic paraplegia (4), in which the main points chosen were the *Hua Tuo* points and the bladder channel points that lie lateral to them, just a little further from the spine (1.5 *cun*), on the back.

**THE METHOD OF CHENG YONGDE**

Cheng Yongde noted that in the past Chinese physicians mainly relied on the ancient doctrine of the *Niejing Suwen* (ca. 100 A.D.) in treating diseases where the muscles atrophy. The basic approach they take when encountering a disease that causes the muscles to weaken and atrophy is to direct treatment at enhancing the function of the stomach/spleen system, rooted in the concept that the spleen governs the muscles. By treating the associated meridians (e.g., yangming meridian), the muscles would be nourished and invigorated. Cheng believes, instead, that ALS is due to a blockage of the governing vessel, leaving it unable to regulate the qi and blood flowing to the viscera; then, the limbs are not adequately nourished by the flow of qi and blood. Therefore, using acupuncture to unblock the governing vessel is the key to therapy. This is his 1999 report (edited slightly).

ALS is an illness of the motor neurons. The pathological alteration affects mainly the anterior kerato-cell of the spinal cord, motor neural kernel of the lower brain stem, and the motor cortex corpus-vertebral cell of the brain. As a result of a degenerative change of the myelolateral cord, the spinal cord becomes atrophic and smaller; further, degenerative damage of the anterior kerato-cell and the motor neural
The kernel of the medulla oblongata and pons varolii occurs. The muscles then atrophy due to lack of control by the nerves that influence their function. Traditional Chinese medicine ascribes it to the category of wasting syndromes (weizheng). The author had treated total of 46 ALS patients from 1980 to 1996, and this is the clinical report.

The group of patients comprised 27 males and 19 females (3 patients were aged 21-30 years, 4 aged 31-40, 10 aged 41-50, 25 aged 51-60, and 4 aged over 61). As judged by initial symptoms, two patients had the bulbar type, 8 had the cervical medulla type, 13 had the lumbar medulla type, and 23 had the mixed type of ALS. Pathogenesis after initial appearance of the disease shows cryptic and gradual progression, with clinical symptoms associated with the lesions of either the upper and lower motor neurons or both; the electromyogram displayed lesions of the motor neuron. The indicators for this group of patients were in accord with the diagnostic criteria for ALS, so the diagnosis was clear and definite.

Acupuncture was performed in a manner unique to each individual but the acupoints were mainly fengfu (GV-16), dazhui (GV-14), and the Hua Tuo points, used together with both local and distal points (mainly jing points) on the meridians traversing the muscular atrophic part. The acupoints were arranged in groups, using one set one day, and another set the next day, and then repeating this basic treatment. For Hua Tuo points, about eight points would be needled bilaterally along the area of the spine affected by the disease. Needle stimulation was adjusted to apply tonification or draining with the needle directed along or against the direction of the meridians, the technique selected to enhance and normalize the flow of meridian qi. The first course of treatment for each patient was 1-3 months, needling once per day or every other day; this was followed by the second and the third course administered according to the patient needs (in terms of frequency of treatment and overall number of courses).

Patients also took the formula Sanqi Fuwei Ruansuo Wan (Atrophy Restoring and Cord Softening Pill) designed by the author, comprised of tien-chi ginseng, deer horn glue, and processed pangolin scale as the main ingredients. The herbs are ground to powder, made into pills and taken 10g a time, 3 times a day, for a duration of 6-24 months.

After applying acupuncture to open the governor vessel, and using the herb pill to tonify and disperse slowly, physical exercise therapy was employed to promote
restoration of physical function. Patients were trained to undertake an improved *Ba Duan Jin Qi Gong* (literally, eight pieces of brocade exercises) with emphasis on concentrating one's mind at the *dantian* (just below the umbilicus). These physical exercises, which included having the patients make some wide circular motions with the arms and torso and performing some deep breathing exercises, could promote restoration of the atrophic muscles and sustain normal functions of the non-atrophic muscles.

The results of therapy were classified into four categories: **clinical remission**, where atrophic muscles were largely restored, the patient then being able to manage daily activities and take place in social activities, or being able to survive with the disease more than ten years after diagnosis; **markedly effective**, where the ability of managing daily activities was enhanced somewhat, or being able to survive more than five years after diagnosis; **fairly effective**, muscular atrophy slows down, with survival over three years; **ineffective**, symptoms do not significantly improve with survival less than three years. Of the 46 patients, 6 appeared to have clinical remission; for 11 the treatment was markedly effective; for 24 it was fairly effective, and for 5 it was ineffective (the patients died within a few months time).

ALS is a recalcitrant atrophic disease. In ancient times, many practitioners treated the atrophic syndrome from the point of view that since the spleen governs the muscles, "choose the *yangming* meridian alone" as the therapeutic principle, originally described in the *Neijing* where it was taught that deficiency in this meridian yielded flaccid paralysis. This viewpoint emphasizes only the nutritional role of the spleen on the muscles (extracting the essence of food and water), but neglects modulating the distribution of the vital essence to the governing vessel. The governing vessel is an extra meridian, independent of the visceral main meridians. So, to treat certain atrophic syndromes, especially ALS, by the spleen tonification method seems quite hopeless. Planning the treatment for atrophy through the governing vessel goes beyond the limited framework of "choose the *yangming* meridian alone" and reliance on the doctrine that "the spleen governs the muscles." It has opened up a new way for the treatment of ALS, consistent with our modern knowledge that the disease affects the spinal cord first, not the muscles first.

The limbs are the root of all yang, which are in close relationship with governing vessel being the sea of yang channels running through the vertebra to govern all meridians. If the limbs are not regulated through the governing vessel, the visceral qi and blood are unable to nourish the limbs through the main meridians. In the case where the governing vessel becomes gradually blocked, its ability to control the limbs would be limited progressively,
and the muscles of the limbs become withered due to insufficient nourishment by the visceral qi and blood. Eventually modulation by the governing vessel is abolished, the limbs, and even all the other muscles of the body, become atrophied. So, the treatment of ALS is based upon opening the governing vessel.

The governing vessel is nourished by the meridian qi of the central viscera. If the viscera become weakened, the essence of the main meridians becomes deficient and is unable to nourish the governing vessel sufficiently, and this process will result in debility. It is a well-known doctrine that "the site with extreme deficiency is the usual place of invading pathogens." The external pathogens include the six excesses (wind, cold, summer-heat, dampness, dryness, and fire) that exploit bodily weaknesses to invade into the governing vessel and are retained, unable to leave. This retention of pathologic influence as a result of weakness of the governing vessel induces accumulation of phlegm and dampness, stasis of qi and blood, and toxicity and heat lingering for a long time. In such case, there is a deficiency of the normal qi and excess of the pathogenic factors (external evils). By this mechanism, the governing vessel becomes blocked; it then loses its ability to regulate the muscles, thus resulting in amyotrophy.

"Treatment of diseases ought to be aimed at their roots." One must first dredge the governing vessel, relying upon this meridian to regulate and improve the nutrition of the muscles. This approach should effectively limit the development of sclerema of the lateral cord, to limit, halt or even reverse the progressive amyotrophy in this disease.

The principal therapeutic means employed in these cases was acupuncture that was focused on dredging the governing vessel. The major acupoints were needled very deeply, that being a key to dredging the governing channel. The author needled the fengfu (GV-16) point slowly and deeply, to a depth of up to 10 cm (aimed downward to pass along the spinal cord) more than thousand times without having any accidents. However, the acupuncture practitioner must pay much attention to the details of the needling [see note below]. Dazhui (GV-14) was also needled slowly and
deeply. The administration of herb pills and use of physical exercises should adhere to the principle of getting the governing vessel strong and being dredged. The three therapeutic measures—acupuncture, herbs, and exercises—should be carried out successively to get the desired results, though whether the latter two means are essential for getting better results with ALS is suggested but needs further clarification.

**Noted by the journal editor:** needling of the *fengfu* (GV-16) acupoint to a depth of around 10 cm (more than 3 cun) was solely used in clinical practice by the author of this article and is not common practice. The editors consider that needling at the *fengfu* point with an excessive depth might put the patient at the great risk; if readers want to adopt this acupuncture therapeutic method, they must contact the author first before attempting to employ this needling maneuver in clinical practice. Usual needling of *fengfu* is to a depth of 0.5-0.8 cun, though points along the spinal column are sometimes needled to a depth of 1.0-1.5 cun (see Figure 2 for a similar type of deep needling at GV-15); even at this depth, special training in needed and precautions must be taken.

In the book *Acupuncture Treatment for Paralysis* (4), the therapy for paraplegia due to spinal injury is somewhat similar to that recommended by Wang Leting and Cheng Yongde. The authors recommend needling the governing vessel just above and just below the site of injury and needling the *Hua Tuo* points on both sides. Adjunctive points are treated for the specific areas or body functions affected, or for the general purpose of promoting the production and circulation of qi and blood.

**HERBS**

Herbal therapies for ALS are aimed at nourishing the kidney to benefit the marrow and spinal cord, and at vitalizing blood to soften the sclerosis and to invigorate the circulation to the affected muscles. The traditional formula most often mentioned for treatment of wasting syndrome is *Huqian Wan* (Hidden Tiger Pill), which is sometimes modified by adding additional tonic herbs (see: [Chinese herbal treatment of multiple sclerosis and other flaccidity syndromes](#)). A key herb in this formula is tortoise shell, which is used for flaccidity and debility, especially of the lower limbs. However, the basis for the design of *Huqian Wan* is the concept that a heat-type disease damages the yin fluid, leading to the atrophy of muscles. For this reason, *Huqian Wan* contains rehmannia, tortoise shell, and peony to nourish and retain the yin essence, and anemarrhena and phellodendron to quell the deficiency fire of the kidney that threatens the remaining yin. Although this mechanism may apply to some cases of ALS, there is no clear evidence that a heat-type syndrome precedes its development or that yin deficiency heat dominates the syndrome. Thus, treating
flaccidity as if it is due to yin deficiency with heat may-like the idea of treating it as if it is due to spleen deficiency, with failure to nourish and generate the muscles-be inadequate for diseases of the spinal cord. So, other ideas must also be considered.

Regeneration of the damaged nerves and bones is often attempted with deer antler or its gelatin, which is considered one of the main herbs for tonifying the governing vessel. Tortoise shell and antler gelatin were used in a case study involving ALS. The formula, provided to a small number of patients, had deer antler gelatin, tortoise shell, rehmannia, tiger bone, dipsacus, cuscuta, eucommia, atractylodes, licorice, (with astragalus added for a later prescription), eucommia, achyranthes, tang-kuei, peony, phellodendron, anemarrhena, and citrus (5). As described in the case of paraplegia due to injury (6): "The governing vessel travels along the back and is in charge of the yang qi of the whole body. Damages in the governing vessel cause yang deficiency." For this reason, many modern formulas for flaccidity and wasting, such as this one, also include yang tonic herbs, such as dipsacus, deer antler, cuscuta, and eucommia.

A formula Yisui Tang (Boost the Marrow Decoction) used for progressive spinal myodystrophies, including ALS, is similarly formulated: it is made with tortoise shell, deer antler gelatin, rehmannia, dipsacus, cuscuta, atractylodes, licorice, astragalus, psoralea, cibotium, achyranthes, tang-kuei, peony, millettia, phellodendron, and anemarrhena. This combination, given as a decoction with 9-15 grams of each ingredient (except only 5 grams each of phellodendron and anemarrhena), was used to treat 110 patients, of which 30 were diagnosed as having ALS (7).

As pills, the herbs are taken in doses of 3-9 grams each time, 2-3 times daily (total dose 9-18 grams per day), while the decoctions are taken in high dosage of 150-180 grams per day. The clinical reports in which the herbs were utilized claimed benefits for ALS patients, though the small number of patients involved makes it somewhat difficult to interpret the results.

A disadvantage of herb-only protocols in the West is that it is too easy for a patient to become discouraged if there are a few difficult days and then stop taking the herbs. This easy discontinuance of therapy occurs especially because herbal therapy is not a routine practice here, so there is little support for continuing treatment. With regular office visits for acupuncture, it is easier to adjust the herbal treatment as needed and to give immediate symptom relief with the acupuncture while, at the same time, encouraging compliance with the herbal protocol.

REFERENCES


APPENDIX. ITM FORMULARY

A version of *Huqian Wan* is produced as Tortoise Shell Tablets (Seven Forests); Antler 8 (Seven Forests) provides a significant dose of deer antler, and additional deer antler is available in White Tiger Pantosterone. Tien-chi Ginseng (Pine Mountain) is available as a single herb tablet, and herbs for tonifying the governing vessel are included as major ingredients of Eucommia 18 (Seven Forests). Antioxidants are obtained with the White Tiger formulas Quercenol, Cartaequin, Calmagnium, and Alpha-Curcumone.
**Figure 1:** Points on the Governing Vessel (*Du Mai*). The points are labeled either DU, as in this illustration, or GV, as in the text.
**Figure 2:** Location for needling *yamen*, a point on the governing vessel midway between *fengfu* (DU-16) above it and *dazhui* (DU-14) below it. This illustration shows the maximum depth of needling and the position of the patient (sitting up, with head bent forward) commonly used during this treatment. Deeper needling is done at an angle, so that the needle does not penetrate the spinal cord. Practitioners should avoid deep needling of these points unless adequate training has been undertaken.

*July 2003*
Seeking a Cure for Lou Gehrig's Disease

Posted October 13, 2008

Li Niu, Ph.D., State University of New York, Albany, New York

Amyotrophic lateral sclerosis (ALS), or Lou Gehrig's Disease, is an incurable, neurodegenerative disorder that results in paralysis and death. Research to cure ALS is especially relevant to members of the U.S. Military, who are statistically more likely to
develop ALS than the general public. The cause of ALS is unclear, but it is known that excessive glutamate receptor activity plays an important role in triggering motor neuron death, which causes the loss of muscle control. Dr. Li Niu of the State University of New York-Albany is exploring the use of RNA aptamers, small single-stranded nucleic acid inhibitors, to control glutamate receptor activity. Decreasing the activity of glutamate receptors may prevent motor neuron death.

