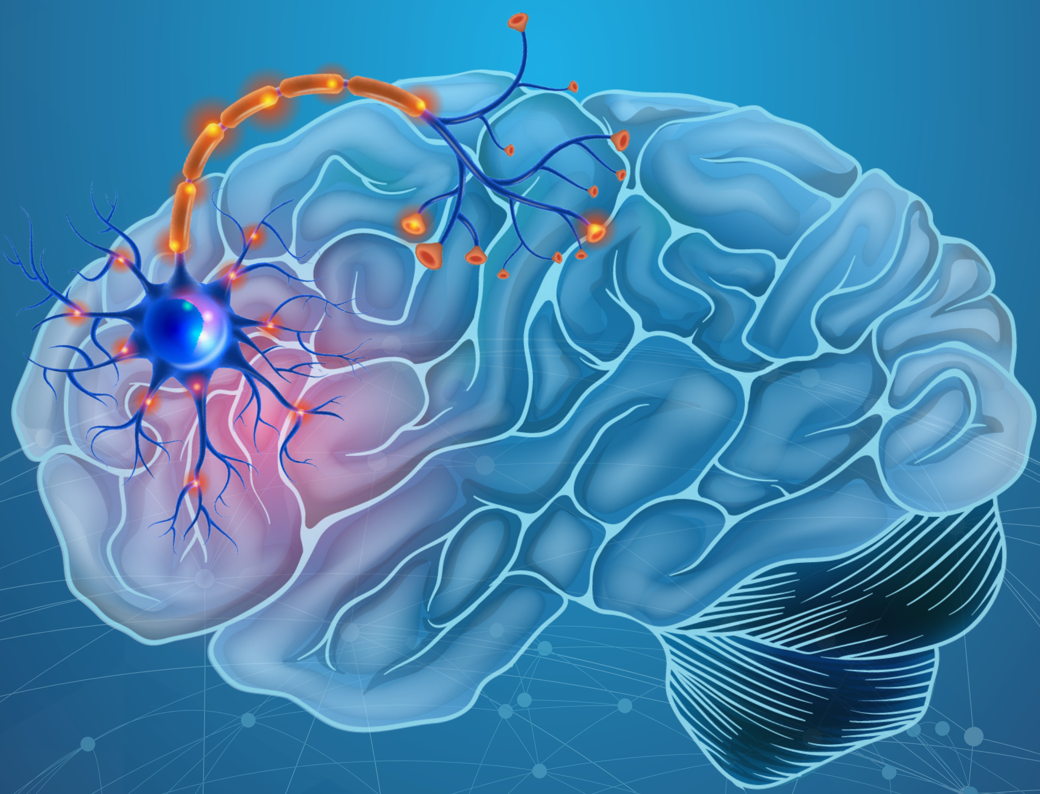
MULTIPLE SCLEROSIS (MS)

BENEFITS FROM PEMFS



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CONTENT

GENERAL

MS is a neurological condition that affects nearly 1 million American adults. MS is generally considered a chronic autoimmune demyelinating disease of the central nervous system (CNS). Although there is no apparent single cause of MS, it is most often diagnosed by the clinical picture, lab testing for oligoclonal bands in the spinal fluid and lesions on MRI. These early acute lesions, the so-called "plaques" seen on MRI, are made up of small areas of inflammation associated with damage to the myelin sheath of the nerves, "demyelination," that either resolve by remyelination or evolve into chronic lesions with associated nerve cell "axonal" loss, "oligodendroglial cell" loss and "glial" scarring. Clinically, most MS starts or becomes clinically obvious in young adulthood followed by characteristic symptom relapses and remissions (RRMS).

Once progressive disability is established, however, there are no effective standard therapies currently available to protect, repair, or regenerate neural tissue in order to restore neurological function.

Common clinical manifestations of patients with SPMS or PPMS include motor weakness with progressive paralysis, sensory dysfunction, bladder/bowel dysfunction, coordination diffculties and cognitive decline and mood changes.

The Stages of MS

People with MS will generally experience a progression of MS symptoms and severity throughout their lives. There are four stages/types of MS progression:

1. Clinically isolated syndrome
2. Relapsing-remitting MS
3. Secondary-progressive MS
4. Primary-progressive MS

The Stages of MS

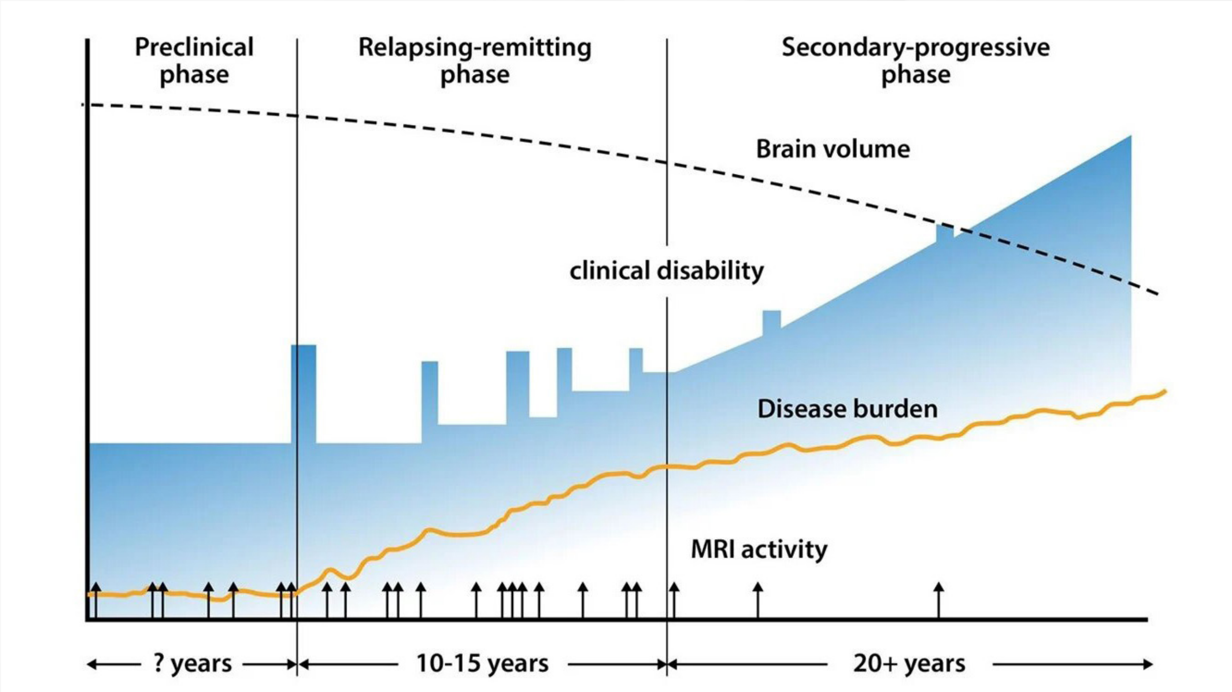
MS stage	Characterization
Clinically isolated syndrome (CIS) 1	1. An episode of neurological symptoms lasting at least 24 hours. 2. Diagnosed after a single episode. 3. An MRI shows one area of myelin damage from the episode. 4. More than one area of myelin damage indicates a different MS stage.
Relapsing-remitting MS (RRMS) 2	1. Characterized by a pattern of relapse and remission. 2. People with RRMS often have no symptoms during remission periods. 3. Symptoms generally only occur during replace. 4. The pattern of release and remission is predictable. 5. Might progress to cause more severe symptoms during replaces. 6. Can get more difficult to manage over time. 7. Can progress to become secondary-progressive MS.
Secondary-progressive MS (SPMS) 3	1. Characterized by a steady progression of symptoms. 2. More aggressive than RRMS. 3. Might have periods of remission. 4. Symptoms increase and are more severe with each remission.
Primary-progressive MS (PPMS) 4	1. Slow and steady progression of symptoms with no remission periods. 2. The most rarely diagnosed form of MS. 3. Symptoms might plateau but will not disappear. 4. Progressive difficult walking is common in PPMS.