Dr. Niu received a fiscal year 2003 Investigator-Initiated Award to discover glutamate receptor aptamers and to study their utility to inhibit the activity of these receptors. Using novel technologies such as systematic evolution of ligands by exponential enrichment (SELEX) to "breed" candidate aptamers and laser-pulse photolysis to characterize the aptamer-receptor interactions in the microsecond time domain, Dr. Niu and his colleagues have selected several groups of aptamers that display varying affinities to glutamate receptor channels, targeting a key glutamate receptor subunit. These aptamers may aid in the cessation of glutamate-associated neurotoxicity linked to ALS. Dr. Niu characterized the kinetic mechanism for nine different glutamate receptor channels, which will assist in finding additional aptamers specific to varying channel conformations. Dr. Niu is also exploring conformation-specific aptamers that are capable of inhibiting glutamate receptors with high affinities and selectivity by preferentially binding to a conformation of the receptor. This research establishes the foundation for developing new therapeutic candidates and diagnostic probes for the treatment and detection of ALS.

Aptamers M1 and M2 combine to block the glutamate receptor.

Publications:


*Link:*

[Abstract: Glutamate Receptor Aptamers and ALS](#)

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**Natural Remedies for Multiple Sclerosis**

by Admin  15/02/2014 | 12:03  Posted in Multiple Sclerosis

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Multiple Sclerosis is a neurological disorder as the disease affects various parts of the central nervous system by way of destroying the myelin sheaths that cover the nerves. The destruction of the myelin sheaths leaves a form of scar tissues called plaque and this plaque destroys the nerves by hardening them, a process called “sclerosis.”
Now, as an autoimmune disorder, this would presuppose that the cells of the body, white blood cells to be exact, attack the myelin sheaths as if they were foreign invaders or substances. Anytime you have white blood cell activity, you have toxicity (of something foreign) on the scene. And when the cells begin to attack the body, you have dharma in the body whereby there is a separation – the cells see themselves as separate from the body and begin to attack the body.

Sclerosis means “hardening.” Is not arteriosclerosis a hardening of the arteries? Yes it is. And what makes the arteries harden up? Is it not arterial plaque and mucus? Of course it is! Well, it’s the exact thing with Multiple Sclerosis.

With Multiple Sclerosis, you have a hardening of the nerves in the brain due to excess plaque and mucus which dries up.
This plaque and mucus hardens up in the brain and on top of the myelin sheaths (protective nerve coverings) and because this plaque and mucus is acidic, it causes inflammation and the inflammation burns through the myelin sheaths and it is this activity that affects the nerves. It is the equivalent of removing the plastic coating from wire exposing the copper. If water gets on the copper of the wire, what happens, especially when what the wire is connected to is activated or turned on? Answer: It will affect the device that is activated by the wire and malfunction of the device will occur. With Multiple Sclerosis, there will be a malfunction with the human device (body).

In a nutshell, this is what Multiple Sclerosis is and now, this makes healing from Multiple Sclerosis much easier because now we have understanding of the particular problem or pathology. Multiple Sclerosis is a condition that can be healed. You just have to remain consistent with the therapy (remedy).

Diet cannot be overlooked in Multiple Sclerosis. Acid creates mucus and nothing produces more acid or acidic byproduct waste than the big three of meat (Uric Acid), dairy, (Lactic Acid), and Starch (Carbonic Acid) of which many of our diets are composed of.

I can’t forget about the connection between aluminum and Multiple Sclerosis. It is true that aluminum deposits collect and store in the brain (within the plaque and mucus). Aluminum (and other toxic heavy metals) has rightly been implicated in Multiple Sclerosis. And no herb counteracts aluminum buildup in the body better than the herb GOTU KOLA.

Gotu Kola itself contains trace amounts of bio-aluminum and because of this, when inside the body, it naturally attracts aluminum oxide unto itself and takes it out of the body. Gotu Kola is one of the best herbs for the brain and memory. It works well with Gingko Biloba!

**HEALING FOR MULTIPLE SCLEROSIS**

The sufferer of Multiple Sclerosis should say goodbye to consuming meat, dairy products, and refined grains and starches; in addition to sugar, salt, soda pop, wine/spirit, coffee, all products containing vinegar, and chemical additives (preservatives, flavor enhancers, etc.) to name a few.

Diseased conditions always help to be eradicated or healed when a raw foods and vegan diet and lifestyle is embraced.

Drinking vegetable juice (green veggies) daily will help to loosen up hardened mucus and plaque stuck to the myelin sheaths. Vegetables are very alkaline and greatly counteract acidity throughout the body.

Herbs that counteract mucus by liquefying it for purposes of release from the body include: Mullein Leaf, Yerba Sante, Fenugreek Seed, Comfrey Root, Hyssop, Elecampane, and Talisadi.
Trulyherbs.com has a formula called Mucus Reducer. In addition to Mucus Reducer, we offer its counterpart, Acid Neutralizer. These two formulas work great together in busting up and expelling mucus from the body.

Herbs that heal the central nervous system include: Kava Kava, Yerba Maté, Passionflower, Valerian Root, Jatamansi, Blue Vervain, Cinnamon, and Lady’s Slipper. TrulyHerbs.com offers three formulas that can help heal the central nervous system and brain: (1) Brain Flow, (2) Calming Formula, and (3) Central Nervous System Formula.

Lady’s Slipper herb (a/k/a Nerve Root) is by far the best herb available for healing from Multiple Sclerosis. It will help one heal from any nervous system disorder (considering one changes ones diet, lifestyle, and thought process) and no other herb helps to repair and rebuild damaged myelin like Lady’s Slipper.

Herbs that increase circulation throughout the body include: Cayenne, Ginger, Butcher’s Broom, Gingko Biloba, Holy (or Blessed) Thistle, and Gotu Kola.

Deep breathing exercises are helpful for the Multiple Sclerosis sufferer. Deep breathing will enhance and increase oxygen flow and chi to the brain (as well throughout the whole body).

The healing begins once one believes the disease is healable and you yourself (if a sufferer of the disease) believe you can be healed.

Faith (in healing) is essential to the healing process. When people don’t heal from a disease, they often times lack the necessary faith and willpower to heal. All modalities must work in harmony. Prayer, belief and faith are also necessary.

Modified diet alone will not heal you. Modified lifestyle alone will not heal you. Thought alone will not heal you. You have to put all the necessary constituents of healing together to successfully heal.

First you start thinking healing and positive thoughts. Then you start visualizing yourself in a healthy and healed state. Then you develop a strong faith and belief in your healing and full recovery. This usually leads to inspiration to do better (now that you know better) which leads you to change (improve) your diet and lifestyle. Every individual act you do in one area enhances and compliments the other areas.

Eating healthy and feeling good about what you eat positively affects your thought process and your faith and belief. This in turn positively affects your lifestyle. This in turn positively affects your emotions and how you feel about yourself. And your body responds in a positive fashion to all of this.
IMS-088
IMS-088 is the first in a series of novel compounds derived from withaferin A (WA), a natural withanolide isolated from the leaves of the winter cherry plant (withania somnifera). In preclinical animal studies, WA showed promise as a treatment for ALS but lacked suitable pharmacologic characteristics to be developed as a therapeutic drug.

**IMS-o88 – Positive in vivo Activity**
Evidence of BBB Penetration, in vivo Activity & Target Engagement

**Brain Bioluminescence in GFAP-luciferase Mice**

- GFAP-luciferase transgenic mice induced with intranasal LPS
- Mice injected 2x IP with WA, analogs, or saline
- Imaged 24h after induction

**Multiple novel withanolides possess comparable in vivo activity on GFAP-promoter under acute conditions**

ImStar chemists have designed novel withanolides related to withaferin A that have superior drug like properties. IMS-088 is the lead drug candidate in this series that is currently being developed for ALS. These small molecule compounds cross the blood brain barrier and are covered by new composition of matter patents.
TANA Inhibitors

ImStar is developing novel therapeutics directed at a proprietary new biological target called TANA (i.e. TDP-43-associated NF-κB Activation). TAR DNA-binding protein 43 (TDP-43) was recently identified as the major disease-associated protein in ALS. Under normal conditions, TDP-43 regulates gene expression and is predominantly localized in the nucleus. However, in ALS-affected neuronal cells the protein is misprocessed, resulting in aggregation in the cytoplasm and a loss of motor function.
A recent discovery by ImStar co-founder Dr. Jean-Pierre Julien has shown that, in patients with ALS, TDP-43 unexpectedly associates with and activates nuclear factor-κB (NF-κB), an inflammation-regulating protein. This activation leads to exaggerated immune responses resulting in neuro-inflammation and motor neuron destruction.

Inhibition of this pathway in mouse models of ALS produced substantial improvements in motor function and extended survival indicating this is an important new target for drug discovery. ImStar is researching various approaches to block the TANA interaction with the objective of identifying specific therapeutic TANA inhibitors.

Final Diagnosis -- Acute demyelinating disease
FINAL DIAGNOSIS: ACUTE DEMYELINATING DISEASE

DISCUSSION:

The demyelinating diseases of the central nervous system are usually diagnosed on clinical findings. Unless progressive multifocal leukoencephalopathy is suspected, demyelinating diseases are often investigated without biopsy.

Histologically, primary demyelinating diseases are characterized by destruction of myelin with relative axonal preservation, and abundant foamy macrophages containing myelin debris and lipid droplets. The macrophages stain for class II major histocompatibility complex antigens (HLA-DR; Ia). Electron microscopy studies reveal that most myelin destruction appears to be mediated by macrophages. In addition, perivascular lymphocytic infiltrate and variable gliosis are also features of demyelinating disease. Demyelinating lesions of multiple sclerosis can be subdivided into active and inactive plaques. Active plaques are hypercellular lesions containing a relatively dense perivascular and parenchymal infiltrate of lymphocytes and macrophages, and scattered reactive astrocytes. The lymphocytes in these regions are mostly T cells. CD4-positive (helper) cells predominate in earlier lesions and the actively demyelinating regions of older lesions, while CD8-positive (suppressor/cytotoxic) cells are more numerous in less active regions. Inactive plaques are hypocellular and densely gliotic lesions showing a marked loss of oligodendrocytes. In current case, hypercellular histologic features, along with contrast enhanced radiologic findings, are consistent with an acute demyelinating disease. Demyelinating diseases of known etiology or that occur only in specific clinical contexts include progressive multifocal leukoencephalopathy, central pontine myelinolysis and multifocal necrotizing leukoencephalopathy. On the other hand, differential diagnoses of the idiopathic demyelinating diseases include multiple sclerosis, acute disseminated encephalomyelitis, inflammatory or infectious processes, metastatic neoplasms and gliomas.

Multiple sclerosis (MS) is the most common demyelinating disease of the central nervous system which is typically multifocal with lesions of different ages. It is the prototype inflammatory autoimmune disorder, and with a lifetime risk of one in 400, potentially the most common cause of neurological disability in young adults. MS should be differentiated from other disorders that may have similar histological appearance of the lesions.

Acute disseminated encephalomyelitis (ADEM) is an uncommon multifocal inflammatory demyelinating disease of the central nervous system. It results from a transient autoimmune response towards myelin or other self-antigens. ADEM has similar histological features with that in MS, but has a much favorable long-term
outcome. Therefore, differentiation of ADEM from the first attack of MS is important from prognostic as well as therapeutic point of view.

Solitary lesions, not surprisingly, prompt consideration of aggressive glial neoplasia, whereas multifocal lesions suggest metastatic neoplasms or even cerebral parasitosis when lesions exhibit cystic characteristics on scan. Such demyelinating "pseudotumors" understandably occasion neurosurgical intervention for purposes of definitive diagnosis. Demyelinating "pseudotumors" are non-neoplastic lesions most often misinterpreted on biopsy as gliomas, specifically as diffuse fibrillary astrocytomas or, rarely, as oligodendrogliomas. The reasons for misinterpreting demyelinating disease as a glioma may be due to cytologically atypical astrogliosis and the finding of scattered mitotic figures. If numerous lipid-laden macrophages are encountered within parenchyma and around vessels, a demyelinating disease should be considered. Also, appropriate special stains for myelin and axons are needed to confirm this impression. Diffuse infiltration by macrophages is so rarely a feature of the untreated glioma as to virtually exclude this diagnosis. The ready identification of such cells in smears, touch preparations, or tissue sections should suggest a non-neoplastic, necrotizing process or a selectively demyelinating disorder. Every precaution should be taken to avoid interpreting a demyelinating lesion as a glioma, since the treatment for glioma is so different from that for demyelination.

It is also very important to exclude any infectious etiology before making a diagnosis of demyelinating disease. If the lesion was induced by a virus, amphophilic inclusions may be found, particularly at the periphery of the lesion. Viral disorders known to cause demyelination are HIV, JC virus, cytomegalovirus, papovavirus and varicella zoster. In our case, immunohistochemical stains for varicella-zoster virus, herpes simplex virus and Toxoplasma were negative, as well as in situ hybridization for JC virus.

Taken together, a confident diagnosis of demyelinating disease can only be rendered following exclusion of infectious etiology, necro-inflammatory process, sarcoidosis, Wegener's granulomatosis, rheumatoid disease, metastatic neoplasms and primary central nervous system tumors.

REFERENCES:

Demyelination terms A to Z

A

4-AminoPyridine (4-AP) - An experimental drug that eases symptoms for some with MS, particularly if you are more Heat Sensitive. 4-AP is a Potassium Channel Blocker that improves Conduction of Nerve Impulses, through Axons with or without DeMyelination. Its use may cause Seizure, Convulsion, or Dizziness.

Acetylcholine - An excitatory NeuroTransmitter that is produced and used by Cholinergic Neurons to communicate with each other. #25 (View Image)

ACTH - Abbreviation for AdrenoCorticoTrophiic Hormone a Steroid produced by the Anterior Pituitary Gland, it stimulates the Adrenal Cortex to release several Hormones including Cortisol.