From: http://www.healthline.com/health/progressing-ms/ms-progression-chart#stages-chart

There is no one set timeline or course of MS, but knowing the stage can help you understand and manage your MS. Every MS timeline is unique to the individual person with MS. Not everyone who receives an MS diagnosis will progress at the same rate or experience all stages.

For example, some people with relapsing-remitting MS (RRMS) never progress to any other form of MS. They might not have severe symptoms or notice any progression of their MS. Other people might see a steady worsening of their symptoms.

There are many models of the timeline for progression of MS. This is one example.



From: https://blog.crownbio.com/models-multiple-sclerosis

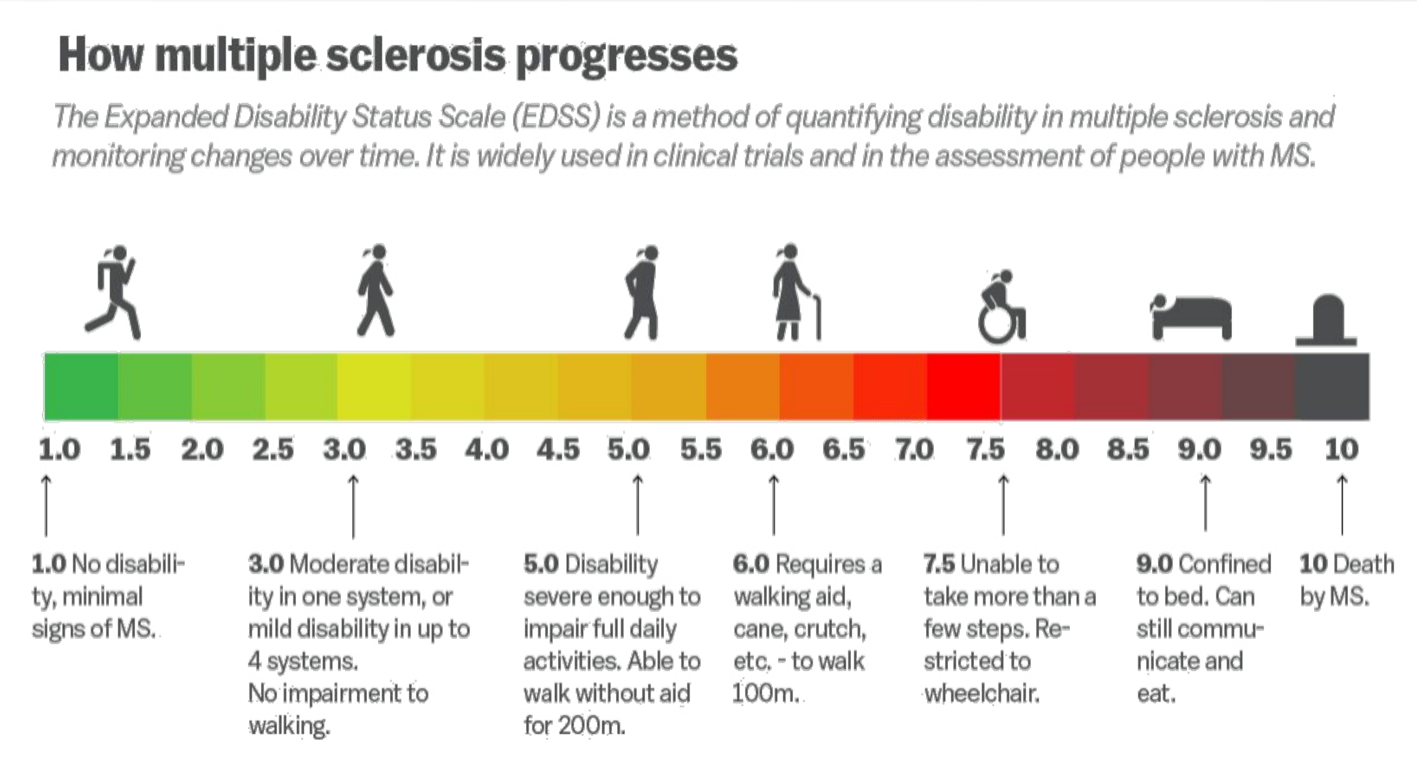
Around 85% of people with MS are initially diagnosed with relapsing-remitting MS (RRMS). RRMS follows a pattern. Any given person may experience defined and predictable flare-ups or relapses of symptoms. There may also be periods of remission when symptoms will not be present.

Over time, the symptoms experienced in relapses can worsen, with remaining symptoms or with each episode. The MS might become harder to treat and manage. There may still be some symptoms remaining during remission. However, most typically, progression only occurs during relapses.

Fortunately, there is not likely to be progression during remission in RRMS.

A well-established scale has been developed to mark the progression of MS in terms of disability status. This is called the Expanded Disability Status Scale (EDSS).

Each stage of the progression of MS is noted by the clinical status per the EDSS and changes on MRI with the burden of the disease [the number and extent of the plaques seen on MRI] and changes in the brain volume as neurons begin to atrophy and die. The chart below shows that as the burden of disease increases, the brain volume gradually decreases. At some point the level of the burden of disease begins to plateau in a severe stage as more and more damage accumulates in the brain.



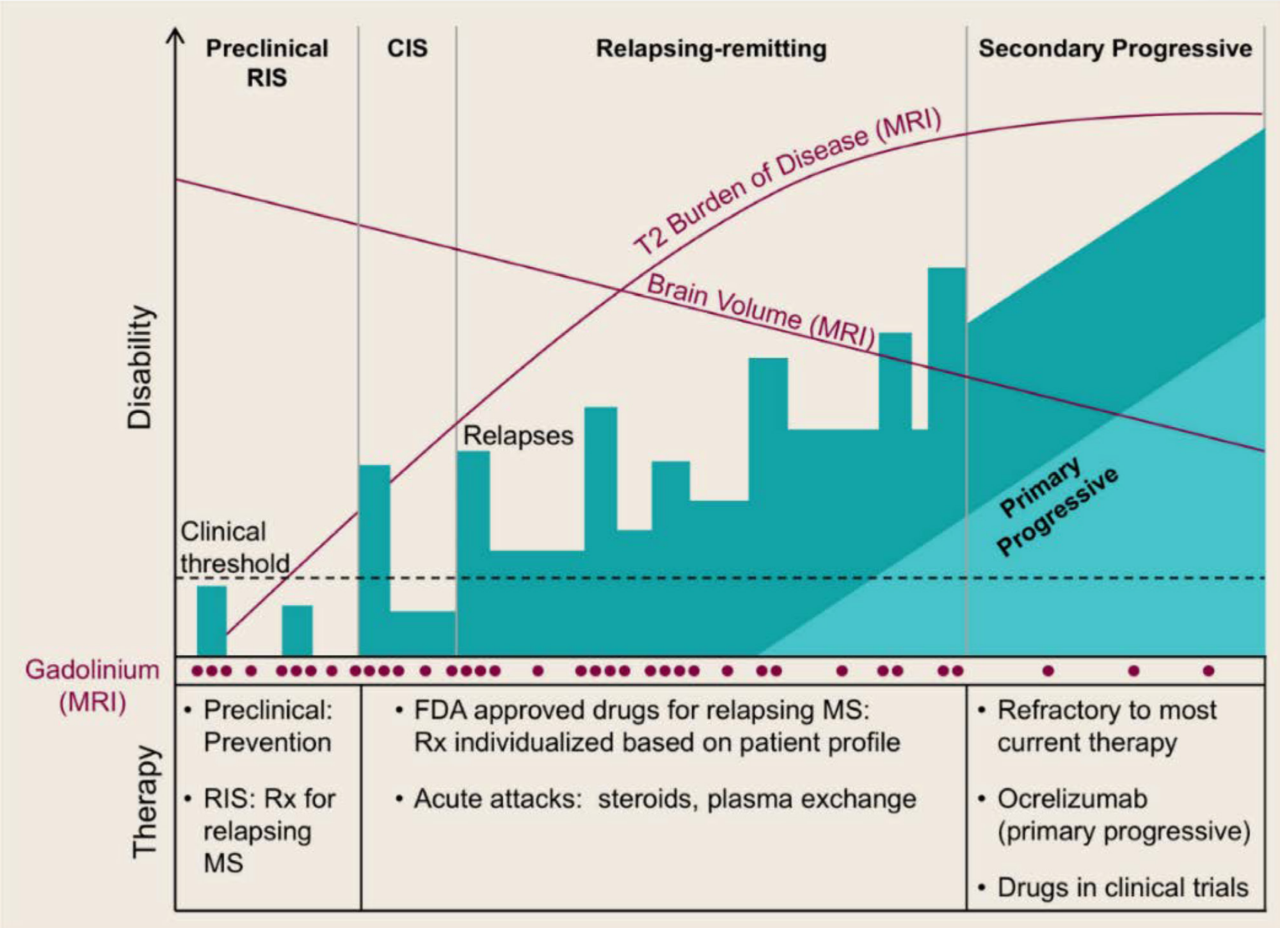
From: mistrust.org.uk

The primary approach that conventional medicine uses to treat MS is with disease modifying medications of varying kinds. Unfortunately, medication is not a cure, does not help many aspects of the disease and can cause its own side effects and complications. So, there is a continuing search for other therapies. Most conventional medicine does not involve itself with alternative approaches to the management of MS, including nutritional approaches.

While there are no currently FDA approved energy-based technologies for MS, there is growing interest in finding alternatives or complementary or integrative therapies. The FDA has approved one energy- based technology, pulsed electromagnetic field therapy [PEMF], for use for several conditions, including pain and inflammation, bone healing, wound healing, treatment resistant glioblastoma and treatment resistant depression and obsessive-compulsive disorder (OCD).

See next graphic.

This e-book is about the use of PEMF therapies helping with the management of the spectrum of MS.



[13] Kammona O, Kiparissides C. Recent Advances in Antigen-Specific Immunotherapies for the Treatment of Multiple Sclerosis. Brain Sci. 2020 May 29;10(6):333.

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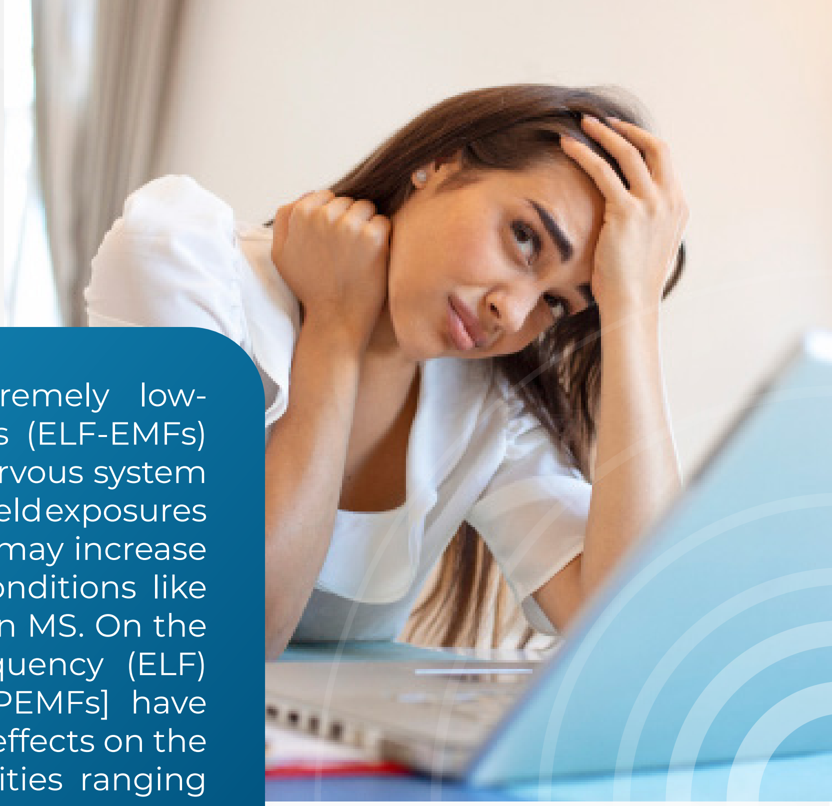
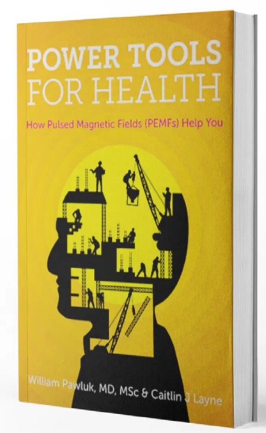