- ACTH is often used for Short-Term treatment of an acute exacerbation (attack), no value as a Long-Term treatment of Multiple...
Sclerosis due to its proven Side-Effects. #09

- A substance produced by the Brain that regulates the production of Steroids by the Adrenal Gland. This material can be produced artificially and is sometimes recommended by physicians to manage flare-ups of Multiple Sclerosis. #25

Acuity, Visual - Clarity of vision. Visual Acuity is expressed as a fraction of normal vision. 20/400 means an Eye that sees at 20 feet what an average Eye sees at 400 feet. #01

Acute Phase Proteins - A class of Proteins synthetized by the Liver in response to Inflammation, called the Acute Phase Reaction. Also in response to injury, local inflammatory cells (Neutrophil, Granulocytes, and Macrophages) secrete a number of Cytokines, most notably the InterLeukins (IL-1, IL-6 and IL-8 and TNF-α).

Adrenal Glands - A collection of Sympathetic Nerve Cells specialized in a number of important respects. The Cortex secretes HydroCortisone (Cortisol). The Neurons of the Medulla synthesize NeuroTransmitters NorEpinephrine and Epinephrine (Adrenaline), the only source of Epinephrine that enters the Bloodstream.

- This activates the Sympathetic Neurons of the Blood Vessels by commanding their release of NorEpinephrine, which specifies types of stimuli that have little or no effect on the rest of the Automatic Nervous System (ANS).

- Sensory situations of: Emotional Excitement, Fear, Apprehension, Psychic Distress, Panic Reactions, Sexual Activity and Fight-Or-Flight Stimuli, activate many parts of the the Sympathetic Nervous Systems.

Afferent Pupillary Defect (APD aka, Marcus Gunn Pupil) - An Autonomic Nervous System dysfunction where the affected Eye Pupil dilates (widens), instead of constricting (partial closing) upon increased illumination. APD is a permanent deficit that can result from a previous (subclinical or acute) Optic Neuritis episode.

- An Afferent Pupillary Defect can be demonstrated, by shining a flashlight back and forth, alternating between each Eye. Shining a light into one Pupil causes constriction in both Pupils (Consensual Pupillary Reflexes). While quickly alternating it, from Eye to Eye, gives a "relative" indication of each Eye's functioning level.

- A Relative Afferent Pupillary Defect (RAPD) can only exist, when there is an observed difference between the two Pupils' functioning levels. In other words; when both Pupils are equally dysfunctional, there is no RAPD, since there is no
"relative" difference. Hence, both Pupils can have an equal APD, but not a RAPD. #31

Amines - Are derived from the Amino Acid Tyrosine and are secreted from the Thyroid and the Adrenal Medulla.

Amino Acids - Chemical substances (building blocks of Protein) the body obtains from food. The 21 Amino Acids are:

Essential Amino Acids - (Only obtained from food)
Histidine, Isoleucine, Leucine, Lysine, Methionine, Phenylalanine, Threonine, Tryptophan and Valine.

NonEssential Amino Acids - (Body Can derive them)
Alanine, Argine, Asparagine, Aspartic Acid, Cysteine, Glutamic Acid, Glutamine, Glycine, Proline, Serine, Taurine and Tyrosine.

Anesthesia - Loss of feeling (Pain and Touch Perception) over part or all of the body. #25

Anoxia - A condition or state that exists, when there is not enough Oxygen for tissue Oxygenation. #17

Anterior Horn - Nerve Ganglia in the Gray Matter of the Spinal Cord containing Motor Neurons. The Posterior Horn (top) contains Sensory Neurons, which directly command Skeletal Muscles, to perform quick or repetitive movements and are the final target of most Neural activity. Lesions in the Cerebrum, Basal Ganglia, Cerebellum, or Pyramidal Tracts affect their function. ex: Unstable gait, or Incoordinate fingers. (View Image)

Anterior Horn Cell (Anterior Horn Neuron) - A Motor Neuron in the Anterior Horn Gray Matter. These cells innervate Muscle Fibers directly to produce movement of body parts. #01, #02

AntiBodies - Are complex GlycoProteins (ImmunoGlobulins) having a destructive impact on specific Antigens (ie, Germs, Parasites, Bacteria, and other foreign substances) that stimulated their formation, conferring Immunity against exactly that Antigen. They are produced by Plasma Cells (B-Cells that have differentiated), in direct response to an Antigen’s presence. #09, #25, #27

Antigen - A molecular protein or carbohydrate substance (Virus, Toxin, or Enzyme), which stimulates an "Immune Response". Any substance that triggers the Immune
System to produce an **AntiBody, #09, #28**

**Antigen-Presenting Cell (APC)** - A specialized type of **Leukocyte**, bearing cell surface **Class II MHC** (Major Histocompatibility Complex) molecules. APCs process and present Antigens to an Inducer, **T-Cell**, or **Helper T-Cell**.

Examples: **Macrophage**, **Neutrophil**, **Dendrite**, and **B-Cell**

Anti-Inflammatory Drugs - Over-the-counter and prescription medications (**Steroids**) that are sometimes recommended to decrease inflammation. Aspirin and Ibuprofen are types of over-the-counter anti-inflammatory medications. #25

**Aphasia** - Loss of Speech expression or comprehension. #25

**Apoptosis** - Biologically programmed cell death - self destruction (Cell Suicide).

**Aspiration** - Inhaling food particles or fluids into the lungs. #28

**Asymmetry** - Unequal or out of balance. Not the same on the two sides of the body. #01

**Ataxia** - The inability to maintain balance, while walking. The failure of muscular coordination, poorly coordinated gait or limb movements. Ataxia is seen as a reeling, wide-based **Gait** and is one of the most obvious signs of damage to the **Cerebellum**, or its connecting Neural Pathways. #04, #12

**Atrophy** - A loss of substance, it refers to the loss of bulk in a Muscle, Nerve, or an Organ that is shrunken (**Atrophied**), from less than normal usage or from previous damage. #25
(See: Brain Atrophy #1, #2, & #3

**Atrophy, Optic** - Pallor and loss of Blood Vessels on the Optic Nerve Head, as seen through the Ophthalmoscope. This is caused by the loss of **Myelin** or of Optic Nerve Fibers and Blood Vessels in the **Optic Nerve**. #01

**AutoImmune Disease** - A process in which the body's **Immune System** causes illness by attacking elements, such as particular cells or materials, that are normal and essential for health. The **Immune System** is the body's defense system against abnormal substances (such as Viruses or Bacteria) in the body.

- In AutoImmune disorders, the Immune System attacks substances that are needed by (versus harmful to) the body. #25

**Autonomic Nervous System** - Regulates InVoluntary (UnConscious) body functions, such as the activity of the Cardiac Muscle; Smooth Muscles (ex: Stomach and in the Skin); controls the secretions of internal Glands (**Hormones**); and the functions of
the Respiratory, Circulatory, Digestive, and Urogenital Systems. Its two divisions counter-act each other, in order to achieve the appropriate response:

The Sympathetic Division - accelerates the Heart beat, constricts and dilatates Blood Vessels, dilates the Bronchi and inhibits the Digestive System. It is most active under all conditions of Stress - it prepares the body for physical action (survival).

The ParaSympathetic Division - slows the Heart Rate, increases Intestinal and Gland Activity, relaxes Sphincter Muscles, stimulates Sexual arousal, contracts Pupillary muscles, and increases Saliva production. This division prepares the body for rest and recovery; it is responsible for bodily functions which occur at rest, such as Digestion and Urine production.

Axons - Are elongated Processes (Nerve Fibers) of Neurons. They enhance the speed of transmitting Nerve Impulses (Conduction) from one Neuron to another, due to the combined benefits of their large diameters, Nodes Of Ranvier, and Myelin wraps.

- Axonal damage (Wallerian Degeneration), loss, or Atrophy are the cause of permanent MS Disability. Axons have been simplistically compared to electric wires; however, Axons are the part of Neurons that actively generate electric current (Action Potential), while wires passively conduct current. (Also See: MS Lesions & Axons and Disability)

B

B-Cell - A White Blood Cell (Lymphocyte) that makes Proteins known as ImmunoGlobulins. A type of White Blood Cell that matures into AntiBody producing cells (Plasma Cells), when exposed to specific stimuli (Antigen). #09, #25

Babinski's Sign - When the sole of the foot is scratched, the big toe goes up instead of down. This is an indication that there is a Lesion (Plaque) somewhere between the Motor Cortex, on the Opposite side of the Brain, and the Lower Spinal Cord Neuron (Anterior Horn Neuron). This is a hallmark sign of Pyramidal Tract Disease (Spasticity). #01

Baclofen (Lioresal) - A prescription medication that relieves muscle Spasticity. Baclofen is an AntiSpasticity drug that interferes with the Spinal Cord activity that
produces Increased Muscle Tone (Spasticity), in the Body's Smooth Muscles (ex: Legs, Arms, and Bladder).

- Baclofen is chemically related to the NeuroTransmitter, Gamma-AminoButyric Acid (GABA), and it decreases electrical activity of some Spinal Nerves, by blocking GABA's receptor sites. It inhibits Reflex Spinal Nerve Centers that initiate muscle contractions and its long-term use, leads to increased muscle weakness. #25

Basal Ganglia - Are a group of Functionally Related Nuclei, located bilaterally in the interior of the inferior aspect of the Cerebrum, the MidBrain and the DienCephalon. They are the Largest Nuclei of the Brain and play an important role in Planning and Coordinating Motor Movements.

- Exert their influence over the networks that link the Motor Cortex to other Cortical Areas. The Basal Ganglia behave as a variable filter ensuring smooth Muscle Movements. #11, #22 (View Image)

Blood-Brain Barrier - A semi-permeable cell layer of Endothelial Cells (interior walls) within Capillaries of the Central Nervous System (CNS). The Blood-Brain Barrier prevents large molecules, Immune Cells, all potentially damaging substances, and foreign organisms (e.g. Viruses), from passing out of the Bloodstream and into the CNS (Brain and Spinal Cord). A dysfunction in the Blood-Brain Barrier may underlie the disease process in MS. #28

BrainStem - That portion of the Brain that connects the two Cerebral Hemispheres with the Spinal Cord. It has three major divisions: MidBrain, Pons, and Medulla Oblongata. This is the oldest part of the Brain, where most involuntary functions are controlled from.

- The area of Nerve Cells and Nerve Fibers at the base of the Brain still within the Skull that connects to the Spinal Cord. The Medulla Oblongata, Pons, and MidBrain constitute the BrainStem. It connects the Spinal Cord's Axons to the remainder of the Brain and is responsible for many essential functions. All but two of the 12 Cranial Nerves, enter or exit the Brain through the BrainStem. (View Image) #01, #25, #11

BrainStem Auditory Evoked Response (BAER)- A painless, diagnostic test in which electrical impulses from the base of the Brain are recorded in response to repeated clicks during ElectroEnCephalography. #25
CAT (or CT) Scan - A diagnostic, computerized imaging system that uses X rays to determine the density of different spots in the body. By producing a picture of the densities at thousands of spots in the Brain, a CT scan discloses normal and abnormal structures. However, all MR techniques provide superior imaging resolutions. #25

CD4⁺ - A specific, Genetically determined type of T-Cell, that is thought to play a primary role, in MS & EAE. It is also known as a "Helper T-Cell"; because it activates all Acquired Immune Responses, only if it recognizes, the presented MHC Class II complex. #27

Cell - The body is made up almost entirely of many different kinds of Cells. Each Cell has a discrete inner core called the Nucleus, surrounded by CytoPlasm, and is encased in a Membrane separating it from other Cells. #09

Cell Membrane - The thin layer made of Proteins, Fats and Carbohydrates, which form the capsule of a Cell, and is its outside "Skin". #01

Cellular Immunology - Also called Adaptive or Acquired Immunity is one part of the body's Immune System. Its chief component is the Cytotoxic T-Cell, which recognizes and destroys any Cell that is infected with a Virus, or a Bacteria, and it can directly kill Tumor Cells. #09

Central Nervous System - The part of the Nervous System covered by the Meninges. It includes the Brain, Spinal Cord, and Optic Nerves. #25

- The Nervous System comprises the Brain and Nerves:

Afferent Nerves (from the Latin: ad = towards; ferro = I carry), which carry Sensory impulses from all parts of the Body to the Brain.

Efferent Nerves (ex = from; ferro = I carry) through which "Messages" are conducted from the Brain to the Muscles and all of the Organs of the Body.

- The Somatic part of the Nervous System has Sensory components which convey Sensations from the Eyes, the Nose and other Sensory Organs to the Brain, and Motor components transmitting impulses to the Skeletal Muscles in the Limbs and Trunk permitting Voluntary control of Movements.

Centrocecal Scotoma - A Blind Spot that interferes with Central Vision, because part of what you should see does not register - due to DeMyelination, along the Optic Nerve. #25
Cerebellum - Part of the Brain, located above and behind the BrainStem, it regulates Balance and Coordination of Movements. It has no direct connection to any specific movement, rather it is the primary regulator of all movements. Hence damage to the Cerebellum or its inputs is one cause of Posture Imbalance and Gait problems.

- The Cerebellum can not re-learn non-voluntary movements, since these routines are hard-wired; but the repetition of motions employed in balance training, usually enable the substitution of compensating, unimpaired pathways to work around the deficit.

- Cerebellar disease is evidenced as Complex Motor Dysfunctions: changes in Speed and Cadence of Speech (Scanning Speech); Willed Movements resemble Tremor; and Eye Movement abnormalities (Nystagmus, Oscillosia).

Mild Cerebellar Dysfunction
The inability to judge the range of limb movements, without watching them.

Severe Cerebellar Dysfunction
The inability to perform limb movements smoothly and efficiently, even while watching them. #01, #22, #02

Cerebellar Function Disorders
The severity of symptoms is directly proportional to the amount of tissue destroyed - NOT on the specific location of damage. Among the most characteristic signs of Cerebellar damage are the following:

Asthenia - a lack of muscular strength, either during Voluntary Muscle Contraction or in Holding Posture.