Magnetic field (PEMF) therapy for MS

It is well-established that extremely low-frequency electromagnetic fields (ELF-EMFs) easily interact with the central nervous system (CNS). High-frequency magnetic field exposures in industry and the environment may increase the risk of neurodegenerative conditions like Alzheimer's disease, ALS, and even MS. On the other hand, extremely low frequency (ELF) pulsed electromagnetic fields [PEMFs] have been proven to have therapeutic effects on the CNS, with magnetic field intensities ranging from low to very high.[11]



Although any type of magnetic field that enters the brain can activate not only brain structures themselves but also have many other physiologic actions. The intensity of the magnetic field used will penetrate the brain to varying levels and produce varying effects depending on the level of penetration. A review of these actions is covered in the book, ***Power Tools for Health***[17] and the website DrPawluk.com.

Magnetic stimulation produces current flow in the nerve tissue and causes neuronal depolarization. Transcranial magnetic stimulation (TMS) generates current flow in the brain without direct contact with the scalp and can be used to assess and control the excitability of certain regions of the brain.

Magnetic stimulation produces current flow in the nerve tissue and causes neuronal depolarization. Transcranial magnetic stimulation (TMS) generates current flow in the brain without direct contact with the scalp and can be used to assess and control the excitability of certain regions of the brain. When induced at a regular frequency, these TMS pulses are called repetitive transcranial magnetic stimulation (rTMS).

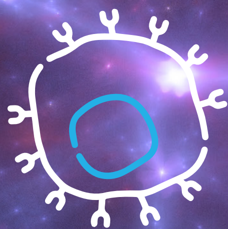
rTMS is a non-invasive and less painful method stimulation than electrical to induce brain stimulation with no significant side effects. rTMS is used as a treatment for a wide range of neurologic diseases, such as stroke and movement disorders, psychiatric diseases, and pain syndromes.

Several studies have demonstrated that the excitability of the cortex can be differentially modulated by intensity, frequency, and the overall pattern of the rTMS. Frequency is an important factor that can control cortical excitability. High-frequency (>3 Hz) stimulation usually has an effect of facilitation while low-frequency (≤1 Hz) stimulation has a lowering effect of synaptic efficiency.

While very high intensity systems, such as rTMS (repetitive transcranial magnetic stimulation) can cause neurons to be charged, i.e. to "fire" and are FDA approved to be used therapeutically for the management of treatment resistant depression, they have also been studied for use in neurodegenerative conditions, such as MS. The evidence for rTMS is extensive. It has been studied for changes in cognition, neurobehavior and to treat various neurologic and psychiatric disorders. Even these very high intensity PEMFs have been found to be extraordinarily safe.

» Immune aspects of MS

MS is considered autoimmune because immune T lymphocyte cells attack the myelin sheath of neurons, especially in the optic nerve, brainstem, spinal cord, and deeper areas of the brain. These activated T cells damage not only myelin, but also myelin-producing cells called oligodendrocytes and nerve fibers. Deterioration of myelin sets off an inflammatory process that triggers further recruitment of immune cells into the CNS and the release of inflammatory cytokines. Symptoms are varied but include muscle weakness, ataxia, visual problems, and acute or chronic pain.[16]



Low oxygen levels in the brain in MS

Hypoxia (low oxygen) is associated with many brain disorders as well as inflammation. Since Multiple sclerosis (MS) has a significant inflammatory component, it may be associated with low local brain tissue oxygen levels. Using near-infrared spectroscopy (fdNIRS), oxygen levels were measured in the cortex and correlated with disability of individuals with clinical isolated syndrome (CIS) (3), MS patients (72) and 12 controls. Control tissue O2 was 64%). In MS, 42% of O2 values were more than 2 × lower than the control. There was a significant relationship between O2 and clinical disability. This indicates that there is reduced microvascular O2 in MS brains and therefore hypoxic regions in their brains. These microvascular oxygenation deficits would be expected to impact neurological function.[26] PEMF therapy has a direct effect on circulation, whether in the brain are in the body in general and in addition reduces inflammation. Both actions would be expected to be part of the "bank" of actions caused by PEMFs that result in the improvements seen with the treatment of people with MS.

Hyperbaric Oxygen Therapy (HBOT)

In the 1980's there was speculation that several features of MS supported the question of whether MS may have a vascular ischemic component. It was observed that MS plaques showed lesions around small veins, abnormal blood vessel permeability and abnormal vessel reactivity. Acute lesions often extended along the vessels like a sleeve and both thrombosis and perivascular hemorrhages had been observed.[5] As a result of these observations, hyperbaric oxygen therapy (HBOT) was considered to potentially slow or reverse the progress of MS. Numerous studies had been conducted using HBOT to help MS. The author conducted a literature review and did a meta-analysis of evidence from randomized controlled studies. These trials include data on 504 participants, 260 receiving HBOT and 244 control or sham therapy. The lowest dose of oxygen administered was 1.75 ATA for 90 min., while the highest dose was 2.5 ATA for 90 min. All others used 2.0 ATA for 90 min. All trials used an initial course of 20 treatment sessions over 4 weeks, and 2 continued to administer "top-up" treatments.

There were no significant improvements in mean EDSS at the completion of 20 treatments (HBOT showed 0.07 EDSS points better than sham, at 6 months 0.22. There was a better result or the "top up" treatment program. The analysis suggests 10 to 71 people would need to be treated with HBOT to achieve one extra patient with an EDSS improvement of one point at 1 year. At the final follow-up, 26% of patients in the HBOT group had suffered an exacerbation vs 37% in the sham group.

On analysis of individual functional scales, there was no significant improvement or slowing of deterioration in bladder/bowel control or signs of spasticity or weakness after 20 treatments, but at 6 months and 1 year there was a less chance of deterioration in pyramidal signs. At one year, 13% of participants improved in the HBOT group compared to 5% in the sham group.

These results largely reflect the outcome of the "top-off" trial. This suggests that at least 6-197 individuals need to be treated with HBOT in order for one extra individual to show improvement.