Ataxia - incoordination of muscular activity involving Tremor, failure of progression, and failure accurately to perform rapid alternating movements, such as tapping a finger. A swaying, unsteady, and wide based gait is often the most obvious sign.

Dysmetria - literally is difficulty measuring. Dysmetria is the failure to stop a motion at the intended point, with overshoot occurring (ex: the finger to nose test). This Cerebellar miscalculation is either from output failures or faulty inputs.

Fatigability - muscles on the same side, where Cerebellar damage has occurred, tire more easily and have slower than normal contraction and relaxation times.
producing slowed movements.

Hypotonia - The muscles feel flabby and offer less resistance to passive displacement. This may be from lack of response to Spinal Tract input.

CerebroSpinal Fluid (CSF) - The fluid surrounding the Brain and the Spinal Cord, containing Glucose (sugar), Proteins, and other substances that are also found in Blood. However, it does not normally contain Red or many White Cells. CSF is filtered from the blood supply and secreted by a vascular membrane (Choroid Plexus), within the Lateral, Third and Fourth Ventricles of the Brain. #09, #21

Cerebrum - Forms the great bulk of the Brain and consists of two Hemispheres, which occupy the entire vault of the Cranium and are incompletely seperated from each other by a deep median cleft, The Longitudinal Cerebral Fissure. #16

Chemokines - See: Cytokines

Chemokinesis - Indicates general movement, of many different cell types.

Chemotaxis - Litterly means directed locomotion. It refers to the trail of secreted Cytokines that lead various Leukocytes, to a site of Inflammation.

Circumduction - A pattern of moving the Legs in which the person swings the upper Leg widely at the Hip. It is usually caused by partial Paralysis or Spasticity of the Limb. #25

Clonus - Involuntary movement of rapidly alternating contraction and relaxation of a muscle. Ankle Clonus is the most common form of Clonus. Reflexive Spasms in the Calf Muscles, cause the Foot and Leg to bounce up and down, when the Knee is bent and the toes are on the floor. Clonus is a hallmark Sign of Spasticity. #19, #01 (Also See: Neurological Examination)

Cognition - High level functions carried out by the human Brain, including: Comprehension and use of Speech, Visual Perception and Construction, Calculation Ability, Attention (information processing), Memory, and Executive Functions such as Planning, Problem-Solving, and Self-Monitoring. #28

Complement - Nine Serum proteins activated in sequence by an Antigen, forming Antigen-AntiBody-Compound. (Symbol 'C'). It is part of the Non-Specific Immune System that generally deals with Bacteria infections. #09

- Complement upregulates Macrophage Cells, aiding their ability to find and digest foreign cells. It also calls Neutrophil Cells to the scene, which can kill Bacteria by
producing Peroxide.
(Also See: The Complement System)

Computed Tomography - See: CAT scan.

Coordination - An organized working together of muscles and groups of muscles aimed at bringing about a purposeful movement, such as walking or standing. #28

**Corpus Callosum** - Is a thick band of more than 200 million Myelinated transverse Nerve fibers. The Corpus Callosum is the largest and most important **Commissural Fiber** that interconnects the two **Cerebral Hemispheres**. It lies at the bottom of the Longitudinal Cerebral Fissure and is a very frequent site for MS lesions. #16

- Its underside forms the roof of the two **Lateral Ventricles**; the front terminates in the Frontal Lobe and is named the **Forceps Anterior** or (Minor). The back portion (the **Forceps Posterior** or Major) connects to the Temporal and Occipital Lobes and to the **Hippocampus Bands - Peduncles** of the Corpus Callosum. #14

**Cortex** - Is the outer layer of any organ. #01

*Cortex, Cerebral* - The outer layer of Nerve Cells that covers the entire surface of the Cerebral Hemispheres. Thinking and other Complex Neuronal Activity occur in the Cerebral Cortex. #01

- A 2.5 to 4.0 mm. thick layer of **Neurons** containing **Gray Matter**. #20

**Cortex, Association** - The Cortex immediately adjacent to and closely connected to the **Primary Sensory Cortex**. Association Cortex gives form and meaning to raw **Sensory** messages received at the Primary Sensory Cortex thru widespread connections to many parts of both sides of the Brain. #01

**CorticoSpinal Tract** - See: **Pyramidal Tract**

**CorticoTropin** - See: **ACTH**

**Cortisone** - A Steroid Hormone recommended to some people with Multiple Sclerosis, to reduce acute inflammations in the CNS. **Cortisone treatments carry significant risks** and should **NOT** be used for long term treatment. #25

**Cytokines** - are proteins (usually GlycoProteins) of relatively low molecular mass and often consisting of just a single chain. They are chemicals secreted by various **Leukocytes** to activate other cells, coordinate, and regulate all important biological processes: Cell Growth, **Immunity**, Cell Activation, **Inflammation**, Tissue Repair, Fibrosis and Morphogenesis.
- Cytokine Mechanisms:

  **Autocrine** - effects only the producing cell

  **Endocrine** - travel through the bloodstream, acting on numerous distant cells

  **Paracrine** - acts locally on target cells, adjacent to the producing cell

- Some Cytokines (ie: IL-8) are also *Chemotactic* for specific cell types, and are now called *Chemokines*. Although Cytokins are considered to be a Family, this is a Functional rather than a Structural concept; these Proteins are not all chemically related. (ex: Interferons, Tumor Necrosis Factor, and InterLeukins). #30

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**D**

**Dantrolene Sodium** (Dantrium) - An AntiSpasticity medication. #25

Deep Tendon Reflexes - The involuntary muscle jerks that are normally produced, when the tendon is tapped at certain spots on a limb with a hammer. In MS, the tone of these Reflexes are heightened by lack of Cortical inhibition (Spasticity). #25

Decomposition of Movement - inability to sequence properly fine, coordinated acts. #12

Decubitus - An Ulcer (Sore) of the Skin resulting from pressure and lack of movement, such as occurs when a person is mostly in a bed or a wheelchair. The Ulcers occur most frequently in areas where the bone lies directly under the Skin, such as the Elbow, Hip, or Tailbone. #28

Dementia - A generally profound and progressive loss of intellectual function, sometimes associated with personality change, that results from loss of Brain substance, and is sufficient to interfere with a person's normal functional activities. #28

DeMyelination - The destruction, loss, or removal of the Myelin Sheath, which normally insulates some Axons, by a disease process. Multiple Sclerosis is a Chronic CNS Disease that results in DeMyelination (Lesion, or Plaque), following damage to Axons, Myelin, Oligodendrocytes, or Neurons. #01, #09, #25 (View: Image, OR Image)

Also See: DeMyelinating Diseases Of The Brain by: John R. Hesselink, MD, FACR

**Dendrite** - The thin, afferent Process of a Neuron that carries newly received Nerve
Impulses towards the Cell Body. #01

Dendrite Cell - A Phagocyte, these Leukocytes are found in the Spleen and other Lymphoid Organs; they typically use threadlike tentacles to enmesh Antigen, which they present to T-Cells. #30

Diagnosis - The art or act of identifying a disease from its Signs and Symptoms. The MS diagnosis requires clinical evidence (a positive, objective finding) on Neurological Examination of two or more CNS White Matter lesions, in a person between 10 - 60 years old that occurred at two separate and distinct time periods, and of whom no other medical explanation exists ("Poser Criteria"). #12

DienCephalon - is the part of the Brain between the BrainStem and the Cerebrum. Its main components are: Thalamus, SubThalamus, Hypothalamus, and Epithalamus. #11

Diplopia - Double Vision, or the simultaneous awareness of two images of the same object that results from the failure of the two Eyes to work in a coordinated fashion. Covering one Eye will eliminate Double Vision, by erasing one of the images. (Also See: Fasciculus, Medial Longitudinal) #25

Disability - A disability (resulting from an Impairment) is a restriction or lack of ability to perform an activity in the manner or within the range considered normal for a human being. Permanent MS disability is the result of Axons that have been severed and/or Atrophied; while the temporary dysfunction experienced during an exacerbation is short-term, resolving after the Inflammation clears. #28 (See: Normal-Appearing White Matter & Axons & Disability)

Disseminated - Scattered or distributed (Multiple). #09

Dizziness - A feeling of internal uneaseiness, confusion, or light-headedness (passing out). The term Dizzy is commonly confused with Vertigo (a sensation your surroundings are spinning). While the feeling that you are actually spinning, not your surroundings is Dizziness, caused by DeMyelination within the Cerebellum or its Nerve Pathways.

Dysarthria - Slurring, inappropriate phrasing and lack of modulation in Speech volume. Both Slurred and Scanning Speech are very common types of Motor-Dysarthrias and are generally a result of Lesions (DeMyelination), in the BrainStem or within its connecting Nerve pathways. #12

- Poorly articulated Speech resulting from Neural dysfunction of the Muscles controlling Speech. The content and meaning of the spoken words remain
normal. #28

**Dyschromatopsia** - Impaired color vision, characterized by a reduced vividness of saturated colors. Dyschromatopsia, is always present in **Optic Neuritis**. In color terminology, Saturation refers to the purity of color, and desaturation is the degree to which a color is mixed with white.

Some people see a red target characterize the sensation as darker, ie. red is shifted toward amber, whereas others say the color is bleached or lighter, ie. red is shifted towards orange. In the absence of a Macular lesion, color desaturation is a highly sensitive indicator of Optic Nerve Disease.

**Dysdiadochokinesia** - Inability to perform rapid alternating movements, such as the nose to finger Neurological Test. #12

**Dysesthesia** - Distorted or Unpleasant Sensations experienced by a person when the Skin is touched. It is often referred to as an unpleasant "Burning" Sensation.#25

**Dyskinesia** - Are stereotypical, involuntary movements that affect muscle groups in varying combinations. **MyoClonus** and **Dystonia** are the most common forms of Dyskinesia seen in **MS**. #12

**Dysmetria** - Inability to control range of movements. A disturbance of coordination, caused by lesions in the Cerebellum. A tendency to over or under estimate the extent of motion needed to place an arm or leg in a certain position. #12, #28

**Dyspepsia** - Indigestion, a feeling of being over stuffed. #09

**Dysphagia** - Difficulty in swallowing either solids, liquids, or both. It causes aspiration (food or saliva enters the airway), choking, and slow swallowing (possibly leading to inadequate nutrition). MS may cause **Dysphagia**, if **Lesions** develop in the **BrainStem** or along its connecting Nerve pathways, disrupting the **sequencing and control of motor programs** that govern muscles regulating swallowing (Mouth, Pharynx and Esophagus). #28

**Dysphonia** - Disorders of voice quality (including poor pitch control, hoarsness, breathiness, and hypernasality) caused by spasticity, weakness, and incoordination of muscles in the throat and mouth. #28

**Dystonia** - movement disorders where sustained muscle contractions cause twisting and repetitive movements or abnormal postures. The **movements** are
involuntary and sometimes painful, they may affect a single muscle; a group of muscles such as those in the arms, legs, or neck, or the entire body.

- Dystonia result from an abnormality in the Basal Ganglia, where some of the messages that initiate muscle contractions are processed. Scientists suspect a defect in the body's ability to process these NeuroTransmitters prevents Neurons from communicating with each other. Some of which include:

  GABA (Gamma-AminoButyric Acid) is inhibitory
  Dopamine is inhibitory
  Acetylcholine is excitatory

  - In movement, Acetylcholine released at Nerve endings causes muscle contraction. NorEpinephrine and Serotonin are inhibitory NeuroTransmitters that help to regulate Acetylcholine.

EAE (Experimental Allergic EncephaloMyelitis) - A disease induced in lab animals that is similar to what is seen in humans with MS. #27

Edema - Swelling in the Brain or elsewhere caused by the abnormal accumulation of fluid. #25

ElectroEnCephalography (EEG) - A painless, diagnostic technique that records electrical activity in the Brain. #25 (See: Evoked Potential Tests)

Emboli - Are small particles that Occlude (Block) the circulation of smaller Blood Vessels (Micro-Circulation). #17

Embolization - Is the process of Occlusion by Emboli. #17

EnCephalitis - Inflalmmation of the Brain, sometimes called "sleeping sickness" caused by Viruses and other Microscopic organisms. #09

Epidemiology - The science concerned with the cause, frequency and distribution of an infectious process or a physiological state in a human community. #09

Epitope - A single Antigenic Determinant that functionally is the portion of an
Antigen which combines with an AntiBody. Epitopes are surface markers (GlycoProteins) present on all cells, consisting of different combinations of Amino Acids.

- Only this molecular configuration is recognized and bound by an AntiBody or T-Cell. Each Antigen normally displays more than one Epitope and each one, may attract a different Immune member. #30 (See: GlycoProteins)

Etiology - The study of all factors that may be involved in the development of a disease, including the patient's susceptibility, the nature of the disease-causing agent, and the way in which the person's body is invaded by the agent. #28

Evoked Potentials - Electrical signals recorded from the CNS in response to repetitive stimuli, such as a clicking noise (Hearing), flashing light (Vision), or a slight electrical shock (Sensory). Evoked Potentials utilize ElectroEnCephalography to record how long signals take to reach the Brain. #25

- This test is useful in the diagnosis of MS because it can confirm the presence of a suspected lesion, which was not shown by a MRI scan, or identify the existence of an unsuspected lesion (Clinically Silent) that has not produced any symptoms. #28

Exacerbation - An increase in the severity of symptoms. Exacerbations of MS usually involve an increase in definite symptoms, lasting weeks or months. During the attack, numerous individual symptoms may come and go in succession. Acute attacks are usually followed by complete or partial remission (the abatement or diminution of symptoms). #01

- A worsening or flare-up of Neurologic Signs and symptoms (such as Numbness, Weakness or Lost Vision), usually associated with Inflammation and DeMyelination in the Brain or Spinal Cord. The opposite of exacerbation is remittance. #25

- The appearance of new symptoms or the aggravation of old ones, lasting at least 24 hours. (Poser's Criteria)

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F

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Fasciculus, Medial Longitudinal (MLF) - A Nerve Tract in the BrainStem carrying instructions that coordinate horizontal Eye movements. The MLF coordinates the
two Eyes, when they look to the left or to the right.