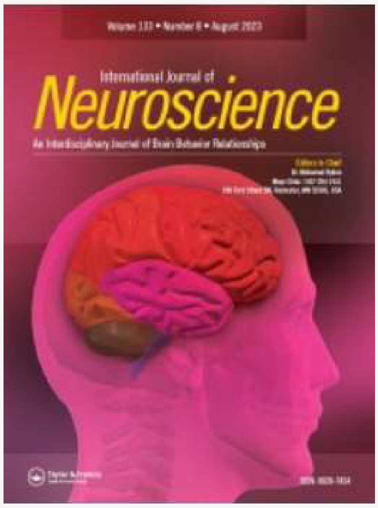
As a result of this review and several others, HBOT is not recommended for the management of MS. It's likely for any benefit to be seen that extended courses of treatment would be necessary and/or primary courses would have to receive periodic maintenance treatments. If HBOT is not covered by insurance, courses of treatment could be very expensive with relatively little long-term likelihood of value.

There is a potential for PEMF therapy combined with HBOT to produce better results than HBOT alone. It's also possible that some individuals may be particularly sensitive to the use of HBOT and derive considerable benefit, despite that evaluations of larger numbers of people don't show significant value. There is very little risk of harm from HBOT otherwise.

What does PEMF therapy do to immunity in MS?

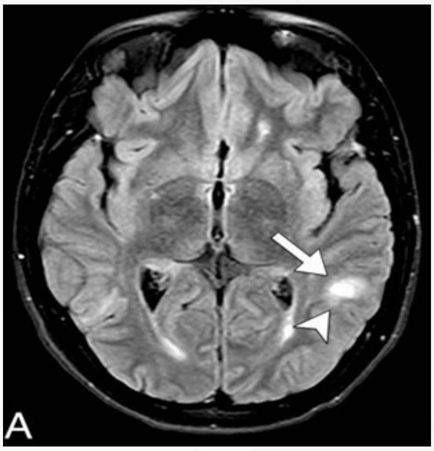
PEMF interactions with the brain start with impact on the cell membrane, are amplified by the body that then carry the reactions into the cell to result in improvements in the health and function. PEMFs have numerous actions on the body, including but not limited to, improvements in circulation, oxygenation, stimulation of ATP, stem cells, nitric oxide and healing responses, effects on the Endocannabinoid and acupuncture systems, and many more.[17] PEMFs also have a major impact on the innate and reactive immune system, both locally and systemically.

While even treatment with weak picoTesla PEMFs (also spelled picoT or pT) can improve neurotransmission, higher intensity PEMFs affect the immune function of cells, including the MS plaques (Marinozzi effect).

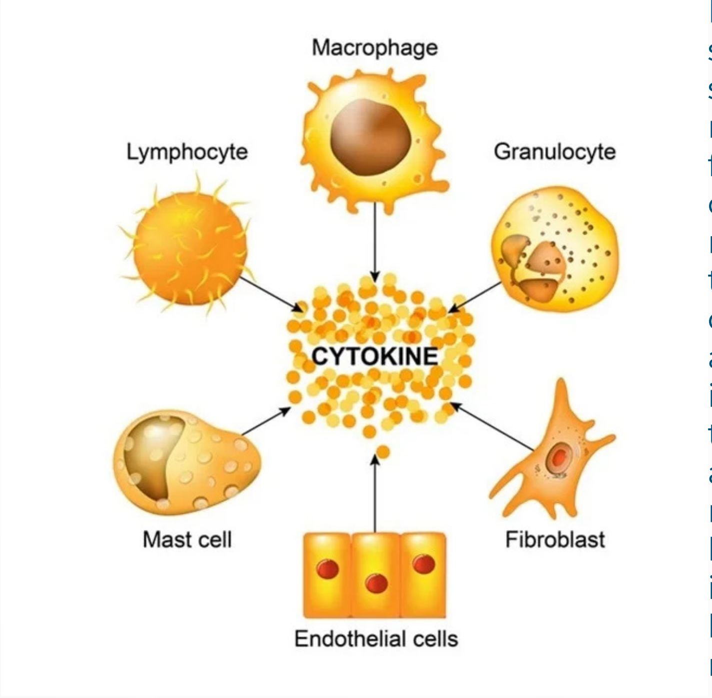


One researcher[20] reported on an individual treatment program. A forty-year-old woman with cerebral palsy (CP) and MS had symptoms of spastic paraplegia, loss of trunk control, marked weakness of the upper limbs with loss of fine and gross motor hand functions, severe fatigue, cognitive deficits, mental depression, and autonomic dysfunction with neurogenic bladder and bowel incontinence. These began at age eighteen with weakness of the right leg and fatigue with long distance walking.

Over the ensuing years, she experienced steady deterioration of functions. She became wheelchair dependent and it was anticipated that within two years she would become quadriplegic. She began treatment with picoTesla PEMFs transcranially weekly. With PEMF treatments over the next year, she had improvement in mental functions, return of strength in the upper extremities, and recovery of trunk control. During the second year, she experienced the return of more hip functions and recovery of motor functions began in her legs. For the first time in years, she could initiate movement of her ankles and actively straighten her legs voluntarily. Over the next year, she started to show signs of beginning to walk again. With enough function restored in her legs, she began learning to walk with a walker and was able to stand unassisted and maintain balance for a few minutes. She also regained about 80% of the functions in her upper limbs and hands. Most remarkably, there was no further progression of the disease during the four-year course of PEMF therapy. The doctor suggested that the regular use of the PEMFs affected the neurobiological and immunological mechanisms underlying the pathology seen in CP MS. Despite the obvious benefits of PEMF in this setting, regenerative changes in the brain require a long course of treatment, possibly forever.



The target of high intensity PEMFs is the MS plaque cells which are composed of T lymphocytes, macrophages, microglia cells and dendritic cells. Microglia are the brain-resident macrophage cells. In other words, they don't migrate from other places of the body to the brain. Dendritic cells process foreign protein material, for example, infectious agents, to send it to the surface of T cells of the immune system for further processing and elimination. They act as messengers between the innate and the adaptive immune systems. The effect of PEMFs may be to not only slow down the autoimmune cells in plaques, but also have an effect on the overall brain or even the entire CNS. They can both help the symptoms of MS in the short-term and also in the long-term by benefiting the immune system and nerve regeneration.[11]



Relative to the immune system, PEMFs stimulate macrophages, nitric oxide, heat shock proteins (HSPs) and adenosine receptors. Macrophages are responsible for fighting infections and removing other cellular debris. PEMFs not only increase the number of macrophages, but also increase their ability to digest infectious agents and cellular waste debris. Heat shock proteins are important for cellular defense. PEMFs increase HSP's and help with natural cell turnover. Research has shown that PEMFs applied to rats for 2 hours per day can be neuroprotective. After a toxic insult to the brain PEMFs help the oxidative damage, increase protein levels in the brain that help brain support and help with growing new nerve cells. The cellular effects of PEMFs depend on their intensity and exposure time, and the type of cell and actions within the cell.

Cytokines are an important part of the immune reaction in MS. Cytokines are chemical mediators within the body that relate to inflammation. Cytokines are either pro-inflammatory or anti-inflammatory.

PEMFs have been found to increase anti-inflammatory cytokines and decrease pro-inflammatory cytokines, throughout the body and in the brain.

Lymphocytes, which are one of the types of white blood cells of the body, help the body fight infections and inflammation and must gravitate or migrate to areas of inflammation and infection to do their work. This migration is important in immune responses, wound healing, cancer metastasis and neuron guidance. PEMFs affect lymphocyte activity, including migration, especially when the lymphocytes have been activated by immune challenges. Likewise, PEMFs interact with lymphoid tissue, such as bone marrow, thymus, spleen and lymph nodes, tonsils, the lymphatic tissue of the intestines, etc.

Research on PEMF therapy in MS

In MS, the relapsing-remitting type (RRMS) is the most common, affecting 85% of patients. Various symptoms, reflecting differing levels of disease activity such as relapse rate and damage severity, may present themselves, leading to limitations in certain functions such as impaired mobility. Fatigue, often one of the earliest signs, can persist for years and is considered the most common and intense symptom associated with MS. The most frequently seen comorbidity in MS patients struggling with fatigue is depressive disorders, which can hinder their independence and work capability. A significant 50% to 80% of individuals living with MS, including those with minimal disability, express that their walking ability is compromised. These combined factors profoundly affect quality of life (QOL) and ability to partake in everyday activities.

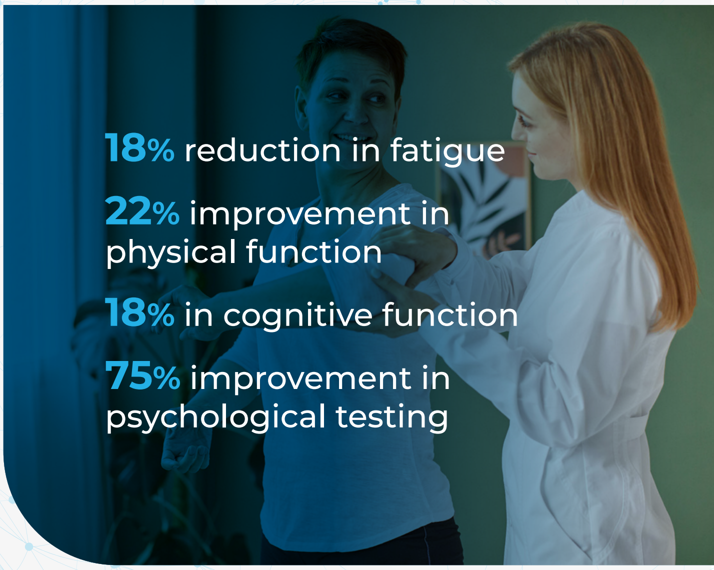
Many of the older studies done on MS have been done using lower intensity PEMF systems. This is because higher intensity PEMF systems were not available at the time. Even then there was some measure of benefit, primarily related to symptoms and function but almost no evidence of healing. Some research shows that there may even be a benefit with local stimulation with higher intensity magnetic fields. This has been shown in the treatment of stroke.

Most of the people in the study discussed were between 3 to 4 weeks after their stroke and were on average between 45-48 years of age. In the PEMF group, the patients additionally were given neural rehabilitation and exposed to a standard series of 10 PEMF treatments, for 15 mins each, at 5 mT (50 G), 40 Hz, to the pelvic girdle. The non-PEMF group received the same rehabilitation program, without PEMF therapy. (See https://www.drpawluk.com/blog/pemfs-and-brain-recovery-after-stroke-2/)

"That's right! PEMF treatment was to the pelvis, not to the brain, as would normally be expected. At the time of this research there was a concern about PEMFs precipitating seizures. This concern has largely been discounted with the FDA approved high intensity (up ~8000 Gauss) transcranial magnetic stimulation (TMS) devices for treatment resistant depression. Seizures have been extraordinarily rare and would be much less likely to happen with the relatively low magnetic field intensities used in this research. As it turns out, from this research, stimulation of the pelvic area with this PEMF set-up still ended up producing significant changes in levels of various biochemical markers. These biochemical factors end up in the circulation, and finally in the brain. In the brain they create various reactions that can help improve the negative effects of stroke." Higher intensity PEMF stimulation to the brain would be expected to produce even better results than the indirect stimulation used in that study.

Nevertheless, one example of a lower intensity study was with the use of a low intensity, whole body PEMF system [25-5 uT), 15 Hz-30Hz, 45 minutes 5x/wk for 4 wks in 44 people.[10] They were re-evaluated at baseline, after the last treatment, and at 3 months. All the individuals had minimal to significant disability and were able to walk without aid for at least 300 m. The PEMF group had a 15% improvement in fatigue after treatment vs. a 5% improvement in the control group. There were no differences in the outcomes at 3 months for either group. This research indicates that low-level magnetic field therapy has minimal impact on fatigue in MS. There were no differences between groups in score changes at post intervention or at follow-up for any of the measures of gait performance, severity of depression, and quality of life.

A low intensity whole body PEMF system was also used to treat 37 individuals with relapsing remitting MS. The device was 14 uT, modulated at about 33.3 Hz, 8 minutes twice a day for 12 weeks. After the 12-week treatment course, the treatment group had an 18% reduction in fatigue, 22% improvement in physical function, 18% in cognitive function and 75% improvement in psychological testing. The placebo group had minimal improvements, except for 22% improvement in psychological testing, indicative of a strong placebo response.[19]



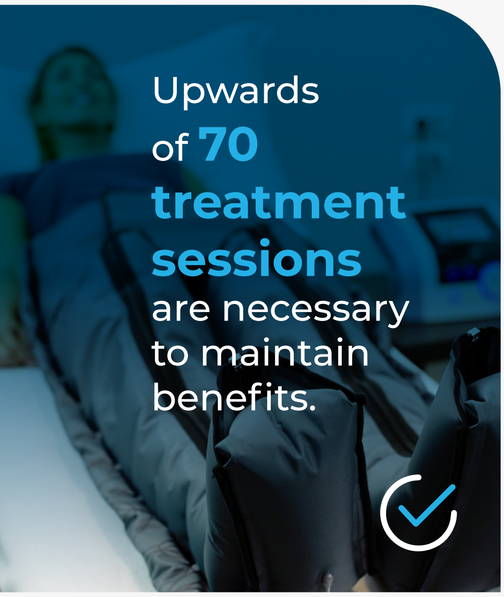
On the other hand, with the introduction of high intensity PEMF systems, that is, transcranial magnetic stimulation (TMS) there are many more studies[3] including hundreds of individuals now on the use of these systems for various neurological conditions. This contradicts the claims that are being disseminated about the harm caused by higher intensity PEMF systems.