A lesion in the MLF interrupts that coordination and the Eyes do not turn in precisely the same direction, at exactly the same time. Thereby producing two images in the Brain of the same scene - Diplopia (Double Vision). #01

Fatigue (Lassitude) - Is a debilitating kind of overall weariness, which is unpredictable and out of proportion to the activity. Any increase in your body temperature will temporarily worsen fatigue; conversely, air-conditioning or a cool drink will lower your temperature, enabling you to feel better and continue functioning.

Causes Of Fatigue

Nerve Fiber Fatigue (Conduction Failure)

MS Process Fatigue (Due To Inflammation)

Fatigue Of Handicap (Increased Effort)

Fatigue from a current infection

Iatrogenic Fatigue (Caused By Medication)

Fatigue from disrupted Sleep

Fatigue associated with Depression

- Even a good night’s sleep does not relieve MS Fatigue. You wake exhausted, feeling like it is again time for bed; it may take a few days of total rest, to recover from any over-doings. Fatigue is one of the most common, earliest, and troubling Multiple Sclerosis symptom. (Also See: MS Fatigue Or: Fatigue In MS)

Fecal Incontinence - Loss of control of bowel movements. #25

Flare-up - Also See: exacerbation.

Focal - A specific defined location or structure: of, relating to, being, or having a focus. #12

Focal Deficits - Impaired strength or sensation over a specific, clearly defined part of the body. #25

Footdrop - Impaired or Absent Voluntary Dorsiflexion of the foot. The normal Heel-Toe pattern of Walking (Gait) is disturbed, causing the toes to touch the ground
before the Heel, resulting in tripping and lose of balance. #25, #28

**Frontal Lobes** - The largest Lobes of the **Cerebrum**. The Anterior (Front) part of each of the Cerebral Hemispheres, is the control center for Learning, Behavior, Judgement, and Personality. The back part of the Frontal Lobe is the Motor Cortex which controls Voluntary **Movements**. #28

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**G**

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**Gadolinium** - A chemical compound which can be administered to a person undergoing a **MRI** procedure, to enhance the distinction between new vs old lesions. It also **increases the scan's sensitivity**, which enables the imaging of lesions that would be missed on unenhanced **T_1** and **T_2** scans. #28

**Gait Ataxia** - Broad-based, staggering patterns of walking usually a sign of **Cerebellar damage**, causing poor coordination of the Limbs. #25

**Gamma Globulin** (**ImmunoGlobulin**) - A protein fraction of Blood Serum that contains many different **AntiBodies**. Increased percentages of ImmunoGlobulin and/or the presence of Ig Clonal Bands are characteristic of MSers’ **CerebroSpinal Fluid**; but they are **not conclusive proof**, you have **MS**.

- Because identical Bands are also produced by many other CNS diseaseses, which renders this an important but nonspecific finding. #01, #25, #09

**Ganglia** - Are collections of **Nerve Fibers** and Neuron Cell Bodies. **Neurons** are large cells with appropriately large nuclei. Patches of Basophilic material and pigment are often seen in Ganglion Cell **CytoPlasm**.

**Gene** - The biological unit of Heredity. Genes determine the structure and function of all proteins in the body. In turn, these proteins govern body shape and function. #01

**Genetic Determinant** - The unique **Antigens** that identify all Cells as **Self**, due to Heredity, ie, **HLA**, to the Immune System. #09

**Girdle Sensation** (**MS Hug**) - A sensation of feeling a tight band (like wearing an overly tight girdle or corset) around your trunk that is experienced by some MSers, who have a **lesion** (old or new) on the Spinal Cord. If it prevents you from taking in a full breath, it is best to treat with a course of **IV MethylPrednisolone**.
- This *Hug* is usually the first indication of a new *exacerbation*, when the
inflammation is primarily centered around the *Spinal Cord*. Alternately, the *MS
Hug* can also be brought on by an increase in temperature (body core or ambient);
if you have a pre-existing Spinal lesion. #25 (Also See: *Transverse Myelitis*)

Glands - A collection of Cells specialized to secrete materials unrelated to their
ordinary needs. For instance, the Salivary Gland is a collection of Cells that secrete
Saliva. Those Cells have no use for the product, which aids digestion in the Mouth
and Stomach. #01

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**Glia Cells** - outnumber *Neurons* by about five to one in the Nervous System, they
have processes but do not form or conduct *Action Potentials*, and retain the
capacity to divide throughout life. The following are Glia Cell types and their known
functions:

**Astrocyte Cells** - are of two types, depending on number and degree of branching
of their Processes:

- **Fibrous Astrocytes**
  - have fewer and Less branched Processes

- **ProtoPlasmic (Mossy) Astrocytes**
  - have more and Highly branched Processes

- Both Astrocyte types constitute the cohesive force (Neurilemma), which
  maintains the structural and *nutritional relationship of Neurons* with their Vascular
  supply.

- They aid *BBB* regulation, and can display *MHC* Antigens. However, Astrocytes
  produce the *Scars (Plaques)* on DeMyelinated Axons, which either
  prevent *Oligodendrocytes* from repairing damaged *Myelin* or protect newly
  bared *Axons*.

- Astrocytes also maintain a specific relationship with Sodium channel-rich regions
  on Axonal membranes (*Nodes Of Ranvier*) and may play a role in the *deployment
  and/or maintenance of Sodium Channels* within *DeMyelinated* Axons; thereby
  restoring *Nerve Impulse conduction*. #27

Ependymal Cells (Endothelial Cells, Epithelium) - are cells lining the Cerebrum's
four *Ventricles*, CNS Capillaries (*Blood-Brain Barrier*), and the *Spinal Cord's* Central
Canal. They filter and secrete small amounts of CerebroSpinal Fluid from Blood Vessels, form part of the Brain's Choroid Plexuses, and express Adhesion Molecules that control Leukocyte entry into the Brain. #20, #22, #30  (View: Image)

Microglia Cells - the only MesoDermally derived Nervous System cells (originating from Monocytes) and are sometimes called Brain Macrophages. However, Microglia Cells are permanent CNS resident cells that neither traffic into the Bloodstream nor Lymph Glands.

- Microglia maintain CNS surveillance through the usual Immune functions of Antigen Presentation and Phagocytosis (Eat). Microglia have the lead role, over Astrocytes and non-resident Immune cells, directing their activities within the CNS.

Oligodendrocyte Cells - are Myelin forming cells of the CNS that produce, maintain, and repair Myelin Sheaths surrounding Axons. Each section of CNS Myelin (InterNode) is the CytoPlasmic Extension of a single Oligo-Dendro-Cyte cell.

- Each Oligodendrocyte simultaneously maintains numerous InterNodes on many different Axons. The loss or injury to one of these cells, produces multiple DeMyelinated areas on many different Axons. (View Image) #20, #27

Satellite Cells - are formed in Peripheral Ganglia and serve to support the cell bodies of Neurons in those Ganglia.

Schwann Cells - are cells of the Peripheral Nervous System (PNS) that make and maintain its Myelin as well as the formation of the Neurilemma. #20

Gliosis (Glial) - Scars that are produced by enlargement of Astrocyte processes. When a portion of the CNS is damaged (Neuron or Axon), Astrocyte processes enlarge and replace the damaged tissue. This process is referred to as Gliosis, while the resulting permanent scar tissue is called Plaque (Sclerosis). #17

GlucoCorticoid Hormones (Steroids) - Hormones that are produced by the Adrenal Glands in response to stimulation by AdrenoCorticoTropic Hormone (ACTH) from the Pituitary Gland.

These Steroids (Prednisone, Prednisolone, MethylPrednisolone, Betamethasone, Dexamethasone), which can also be manufactured synthetically, are artifically increased to serve both an ImmunoSuppressive and an Anti-Inflammation role in
the treatment of acute MS **exacerbations, #28** (Also See: **Hormones**)

- Five major Steroid Hormone Classes:

  **Progestagens** (Progestational Hormones)

  **GlucoCorticoids** (Stress-related Hormones)

  **MineralCorticoids** (Na+ Uptake Regulators)

  **Androgens** (Male Hormones)

  **Estrogens** (Female Hormones)

Granulocytes - A subset of **Leukocytes** (PolyMorphoNuclear Leukocytes) that are part of the **Adaptive Immune System** and includes **Neutrophils**, Eosinophils, and Basophils.

Gray Matter - Portions of the CNS where Nerve Cell Bodies are concentrated. **Cortex** is Gray Matter. So are the **Anterior** and **Posterior Horns** of the Spinal Cord and more. **#01**

**H**

**Heat Sensitivity** - Causes a transient worsening of symptoms and may make vision blurry (**Uhthoff's Syndrome**). Bodily functions return to normal, when the body cools off and the **Neuron** can resume transmitting **Nerve Impulses**.

- Without its **Myelin** coating, all **CNS** tissue is more sensitive to heat and prone to stop transmitting electrical signals (**Conduction Block**), when the body's core temperature is increased by just 0.5° C.

**Hemianopsia** - One-sided Visual Field loss. **#25**

**Hemiparesis** - Sensory loss or weakness of the face, Arm and Leg on one side of the body. **#25**

**Hemiplegia** - Paralysis of one side of the body, including one Arm and one Leg. **#28**

**Histamine** - A chemical present in cells (**Mast Cells**) throughout the body. Its release opens **Endothelial Cell** junctions in the **Venules**' Blood-Brain Barrier and upregulates **Adhesion Molecules**. It is one of the substances responsible for Inflammation, stimulates production of Stomach Acid, and narrows the Bronchi in
the Lungs. #30

**Histocompatibility Genes** - Are a category of DNA Genes called, Class II Major Histocompatibility complex Genes. They create the **HLA Antigens** by which the *Immune System* recognizes *self*. #27

Hormones - A substance secreted in the body and carried through the BloodStream to organs and tissues, where it serves a regulatory function (Hormones travel in the blood and *can act, far from the site of secretion*). (*Also See: GlucoCorticoid Hormones & Pituitary Hormones*)

Human Leukocyte Antigen (HLA) - The Self-Made-Antigen (Major HistoCompatibility Gene) displayed on the surface of all cells that identifies them to the *Immune System*, as belonging to *self*. These *Antigens* must be presented with Antigenic Peptides, in order for T-Cells to begin an Immune Response. #27

Human T-Cell Lymphotropic Virus type 1 (HTLV-1) - A *RetroVirus* currently being studied that operates in human T-Cells and causes a disease called Tropical Spastic Paraphresis. #27

**Hypoxia** - Indicates a severe Oxygen shortage in tissue. #17

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**Immune System** - The Immune System is a collection of Cells and Proteins that works to protect the body from potentially harmful, infectious Microorganisms (microscopic life-forms), such as Bacteria, Viruses and Fungi.

- It is a defense mechanism characterized by recognition of Nonself, Specificity, and Memory. It has two basic components: **Innate Immunity** and **Acquired Immunity**. #22

- The Immune System plays a role in the control of Cancer and other diseases, but also is the culprit in the phenomena of Allergies, Hypersensitivity, the rejection of Transplanted Organs, **AutoImmune Diseases**, and Medical Implants.

Immunity - Having protection or resistance to a particular disease or poison, ie, **Gamma Globulin**. #09

**ImmunoGlobulin** - A group of GlycoProteins (AntiBodies), present in Serum and tissue fluids that recognize and bind to *Antigens*. They are produced by **Plasma**
Cells and are integral in Adaptive Immune Responses. There are five classes of ImmunoGlobulins (Ig): IgG, IgA, IgM, IgD, IgE. ImmunoSuppression - Any form of treatment or drug, which slows or inhibits the body’s usual Immune Responses. Some examples used to treat MS are: Cyclosporin, Methotrexate, and Azathioprine. Impairment - Any loss or abnormality of Psychological, Physiological, or Anatomical structure or function. It is a deviation from the person’s usual biomedical state. An impairment is thus any loss of function directly resulting from injury or disease. Impotence - Poor or Absent erection of the Penis. Incidence - The number of new cases of a disease in a specified population over a defined time period. Incontinence - The inability to hold urine or stool until urination or defecation is intended. Inflammation - A tissue's Immunological response to injury, characterized by mobilization of White Blood Cells and AntiBodies, Swelling, and Fluid Accumulation. InfraTentorial (Posterior Fossa) - Includes all interior Cerebral areas below the undersurface of the Temporal, Occipital Lobes, extending to the upper Cervical Cord, and includes the Cerebellum. (View Image, MRI image) Most common InfraTentorial MS lesion sites:

Floor of the Fourth Ventricle Cerebellar Peduncles Ventral surface of the Pons Cerebellum Cervical Spinal Cord Insulin - One of many Hormones which helps the body, change the food we eat into energy; Insulin helps us store energy for later use. After we eat, it causes sugar (Glucose) to leave the blood and enter the body's cells - to make fat, sugar, and protein. Between meals, it aids in the utilization of stored fat, sugar, and protein. Integrins - Are transmembrane Proteins capable of binding externally to matrix and other cell-membrane proteins and internally to signal-transferring Proteins,
thereby positioning themselves to communicate ExtraCellular signals.

**Interferon** - An interfering Protein that neutralizes Virus, it is produced by CytoToxic T-Cells of the Immune System, in response to foreign Nucleic Acids (produced by Viruses and Bacteria), thereby protecting uninfected cells.

- Interferon-alpha (α) and Interferon-beta (β), form the Type 1 class of Interferons; while Interferon-gamma (γ) is a Type 2 Interferon. These Proteins are AntiViral Cytokines that are also, potent Immune Regulators and Growth Factors. #09, #25, #30

- Three Interferons

  alpha (α is produced by Leukocytes in response to Viruses or Nucleic Acids;)

  beta (β) is produced by Fibroblasts in response to Viruses or Nucleic Acids;

  gamma (γ) is produced by Lymphocytes, both T-Cells and Large Granular Lymphocytes (LGL), in response to Immune stimuli. It is produced by activated T-Cells and Natural Killer Cells.