For example, in a review of 27 clinical trials, high intensity repetitive stimuli with TMS (rTMS) over the M1 motor area of the brain (at the side of the head just behind the ears) had the most optimal impact on fatigue reduction compared to other interventions and compared to sham stimulation. Intermittent TMS over M1 produced the most significant reduced pain and spasticity. Treatment may also improve accuracy, response time, manual dexterity, and (QOL).[27] Very few significant side effects have been reported.

Another study[6] conducted a systematic review and meta-analysis of 10 clinical controlled trials of rTMS treatment of MS. This meta-analysis included the latest randomized controlled trial (RCT) research, which focused on the two major symptoms in MS, fatigue and spasticity. The measures were the fatigue severity scale (FSS), modified Ashworth scale (MAS), and a direct measure of spasticity, the H/M amplitude ratio of the soleus ligament X reflex (H/M). Quantitative data analysis showed that compared with the control group, rTMS effectively and definitively alleviated limb spasticity symptoms and especially improved the objective, physical H/M measure. The combined assessment of 3 studies did not show a statistically significant impact on fatigue. Two of the 3 studies showed significant benefits for fatigue when exercise therapy was added or vestibular rehabilitation. The nonsignificant study did not do evaluation until 2 weeks after treatment, probably missing a shorter-term treatment benefit. In addition, treatment was to the prefrontal cortex and not the motor area, which improved other measures.

Korzhova[14] performed a parallel, randomized controlled trial, in 34 secondary progressive MS patients to compare the effects of two rTMS protocols, i.e., high frequency (20 Hz) and intermittent transcranial brain stimulation (iTBS) vs a sham group on the level of spasticity and associated symptoms, including pain. All had either real (rTMS and iTBS each included 12 individuals) or sham rTMS (10) once a day for 5 consecutive days for 2 weeks. Concurrently with rTMS, all did 10 physical therapy sessions. Both high frequency rTMS and iTBS significantly reduced spasticity. There seemed to be a longer-lasting effect of iTBS and a reduction of pain and fatigue to high frequency rTMS.

In another review[28], fatigue was an outcome measure in six studies. Most of these studies showed improvement of fatigue and fatigability to M1 stimulation but no effect with frontal cortex or spinal cord stimulation. So, M1 PEMF stimulation may be a better target location for fatigue. But the M1 stimulation groups had 5 and 10 sessions in their respective studies, whereas the frontal lobe studies only had 3 treatment sessions. Other studies had significant effects by stimulating the frontal lobes for ≥5 sessions. In MS patients with pain, fatigue is probably secondary to pain rather than representing primary fatigue, and future studies should better explore this topic.



A major drawback of most PEMF research is the time-limited course of the treatments studied. In addition, for most of the studies, the benefits from treatment did not last long. One of the major goals of most of the MS research to date was to simply establish whether there was a benefit or not. Even in depression studies early research started with 5 to 10 treatment sessions to see whether benefit occurs. Now, after years of research and treatment, and frequent changes to the treatment protocols, it is being found that upwards of 70 treatment sessions are necessary to produce and maintain benefits. It is very likely that the same would apply to MS, being a chronic problem. Just as depression may not be cured with a few treatments, it is unlikely that MS would be cured with a few treatments either. As a putting graphics in my e-book the yes I kid can but the list can't because you get I don't know he would have to he would have to get it yes I assume that Tim couldn't get it while he was married Andrea's right I'd hire you better check with or maybe they change the rules I thought maybe it may be cheaper for him result, it is probably better to consider that treatment for MS treatment needs to be long-term, until it can be established that permanent healing can occur.

All current therapies for MS may be considered to have several aspects: prevention, symptom management, functional support and healing. Prevention has 3 levels to it: primary, secondary and tertiary. Primary is to prevent it from happening in the first place. Secondary is to prevent progression after disease onset. Tertiary is to prevent complications for manifestations that already exist. All current therapies for MS can be considered to primarily help with the condition once it is established.

Nonconventional, non-medical approaches to helping with MS should always be included with PEMF therapy. ***The Wahls Protocol*** (https://terrywahls.com) can help treatment with the entire spectrum of MS. Nutritional, herbal and supplement therapies can support the body and the nervous system, not only with primary prevention, but also the other levels of prevention and treatment. The combination of these approaches and PEMF's have been shown to produce better results in general.

Likewise, PEMF therapy being used for any other reason may be able to help maintain the health of the body to prevent the establishment of the condition in the body. Even PEMF treatments applied to other parts of the body, for any other purposes, can have indirect effects on the brain. This has been seen with the management of stroke as well, mentioned above.

MS relapse treatments

Relapses are part of the definition of relapsing-remitting multiple sclerosis (MS). Relapses are also called flares or exacerbations. About 85 - 90% of individuals with MS will have one or more relapses at some point in the course of their disease.[25] The standard definition of an MS relapse as stated in the revised McDonald Criteria is a "patient-reported or objectively observed event typical of an acute inflammatory demyelinating event in the central nervous system, current or historical, with the duration of at least 24 hours in the absence of fever or infection".

The severity of a relapse influences how quickly and aggressively it should be treated. For severe relapses, considered neurological emergencies, they may need to be hospitalized, evaluated in an emergency department, or treated in an outpatient infusion center. In contrast, less severe relapses may be treated with an outpatient course of oral steroids. IV methylprednisolone is the preferred first-line treatment for MS acute relapse based on a double-blind study showing that a significantly higher percentage receiving high dose IV methylprednisolone had an accelerated recovery from MS relapse compared to patients receiving placebo.

For those previously resistant to steroids or those with persistent symptoms after steroid treatment, second-line therapies including plasmapheresis, intravenous immunoglobulin (IVIG), and adrenocorticotropic hormone (ACTH) can be considered. Plasmapheresis is often utilized for severe symptoms refractory to corticosteroids, including weakness, inability to walk, and impaired vision or speech. IVIG is typically considered a second- or third-line treatment for MS exacerbation.

Placebo-controlled studies suggest that adrenocorticotropic hormone (ACTH) can accelerate recovery in MS relapses. ACTH activates melanocortin receptors (MCRs), including MC2Rs on the adrenal gland, which promote the synthesis and release of corticosteroids. In 1978, the U.S. Food and Drug Administration approved the use of a slow-release gel formulation of ACTH for the treatment of acute exacerbations of MS. It can be administered as an intramuscular or subcutaneous injection at 80–120 units for 14–21 days. Studies suggest that the effectiveness of ACTH is similar to corticosteroids.

However, the ACTH gel is significantly more expensive than steroids.