  - A degree of Immune Activation leads to the production of IFN-γ, an increase in Antigen Presenting Cell (APC) function, activates Macrophages in general, and probably enhances their capacity to act as APCs. #30

**InterLeukins** (IL-1 to IL-##) - A well-characterized group of Cytokines, mainly produced by Leukocytes, which mostly act upon other Leukocytes. Their main targets for actions, vary from T-Cells and B-Cells, to Fibroblasts and Endothelium.

- They have a broad spectrum of functional activities that regulate the activities and capabilities of many cell types and regulate Inflammation and Immune Responses. #30

**InterNuclear Ophthalmoplegia** - UnCoordinated Eye movements, where the outward turning Eye looking towards the side develops Nystagmus, and the other Eye fails to turn completely inward.

- To produce synchronous Eye movements, Cranial Nerves III, IV and VI communicate through the Fasciculus, Media Longitudinal (MLF). In INO, a lesion disrupts this pathway, preventing communication between Nuclei.
- To gaze to the left, the left SupraNuclear control center of horizontal Eye movements [Paramedian Pontine Reticular Formation (PPRF)] must signal the left CN VI Nucleus to turn the left Eye outwards (abduct).

- At the same time, the PPRF must signal the right CN III Nucleus, via the right MLF, to simultaneously turn the right Eye inwards (adduct).

- A lesion of the right MLF would not allow the Neural impulse to reach the Right Medial Rectus. In this case, the left Eye would abduct, but the right Eye would not adduct. Further, the left Eye would go into an Abducting Nystagmus.

- Most lesions of the MLF are located in the Pons and with INO, you will be able to converge. However, if the lesion affects the MLF within the MidBrain and involves the CN III Nucleus, then you will not be able to converge. #31

(Also See: Diplopia, Afferent Pupillary Defect, Retrobulbar Neuritis, Nystagmus, Oscillopsia, Dyschromatopsia, Optic Neuritis, & Diagnosing MS)

Intrathecal - Occurring in the space under the Arachnoid membrane, which surrounds the Brain and Spinal Cord (generally within the CerebroSpinal Fluid). #15

Ischemia - Is an insufficient Blood Supply to an Organ or Tissue. #17

Lateral SpinoThalamic Tract - A Sensory Nerve Tract in the Anterior-Lateral (Front-Side) portion of the Spinal Cord. Interruption of the LST, results in loss of Pain and Temperature sensations below the level of the lesion, on the Opposite Side of the body. #01 (View: Image)

Lesion - Any damage to tissue structure or function. A Scar is a Lesion. So is Cancer, a MS Plaque, a Stomach Ulcer or a Pimple. On T1 MRI scans, old lesions register as *Black Holes* - Hypointense (less tissue) areas. While new inflammatory lesions are seen on T2 scans as, *Bright Spots* - HyperIntense (higher fluid content) areas.

- MS lesions on conventional MRIs T2, first appear as small, ovid shaped, focal bright spots having discrete borders. Cerebral lesions are usually located centrally, near the MidLine, asymmetrically arrayed, deep within the White
Matter, and close to a blood vessel (Venule) that is near CerebroSpinal Fluid (Ventricles, or Spinal Cord). #01

Leukocytes - Any of the blood cells that are colorless, lack Hemoglobin, and contain a Nucleus (also called White Blood Corpuscle).

Leukocyte Sub-Families:

<table>
<thead>
<tr>
<th>Lymphocytes</th>
<th>Phagocytes</th>
<th>Auxiliary Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Granular Cells</td>
<td>Neutrophil Cells</td>
<td>Platelets</td>
</tr>
<tr>
<td>T-Cells</td>
<td>Dendrite Cells</td>
<td>Mast Cells</td>
</tr>
<tr>
<td>B-Cells</td>
<td>Monocytes Cells</td>
<td>Basophil Cells</td>
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<tr>
<td></td>
<td>Eosinophil Cells</td>
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L'hermitte's Sign - An electrical sensation (Shock, Lightning Bolt) that some MSers experience, when flexing the neck, tilting, or lowering the head towards the chest. It begins at the base of the skull, runs down the Spine and into the limbs, before exiting through the hands or feet. #02, #25

- L'hermitte's Sign is thought to stem from injury (ie: compression, distortion, inflammation, radiation, metabolic or toxic aberrations) of the Cervical Dorsal Columns.

- After injury, the damaged Dorsal Column Axons or cell bodies have increased MechanoSensitivity, producing Ectopic Action Potentials that occur with greatest frequency during Cervical flexion (i.e., a maneuver that can alter Spinal Cord length by 2 cm).

- L'hermitte's Sign occurs in 33% of MSers and was the presenting symptom in 16%. (Also See: Tic-Douloureux)

Ligand - A Molecule or Ion that can bind another Molecule.

Lobe (Of The Brain) - A major division of the Cerebral Hemisphere. Each Cerebral Hemisphere is divided into: Frontal Lobe, Parietal Lobe, Occipital Lobe, Temporal Lobe, and Limbic Lobe. #01

Lymphocytes - A variety of White Blood Cells (Leukocytes), which are part of the body's Cellular Immune System. #09

- White Blood Cells play a large role in the Immune System, by responding
to **Antigens** and triggering reactions in other cells. #27
(Also See: **Lymphocytes**)

- Are produced by Bone Marrow Stem Cells and depending on their site of subsequent maturation, they develop into either: B or T-Cells. #30

**B-Cells** - are responsible for **Humoral Immune Responses**, they produce **ImmunoGlobulins** (**AntiBodies**) to fight ExtraCellular infections (Bacteria, Fungus, etc.).

**T-Cells** - are responsible for Cell-Mediated Immune Responses (**Cellular Immunology**) including both effector and regulatory cells. Helper T-Cells prime both AntiBody-mediated and Cell-mediated effectors for the attack, while **Suppressors** await the signal to change, slow, or end the assault.

**Natural Killer Cells** (NK) - recognize classes of cells and destroy tumor cells on contact, without needing a costimulator signal.

**CytoToxic T-Cells** (CD8⁺) - handle the destruction of host cells, which have become infected by Viruses or other IntraCellular Pathogens. #22, #30

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**Helper T-Cells** (CD4⁺) - heighten the production of **AntiBodies** by B-Cells and regulate the activities of all effector cells. A functional subclass of T-Cells that helps to generate CD8⁺ Cells and cooperate with B-Cells in the production of AntiBody-mediated responses.

- CD4⁺ Cells only recognize **Antigens** that are **presented** in association with **MHC Class II molecules**. #30

**CD4⁺ Response Types**

**Th1** - CD4⁺ Cells make (**IL-2, IFN-γ, TNF, IL-12**, and **IL-23**) to enhance Inflammation and AntiViral Responses.

**Th2** - CD4⁺ Cells make **InterLeukins** (**IL-2, IL-4, IL-5, IL-6**, and **IL-10**) to enhance AntiBody Responses.

**Th3** - CD4⁺ Cells make predominantly **T-Cell Growth Factor (TGF)**, and enhance **IgA AntiBody Responses**. #30
Suppressor T-Cells - supress B-Cell activity and seem to be in short supply during a MS attack (exacerbation). #28
- A functionally defined population of T-Cells, which reduce the Immune Responses of other T-Cells or B-Cells, or switch the response onto a different pathway. #28

Macrophage - Develop from Monocytes, a Phagocyte Cell that helps initiate and is involved in all stages of Immune Responses. It recognizes and can digest (Phagocytize) all foreign Antigens (ie. Bacteria, Viruses) and Cell Debris. Macrophages are also an integral part of DeMyelination and participate in tissue repairs.
- In the CNS, they are called Microglia Cells, and Kupffer Cells in the Liver, where they Phagocytize Bacteria, other Pathogens, and old red blood cells. #25, #27

Macrophage-Activating Factor (MAF) - Actually several Cytokines, including Interferon, released by activated T-Cells, which together induce activation of Macrophages, making them more efficient in Phagocytosis and CytoToxicity.

Mast Cells - Develop from Basophil Cells (PolyMorphoNuclear Leukocytes), they reside in tissues, regulating Vascular Permeability (Blood-Brain Barrier) and Smooth Muscles. They possess IgE receptors, participating in immediate hypersensitivity reactions by degranulation (Release) of Heparin, Serotonin, Histamine, and other VasoActive Amines.

Medulla Oblongata - The lowest major segment of the BrainStem. #01

Memory - (See: Cognition)

MicroEmboli - Refers to any small Emboli that predominantly Occlude (Block) the MicroCirculation. #07

Microglia - (See: Glia Cells - Microglia)

Monoclonal AntiBodies - Are laboratory-produced AntiBodies, which can be programmed to react against a specific Antigen, in order to suppress the Immune
Response. #28

Monocyte Cells - Develop from Stem Cells, are effective Antigen Presenting Cells, and patrol the bloodstream, searching for Antigens. In time, Monocytes migrate into tissue and develop into Macrophages. #30

MR or MRI - (See: Nuclear Magnetic Resonance). #25

Multiple Sclerosis - Is a Chronic Neurologic Disease of the Central Nervous System (CNS), occurring only in humans. MS is classified as both, a DeMyelinating and an Axonal Disease. (See: Multiple Sclerosis as a Neuronal Disease)

- Although increasing evidence points to an AutoImmune aspect, no single Antigen or Immune System Dysfunction has been identified, so the cause of MS remains unknown. (See: Multiple Sclerosis - The range of MS disease patterns, stages, and symptoms, with explanations of today's standard diagnostic tests.)

Myelin - A fatty (Lipid) substance forming a multi-layered sheath around some Nerve Fibers (Axons) in the Central, Autonomic and Peripheral Nervous Systems. Within the CNS, Myelin is formed by Oligodendrocytes and consists of their Cell Membranes (CytoPlasmic Extensions), which wrap themselves around Axons. (View Image)

- This Myelin Sheath covers and insulates sections (InterNodes) of CNS Axons, thereby reducing the electrical Capacitance between a Neuron's negatively charged Axonal Membrane (InterNodal Axolemma) and the surrounding positively charged ExtraCellular Fluid.

- Myelin greatly increases the conducting velocity of an Action Potential; while expending much less energy than an UnMyelinated Axon would require, to send an identical Action Potential, along the same distance. #01, #25

Myelin Basic Protein (MBP) - One of the components of Myelin, which may be increased in the CerebroSpinal Fluid of some - but not all MSers - following a DeMyelinating episode.

- MBP is positively charged and gets in between the Myelin BiLayers to link up the negatively-charged Lipids and glue the Myelin Sheath together. #25

Myelitis - An inflammatory disease of the Spinal Cord. In Transverse Myelitis, the inflammation spreads across the Spinal Cord, resulting in a loss of its normal
function to transmit Nerve impulses up and down, as though the Spinal Cord had been severed. #28

MyxoVirus - A Virus which causes disease in Mucous Tissue such as the Throat, Mouth, or Lung. ex: (Influenza) See: Virus #09

Necrosis - Is tissue decomposition resulting from the loss of its Blood and Oxygen supply, Burns, or other severe injuries. It can also be caused by some medications, commonly used to treat MS.

- Necrosis of the skin occurs after a subcutaneous injection, when the body is intolerant of the medication. Necrosis of the Hip and Shoulder Joints are caused by the Long-Term use of Steroids. #07 (See: Steroids)

Nerve Fibers (Axons) - Are long, sparsely branched Processes, having non-changing diameters that extend from a Neuron's Cell Body and connect another Neuron's Axon, Dendrite, or Cell Body and/or bodily organs that compose their Neural Network. #25

- A bundle of Nerve Fibers (Axons). The Fibers are either:
  
  Afferent - leading towards the higher Brain (CNS) and serving in the Perception of Sensory stimuli of the Skin, Joints, Muscles, and Inner Organs;

  Efferent - leading away from the higher Brain and Mediating contractions and relaxations of Muscles or Organs. #28

Nerve Impulse - The electrochemical charge (Action Potential) carried by an Axon. #01

Neurologic Disease - Any disorder of the Nervous System. There are many different neurologic diseases, among which is Multiple Sclerosis. #25

Neuron - An individual Nerve Cell and the key data-processing cell of the Nervous System. Each has a Nucleus within a Cell Body and one or more Processes (Extensions) called Dendrites and Axons. #25, #28

NeuroTransmitters - Are chemicals (Small Molecules or Hormones), stored in small Synaptic Vessicles clustered at the tip of the Axon (terminal buttons).
- When a Nerve Impulse arrives for transmission to the next Neuron, they cross the Synapse enabling message transmission to another Neuron or the Stimulation of an Effector Cell (Muscle or Gland). (View: Image)

- When a NeuroTransmitter is received, it either Excites (Depolarizes) or Inhibits (Hyperpolarizes) the PostSynaptic Neuron. More than 100 organic molecules are thought to act as NeuroTransmitters.

- Some examples are: Acetylcholine, NorEpinephrine, GABA, Serotonin, and Dopamine, although each acts in different responses. Some are Excitory, such as Acetylcholine, Serotonin, NorEpinephrine, and Dopamine. Some are associated with Relaxation, such as Dopamine and Serotonin.

Neutrophils - A Phagocyte member of Leukocyte Cells, they are the Adaptive Immune System's first line of defense against Bacterial infections. After leaving nearby Blood Vessels, these cells follow chemicals produced by Bacteria in a cut or scratch and proceed to locate and eliminate the invader.

Nodes Of Ranvier - Are the only gaps between Myelin sections (InterNodes) along Myelinated Axons, where Sodium (Na+) and Potassium (K+) can be exchanged (Saltatory Conduction); hence, continuing the Nerve signal's rapid transmission, to its target. They are crucial electrical refresher sites, where Action Potentials are restored. (View: Image) #20

Nuclear Magnetic Resonance (MRI, MR, NMR) - A diagnostic test that uses the magnetic properties of different substances in a Magnetic Field to produce images of the Brain, Spinal Cord, and other soft tissues of the Body. A MRI shows areas of Sclerosis (Lesion, Plaque), when they are larger than 2mm (Macroscopic Lesions).

- Scans can NOT show Microscopic Lesions, as they are too small for current imaging resolutions; but are included in your Lesion Load and Atrophy totals. These early smaller lesions are better documented, by Evoked Potential Tests, which are equally valid in meeting a Laboratory Supported Definite Multiple Sclerosis diagnosis.

- While this is the only test in which some Multiple Sclerosis Lesions can be seen, it cannot be regarded as conclusive; because, all lesions do not register on MRI scans and many other diseases can produce identical MRI images.

- MRI shows the size, quantity and distribution of Lesions larger than 2mm, and together with supporting evidence from your other diagnostic tests, Medical
History, and Neurological Examination, may be a positive finding that confirms the MS diagnosis.

- It also provides an objective measure (Para-Clinical Evidence) of MS lesion activity in the Brain and Spinal Cord; however, Conventional MRI (T1 and T2 images) are NonSpecific (unknown cause) and have little relation to MS progression or Disability.

Magnetization Transfer and Proton MR Spectroscopy are two imaging techniques that better correlate with MS activity. They are not yet widely used, but newer more specific imaging protocols are presently being formulated. #25

- Abnormal MRI scans are found in
  96% with a definite diagnosis of MS
  70% with a diagnosis of probable MS
  30 - 50% with a diagnosis of possible MS

- MRI Criteria for diagnosing MS

  At least 3 Lesions and two of the following:

  Lesions abutting the Lateral Ventricles

  Lesions with diameters greater than 5mm

  Lesions present in the Posterior Fossa (InfraTentorial)

Source


*Comparison Of Onset MRI Criteria To Predict Conversion To Clinically Definite Multiple Sclerosis*

Brain 1997 Nov;120 ( Pt 11):2059-69)

Nocturia - Inability to hold urine while sleeping, resulting in bedwetting and/or disrupted sleep, due to repeated bathroom trips. (See: Neurogenic Bladder, Urgency with Hesitancy)

Nystagmus - A back and forth twitching Eye movement (Rhythmical jerking movements), with the fast component maximal, towards the side of the Cerebellar lesion. Characterized by rapid, involuntary Eye movements, in the horizontal or occasionally, the vertical direction. #12, #25, #28 (Also
See: Oscillopsia; InterNuclear Ophthalmoplegia; Afferent Pupillary Defect; Optic Neuritis; Retrobulbar Neuritis)

O

OligoClonal Bands (Gamma Globulin Bands) - A postive finding from the chemical analysis of ImmunoGlobulin (IgG) found in CerebroSpinal Fluid. IgG Bands indicates an Intrathecal production of AntiBodies. This signifies an Immune response to a nonspecific CNS Antigen.

- IgG Banding is commonly found during a current or very recent exacerbation. It is present in 50 - 75% of patients undergoing a diagnosis for MS, and eventually in 87% - 95% of all MSers. #25

Oligodendrocyte - (See: Glia Cells - Oligodendrocyte)

Optic Atrophy - Degeneration of the Optic Nerve, due to DeMyelination and loss of Blood Vessels on the Optic Nerve Head, seen as pallor through the Ophthalmoscope. #01, #25

Optic Nerve - The bundle of Nerve Fibers formed by the light sensitive Retina of the Eye that extends from the Eye and connects to the Brain. #25


- Optic Neuritis (ON) most often includes Pain, with Eye movement, in or behind the Eye when Vision deteriorates. ON episodes often reappear, each reaching a peak within days, and recovery takes from 5 weeks to six months - with or without any particular treatment. See: CorticoSteroids In Optic Neuritis

- An ON attack is often an invisible (subclinical) event, symptoms are either not noticed, or simply dismissed. Fortunately, subsequent Visual Evoked Potential (VEP) testing always registers this prior damage, as slowed response times. This finding can be used to fullfill MS's diagnostic requirement of a previous attack (Time Dissemination), or involvement of a second (Space Criterion) CNS Functional
System.

- **Optic Neuritis is very common in many**, but not all MSers and usually occurs in only one Eye at a time. It is one of the first diagnosable signs that you may have **Multiple Sclerosis**. Although acute Optic Neuritis is very upsetting and scary, ON is considered a good indication of having a milder MS course, when it is the presenting symptom. #25

- When the inflammation involves the first part of the Nerve and can be seen at the Optic Disk, usually during the course of an Eye Examination, it is called **Optic Papillitis**. This may cause colors to appear washed-out or faded and bright lights generally make seeing difficult, even when there are good color contrasts.

- Wearing yellow tinted sunglasses or adding a light photo-ray tint to your eyeglass prescription, greatly reduces the glare of bright lights and the feeling of **Dizziness**. (Also See: **Diplopia**, **Afferent Pupillary Defect**, **Retrobulbar Neuritis**, **Nystagmus**, **Oscillopsia**, **Dyschromatopsia**, **InterNuclear Ophthalmoplegia**, & **Diagnosing MS**)

**Organelle (Little Organ)** - Particles within Cells that are covered with their own membrane. Many different kinds of Organelle occur within **Cells**, each with a special function. #01

**Oscillopsia** - Continuous, Involuntary, and Chaotic Eye movements that result in a Visual Disturbance in which objects appear to be Jumping or Bouncing. (Also See: **Nystagmus**) #28

**Orthotic** - A mechanical appliance such as a Leg brace or Shoe inserts that are specially designed to Control, Correct, or Compensate for impaired limb function. #28

**Paralysis** - Inability to move a part of the body. #28

**Paraparesis** - A weakness but not total paralysis of the lower extremities (legs). #28

**Paresis** - Partial or incomplete paralysis of a part of the body. #28

**Paresthesias** - (Gr.- para = abnormal, aisthesis = sensation) Sensations of **Burning**, Prickling, Creeping on the Skin, or "Pins-and-Needles" that develop with damage to
a Pain Pathway (Nerve or Axon). Which may or may not be associated with any physical findings on Neurological Examination. #25

- Lesions or damage in the Dorsal Columns (Spinal Cord) often register as tingling and numbness, due to irritation of Sensory Nerve fibers, as they die. These sensations range from merely annoying to severe pain. In some cases, even the light touch of clothing, can be painful.

Paroxysmal Symptom - Any one of several symptoms which have a Sudden Onset, apparently in response to some kind of movement or Sensory Stimulation, last for a few moments, and then subside. They are thought to be caused by the short-circuiting of electrical impulses along DeMyelinated Axons. #28 (Also See: L'hermitte's Sign, Trigeminal Neuralgia)

Peptides - Short strings (groups) of Amino Acids, which Immune Cells (Leukocytes) use to identify Cells, as belonging to Self or Antigen.

Peripheral Nervous System - All the Nerves and Nerve Cells outside the Central Nervous System. #01

PeriVentricular Region - The area surrounding the four fluid-filled cavities (Ventricles) within the Brain. MS plaques are commonly found within this region. #28

Phagocyte - A PolyMorphoNuclear Leukocyte that consumes cellular debris and invading MicroOrganisms. Neutrophils, Dendrites, and Macrophages are Phagocytes or eating cells (phago = "eating", cyte = "cell").

- These APCs present Antigens on their cell surfaces that are the chemical remains (Peptide) of the Organism. Antigens presented in this way activate specific responses and destroy the invading Organism. #30

Phagocytosis - The engulfment, digestion, and subsequent processing of debris or a MicroOrganism by Antigen Presenting Cells. #30 (Also See: Phagocytosis)

PhosphoLipids - Are fatty substances that are a major component of Myelin. #27

Pituitary Gland - (often called the master gland) is located in a small bony cavity at the base of the Brain, it has two Lobes: the Anterior and Posterior Lobes.

- The Anterior Pituitary is Glandular. A stalk links the Pituitary to the Hypothalamus, which controls release of Pituitary Hormones. The Posterior Pituitary is used to store Hormones until they are needed. (Also See: GlucoCorticoid Hormones
Placebo Effect - The apparently beneficial result of a medication or other therapy that has no proven value or effect in the management of a medical problem. The apparent benefits occur because of an individual's expectation that the therapy will help. Some people respond to the placebo or sham treatment simply because they are convinced that they have been given the real treatment, and may even have a real physical reaction to the placebo. #25

Plantar Reflex - A Reflex Response obtained by drawing a pointed object along the outer border of the sole of the foot from the Heel to the little Toe. The normal Flexor Response is a bunching and downward movement of the Toes. An upward movement of the big Toe is called an Extensor Response, or Babinski's Sign, which is a sensitive indicator of disease (Spasticity) in the Brain or Spinal Cord. #28

Plaque - The Scarring of Neural tissue that develop after DeMyelination and Lesions. #01

Prednisone - A Steroid drug related chemically and therapeutically to the Steroid Hormones normally made in the the Adrenal Glands. Prednisone and other Steroid medications carry significant Long-Term Risks. #25

Pons - The portion of the BrainStem just Superior to the Medulla Oblongata, is about 2.5cm. in length. It contains the Respiratory Center, which controls the mechanism that permits Outflow of air from the Lungs. #20

Posterior Column - Bundle of Axons in the Posterior part of the Spinal Cord. Interruption of this column on one side of the Spinal Cord causes loss of Position Sense below the level of the interruption on the Same Side of the body. #01 (View Image)

Prevalence - The number of all new and old cases of a disease in a defined population at a particular point in time. #28

Primary/Progressive MS - A clinical course of MS characterized from the beginning by progressive Disability, with no plateaus or remissions or an occasional plateau and very short-lived, minor improvements. #28

Prognosis - Predicting the future course of a disease. The following factors are most predictive of outcome in MS: #28

No Prognostic Value

Number of relapses in the first two years

Unfavorable Prognosis
An initially Progressive course

Being a male

Higher basal EDSS scores

More Functional Systems involved at Onset

Higher residual Motor System deficits in:

Pyramidal, Visual, Sphincteric, Cerebellar

Presence of OligoClonal Banding in CSF

Cerebral MRI suggestive of MS

Favorable Prognosis

Onset before 30 years of age

Being a female

Complete recoveries - no disability

Sensory System involvement at onset:

ie; Optic Neuritis and/or Paresthesia

Longer first inter-attack interval

Also See: Natural history of Multiple Sclerosis

Progressive/Relapsing MS - A rare type of MS that shows disease progression (increased Disability) from onset, but with clear, acute relapses, with or without full recovery after each relapse. #29, #28

Prospective Memory - The ability to remember an event or commitment planned for the future. Thus, a person who agrees to meet or call someone at a given time on the following day, must be able to remember the appointment when the time comes. Both Prospective and Recent Memory are frequently major Cognitive problems for MSers. #28

Proteins - A group of complex organic compounds, composed of Amino Acids, with defined three-dimensional structures (encoded in DNA) that controls its particular function. Proteins are responsible for all reactions and activities of Cells. #01
Pseudo-Exacerbation - A temporary aggravation of disease symptoms, resulting from an elevation in body temperature or other stressor (ex. an infection, fatigue, heat, or constipation), that disappears once the stressor is removed. A pseudo-exacerbation involves only pre-existing symptoms (flare-up), rather than new disease activity or progression. #28

Pyramidal Tract (CorticoSpinal) - One of the major Motor Tracts from the Brain to the Spinal Cord. The Pyramidal System is specialized for making discrete movements; its Axons fibers form the Pyramids of the Medulla Oblongata. It originates in the Cortex of the Frontal Lobe. #01

It communicates directly with Motor Neurons in the Spinal Cord, to activate Fine Motor Control: ex: tying shoelaces, writing, etc.

It orchestrates the Motor Response and helps to Specify Body Posture at all levels of the Spinal Cord.

It Adjusts Muscle Tone to counter the changing centers of gravity

Plaque here causes the symptoms of Spasticity: Muscle Tightness, Ankle Clonus, Flexor Spasms, Exhaustion, Loss Of Muscle Power, and Paralysis #02

Q

Quadriplegia - The paralysis of both arms and both legs. #28

R

Recent Memory - The ability to remember events, conversations, content of reading material, or television programs from a short time ago (i.e. an hour or two ago, or last night). MSers with MS-related memory impairment typically experience the greatest difficulty remembering these types of things from the recent past. #28

Reflex - An involuntary response of the Nervous System to a stimulus, such as the Stretch Reflex, which is elicited by tapping a Tendon with a reflex hammer; or Absent Reflexes can be indicative of Neurological damage, including MS, and are therefore tested during the standard Neurological Exam.
An unconscious muscle tightening that is mediated by Anterior Horn Neurons, in the Spinal Cord. Increased muscle tone (tightness, spasticity) is normally an early finding in Multiple Sclerosis. #01, #28

Relapsing/Remitting MS - A clinical phase having distinct relapses (also called acute attacks or exacerbations), with either full recovery (no disability), or partial recovery and lasting disability. There is no visible disease progression (worsening) between attacks; but *stable* periods, span and mask, the continuing subclinical disease process.

- Relapsing forms of MS are the most common beginning types, comprising 85% of the total. However, 50% of cases will have progression within 10 - 15 years, and an additional 40% within 25 years of onset; as the disease evolves, into the Secondary/Progressive phase. #29

Remission - A decrease in the severity or number of MS symptoms and signs, or their temporary disappearance. The opposite of remission is exacerbation. #25, #28

Remote Memory - The ability to remember people or events from the distant past. MSers tend to experience few if any problems with their remote memory. #28

ReMyelination - The repair or replacement of damaged Myelin, which usually occurs spontaneously in the early course of MS, but is a very slow process. Early MS damage (Lesion) is repaired (ReMyelinated) by Oligodendrocytes extending new cytoplasmic extensions that spiral around (rewrap) Axons, to form new Myelin sections (InterNodes). #28

Reticular Formation - A vital part of the Autonomic Nervous System, which is scattered like a cloud throughout most of the length of the BrainStem. These nuclei receive Nerves innervating the Face and play an important role in Arousing and Maintaining Consciousness. Visual, or Acoustical Stimuli, and Mental Activities can stimulate this system to maintain Attention and Alertness. #01

Retrobulbar Neuritis - Inflammation of the second part of the Optic Nerve (behind the Eye), which cannot be seen by an Eye Examination. It is one of the most common beginning symptoms of Multiple Sclerosis; but can also occur as an isolated Neurological Lesion incident, with full recovery of Vision and no further progression to Clinically Definite MS. (Also See: Optic Neuritis)

RetroVirus - A type of Virus named for its ability to convert RNA to DNA and thus use Genetic material to make the proteins it needs to survive and reproduce itself, causing several diseases in the process. #27
Romberg's Sign - Loss of Position Sense indicated by, the inability to remain immobile (without swaying), while standing with Feet together and Eyes closed. (Also See: Babinski’s Sign)

Romberg Test - An examination by a physician during which your positional sense of balance is tested. It entails you standing with feet together, arms outstretched in front, and eyes open, and then closed. #25, #26

Scanning Speech - Un-natural Speech characterized by Staccato-like Articulation, that sounds clipped because the person unintentionally pauses between syllables and skips some of their sounds. #28

Sclerosis - Hardening of tissue. In MS, sclerosis is the body's replacement of lost Myelin, around CNS Axons with scar tissue. Early Lesions are usually Remyelinated and functions restored. However, if Astrocytes make Sclerosis (Gliosis), Myelin can NOT be repaired and the damage is permanent. #28

Scotoma - A Gap or Blind Spot in the Visual Field. #28 (Also See: Centrocecal Scotoma)

Secondary/Progressive MS - A clinical course of MS which initially is Relapsing/Remitting and then becomes progressive at a variable rate, possibly with an occasional relapse and minor remission. #28

- MS that begins with a pattern of clear-cut relapses and recovery, but becomes steadily progressive over time with continued worsening between occasional acute attacks. #29 (Also See: Types of MS)

Segment, Spinal Cord - One defined portion of the Spinal Cord, which are - Eight Cervical Segments (Neck & Upper Extremities); Twelve Thoracic Segments (Chest); Five Lumbar Segments (Lower Trunk & Lower Extremities); and Five Sacral Segments (Buttocks, Bowel, Bladder and Sexual Function). #01

Sensory - Receptor mechanisms monitoring changes in both external and internal environment and convey this data to the CNS.

- Such as: Pain, Smell, Taste, Temperature, Vision, Hearing, Touch, and Proprioception (Acceleration and Position In Space). This awareness enables the coordination and quick implementation of survival reactions. (View: Image)
Sensory Cortex - The network of Neurons located along the Cerebral Parietal Lobe's surface.

Sensory Input - Stimuli that the Nervous System receives from the external or internal environment: includes Pressure, Taste, Odor, Sound, Light, and Blood pH. (View: Image)

Sensory Neurons - The Cell Bodies of Axons carrying signals from receptors that transmit information about the environment, to processing centers in the Brain and Spinal Cord. Spinal Cord Neurons processing messages from peripheral receptors are sometimes called Afferent Neurons, InterNeurons, or Lower Motor Neurons.

Sensory Pathways (Afferent) - Axons carrying information from organs and tissues to Cortical control centers (Thalamus, Parietal Lobe). #28 (View: Upper, Lower)

Sequela - A condition following or caused by a previous disease; an after effect of illness. #09

Sign, Neurologic - An objective physical problem or abnormality identified by a doctor during the Neurological Examination. Neurological signs may differ significantly from the symptoms reported by the patient, because they are identifiable only with specific tests and may cause no noticeable symptoms. #28

- Any evidence of malfunction perceived by a physician. #01
  (Also See: Babinski's Sign And Romberg's Sign)

SomatoSensory Evoked Potentials - A painless test which records nerve message transmission times within the Brain, in response to repeated electrical shocks, applied to a Peripheral Nerve. Slower response times are typically present in early MS, especially the Nerves of the legs and feet.

- Normally, the Brain's reaction to such stimuli is almost instantaneous. DeMyelination or a Lesion in the Nerve Pathway causes a delay, so reception time will be significantly slower than normal. #25 (Also See: Evoked Potentials)

Spasticity - CNS damage caused by Multiple Sclerosis, prevents Nerve messages from reaching the Brain's higher control area (Cerebellum); thus it is unable to inhibit the reflex orders (Muscle Contracting) initiated in the Spinal Cord.

- Muscle groups normally work together, when one is flexed, its opposing muscle is relaxed. MS disrupts this communication causing muscles to needlessly stay tight or contracted. This increased muscle tone is called Spasticity. Increased Muscle
Tone - Tightness or Stiff Muscles, usually around a Joint. #04

- Increased resistance to movement. It refers to the stiffness that can occur in a Limb, usually in the Leg. Spasticity often accompanies Weakness, but it is possible to have Spasticity without Weakness and to have Weakness without Spasticity. #25

- Spasticity tends to occur most frequently in a specific group of muscles that are responsible for maintaining our upright posture, referred to as Anti-Gravity or Postural Muscles. These include the Calf (Gastrocnemius), Thigh (Quadriceps), Buttock (Gluteus Maximus), Groin (Adductor) and occasionally the Back (Erector Spinae) Muscles. #06

Spinal Cord - is the communication link between the Brain and the Peripheral Nervous System (PNS) inferior to the head; it integrates incoming Nerve impulses and produces responses through Reflex mechanisms. (View: Function, Structure)

- The cord extends from the Foramen Magnum to the level of the 2nd Lumbar Vertebra. It is composed of Cervical, Thoracic, Lumbar, and Sacral Segments, which are named according to the area of the Vertebra Column from which their Nerves enter and exit.

- Thirty-one pairs of Spinal Nerves exit the Spinal Cord and pass out of the vertebral column through the InterVertebra Foramia.

Nerves to the extremities enter and leave through:
The Cervical Enlargement - in the inferior Cervical region corresponds to the location at which Nerves that supply the upper limbs enter or exit the cord

The LumboSacral Enlargement - in the inferior Thoracic and superior Lumbar regions is the site at which the Nerves that supply the lower limbs enter or exit

- In cross section, the Spinal Cord consists of a central Gray portion and a peripheral White portion. The White Matter consists of Nerve Tracts, and the Gray Matter consists of Nerve Cell Bodies and Dendrites. An Anterior median Fissure and a Posterior median Sulcus are deep clefts partially separating the two halves of the Cord. #11

Splenium - the rear portion of the Corpus Callosum, which is above the Pineal Gland. #14

Steroids (See: GlucoCorticoid Hormones)

Suppressor T-Lymphocytes - White Blood Cells (Lymphocytes) which inhibit or stop
certain Immune activity, and which may be in short supply during a MS exacerbation. 

**Symptom** - Any report of malfunction perceived by a patient. Common symptoms of MS include Visual Problems, Fatigue, Sensory Changes, Weakness or Paralysis, Tremor, Lack of Coordination, Poor Balance, Bladder or Bowel Changes, and Cognitive Changes. 

**Synapse** - The specialized junction between Neurons, there is no anatomical continuity between them. Instead, the gap is crossed by, NeuroTransmitters.

- They diffuse across the Synapse completing the connection, from the end branch of a PreSynaptic Axon, to the Dendrite, Cell Body, or Axon of a PostSynaptic Neuron. 

**T**

**T-Cell** - A type of white blood cell (Leukocyte), whose activities are influenced by their development in the Thymus Gland. 

- Are responsible for Cell-Mediated Immune Responses - used to fight viral infections. (See: Lymphocytes)

- A white blood cell (Lymphocyte) that dominates the Cellular Immune response to an Antigen.

**Tandem Gait** - A test of balance and coordination which involves alternately placing the Heel of one Foot directly in front of the Toes of the other Foot. 

**Thalamus** - Most Sensory Input initially projects to the Thalamus where Afferent Neurons synapse with Thalamic Neurons, which send projections from the Thalamus to the Cerebral Cortex. The Thalamus also has other functions, such as influencing Mood and General Body Movements that are associated with Strong Emotions such as Fear or Rage.

**Thymus** - A small Gland in the Chest above the Heart. The Thymus influences the behavior of White Blood Cells and other elements of the body's Immune System.

**Tic-Douloureux** - See Trigeminal Neuralgia.
Titer - A level or strength of a substance such as AntIBodies in Serum. #09

Tolerance - The T-Cell's inability or diminished sensitivity to an Antigen.

Tract - A bundle of Axons traveling together. In most cases, the Origin and Destination of Axons in a Tract are quite similar. #01

Transverse Myelitis - Inflammation in the Spinal Cord interfering with Nerve function below the level of the inflammation. (Also See: MS Hug) #25

- An acute attack of inflammatory DeMyelination that involves a section of the Spinal Cord. Paralysis and Numbness are experienced in the Legs and Trunk below the level of the inflammation. (Also See: Spinal Cord Segment) #28

Tremor - Either with Intention or Sustention indicates Cerebellar damage (Muscle InCoordination). Intentional Tremor becomes more shaky, in direct correlation to your increased concentration to reach, grasp, or do something. #02

Trigeminal Neuralgia (Tic-Douloureux) - Pain in the Face that comes on abruptly that sometimes develops with Multiple Sclerosis. Lightening-like, acute pain in the face caused by DeMyelination of Nerve Fibers, where the Trigeminal Nerve’s Sensory Root, for that part of the Face enters the BrainStem.

- Tic (sudden jerk) Douloureux (caused by pain) most commonly strikes inside and outside of the cheek, back across the face towards the ear, and the upper teeth.
The AntiConvulsants
[Tegretol® (Carbamazepine); Dilantin® (Phenytoin); Neurontin® (Gabapentin)]
effectly relieve the pain of Trigeminal Neuralgia. #02, #25, #28

Tumor Necrosis Factor (TNF) - A Cytokine released by activated Macrophages, similar to LymphoToxin that activated T-Cells secrete. It enhances activation of T-Cells, and induces proliferation of T-Cells and B-Cells.

- TNF also attracts additional Macrophages and Granulocytes to the site. This prompts Macrophage and other Immune Cells, to release tissue-damaging, Oxygen-containing substances and ProstaGlandins to promote Inflammation. #30

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U
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Uhhthoff’s Syndrome - A metabolic by-product of exercise, or an increase in body temperature causes a Reversible Conduction Block in a DeMyelinated Optic Nerve,
resulting in the temporary loss or blurriness of Vision.

- Uhthoff’s Symptom (temporal Visual Loss with exercise), is an indication of previous Optic Neuritis damage and a major risk factor for the recurrence of Optic Neuritis and the further development of Multiple Sclerosis.

**Urinary Retention** - Involuntary accumulation of excessive Urine in the Bladder. #25

**Uveitis** - Inflammation within the middle layer of the Eye (the Uvea) between the Sclera and Retina, affecting any of the three parts of the Uvea:

The Iris - the colored part of the Eye

The Ciliary Body - behind the Iris, which makes the fluid inside the Eye

The Choroid - a Vascular lining beneath the Retina

- Uveites includes Retinal Venous Sheathing, which represents active Periphlebitis (Sclerosis) that occurs in 10 - 20% of MSers, and symptoms range from mild to severe. Its complications are directly proportional to the extent and severity of the Ocular inflammation. They include: Glaucoma, Cataracts, Macular Edema, Retinal Detachment, and Vitreous Hemorrhages. #31

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**Vенногоles** - The four cavities in the CNS that contain the Vascular membrane (Choroid Plexus) which secrete CerebroSpinal Fluid. There are two Lateral Venticles (one in each Hemisphere), they connect with the Third Ventricle in the DienCephalon.

- In the MidBrain, the Cerebral Aqueduct connects with the Fourth Ventricle (located between the Pons, Cerebellum, and Medulla Oblongata). Which joins the Central Canal of the Spinal Cord and the SubArachnoid space which surrounds the Central Nervous System. (Also See: Ventricular System)

**Vertigo** - A feeling of internal uneaseiness, confusion, or light-headedness (passing out). The term Dizzy is commonly confused with Vertigo (a sensation your surroundings are spinning).

- While the feeling that you are off-balance, vaguely out-of-sorts, and/or actually spinning (not your surroundings) is Dizziness, DeMyelination within
the Cerebellum or its Nerve Pathways, may cause Dizziness. #25 (Also See: Vertigo/Dizziness)

Virus - A living agent, the smallest and simplest form of life, which depends on other living cells, in order to reproduce itself. The first known Virus was discovered in 1898. #09

Visual Evoked Potentials (VEPs) - A diagnostic technique for recording electrical response times, in the CNS to repeated visual stimuli. This is a very sensitive way of detecting Optic Neuritis. #25

- Evoked Potential Tests are able to confirm the presence of a suspected lesion, and can identify the presence of an unsuspected lesion (Clinically Silent), which has produced no symptoms. They are extremely useful in diagnosing MS and VEPs are abnormal, in approximately 90% of MS cases. #28

Wallerian Degeneration - Is Axonal Degeneration without local Inflammation and before local DeMyelination that results from a distal injury to the same Axon. Wallerian Degeneration commonly occurs, sometime after a distant Axonal part has been severed.

White Matter - The common term for Myelin and/or the Medullary Body and consists of: Myelinated Axons, and supporting cells (Astrocytes). The Medullary Body is the Cerebrum's deep interior (includes the Corpus Callosum, surrounds the Basal Ganglia, and parts of the Ventricles).

- Various other Nerve Pathways (ie: Cerebral Peduncles, CorticoSpinal Tract, and Medial Fasciculus Longitudinal) interconnect the entire Brain to the Spinal Cord. White Matter constitutes a larger percentage of the Central Nervous System (CNS) than Neurons (Gray Matter) and DeMyelination, damage to Neurons, their Axons, or Myelin cause MS Symptoms. #01, #23 (View: Brain's Interior)

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