All treatments have side effects, and it is important to consider these and counsel the individual accordingly.

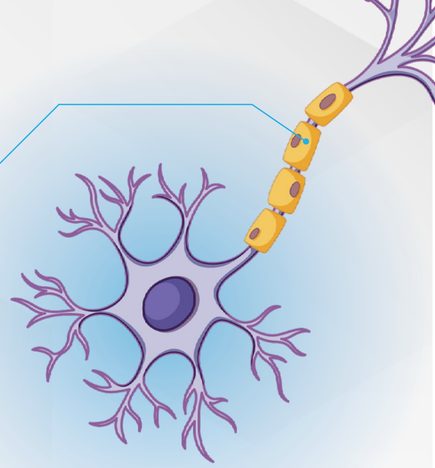
While transcranial magnetic stimulation has not been studied directly in the setting of relapse, a recent case report indicates a potential significant benefit. How much benefit there is in combination with the medical therapies is unknown at this point. A 33 yr old woman diagnosed with RRMS, had a rapid progression of her illness and a poor response to various treatments over 9 years. She had visual optical neuritis-type aftermath, minimal oculomotor alteration, disabling spastic paraparesis, right hemiparesis, and sphincter disorders. EDSS 6. Comorbidities were depression as a reaction to her illness, notable spasticity, fatigue and joint pain.

rTMS was started for 1 year. rTMS was grouped into 5 consecutive days, followed by 3 weeks rest, until 14 cycles (70 sessions in all) were completed, spread over 14 months. The stimulation was to the midline at the hairline. Stimulation was continuous at 1 cycle per second (CPS = 1Hz) for 10 minutes in each session.

Testing showed an improvement in motor and neurocognitive abilities, lower degree of disability (EDSS 6 to 5 points) from the second month of treatment. She also had a better perception of her health in relation to the impact of the disease. Improvement started becoming most noticeable from between 4 and 8 months, and was maintained the whole time after that. Starting from the fourth month of treatment, she had clear improvement at different levels. Psychometric evaluations and blood analyses showed both an improvement in her neuropsychological functions and a reduction in oxidative stress.[2]

Besides the fact that PEMF stimulation across the skull through the brain, that is, transcranially has been shown to be effective for many of the aspects of MS. This case report indicates that even relapsing levels of MS, whether acute or chronically progressive, may benefit significantly from PEMF therapy applied longer-term. The longer-term treatment is necessary to facilitate healing and significant reductions in inflammation in the brain. Symptomatic improvement is not enough. Sustainable benefit requires long- term treatment, respecting the capability of the brain to heal itself.

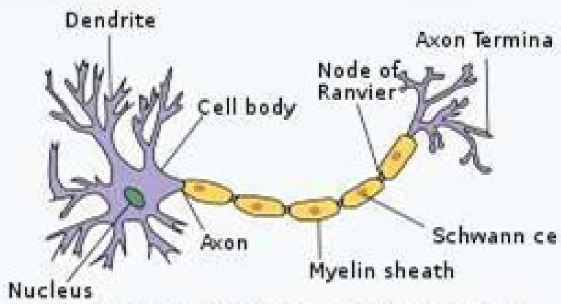
Myelin



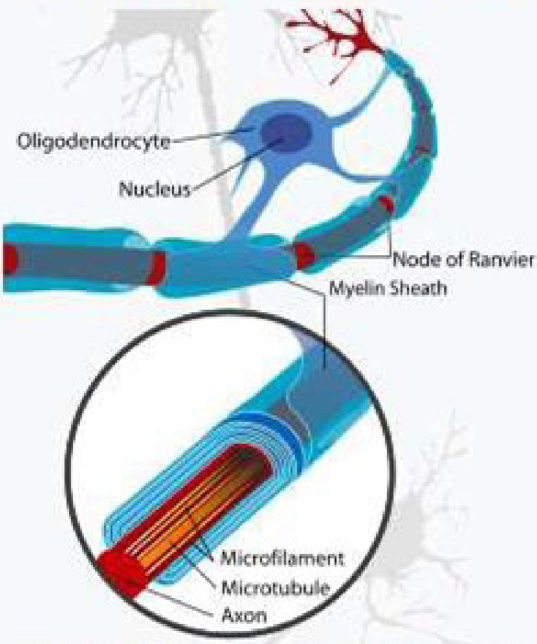
Multiple sclerosis is a demyelination disorder. Myelin covers the nerve axon, as a sheath. Myelin surrounds nerve cell axons (the nervous system's "wires") to insulate them and increase the rate at which electrical impulses are passed along the axon. The myelinated axon is like an electrical wire (the axon) with insulating material (myelin) around it. Myelin sheaths the nerve in segments: in general, each axon is encased with multiple long myelinated sections with short gaps in between called nodes of Ranvier. In the CNS, axons carry electrical signals from one nerve cell body to another.

Myelin is formed in the central nervous system (CNS; brain, spinal cord and optic nerve) by neural cells called oligodendrocytes and in the peripheral nervous system (PNS) by glial cells called Schwann cells.

8 Myelin has been considered a relatively passive structure compared to axons. It has long been assumed that changes in neural circuits were by neurons. Now there is evidence that myelin contributes to neural plasticity. PEMF stimulation of neurons increases neural activity but also stimulates oligodendrocyte progenitor cells (OPC) proliferation, differentiation and thicker myelin formation. Stimulation also increases remyelination in demyelinated lesions by enhancing myelination via promoting survival of new oligodendrocytes.[8]

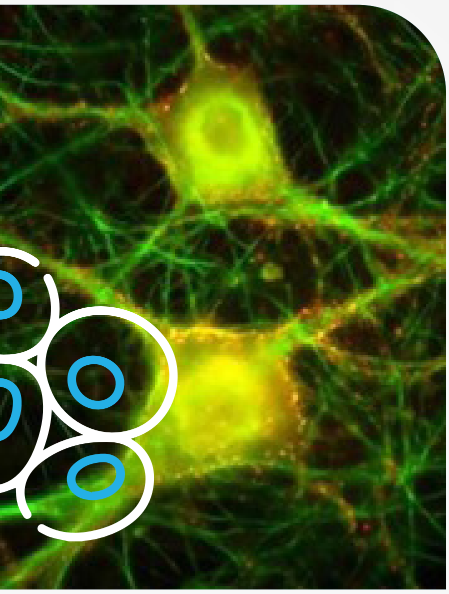


Structure of simplified neuron in the PNS



Neuron with oligodendrocyte and myelin sheath in the CNS

21 To confirm previous lab investigations of PEMF helping demyelination, an animal study of brain injury[21] evaluated demyelination in the brain. PEMFs (60 Hz; 7 G) were applied for 2 h twice a day for 7, 14, or 28 days after the injury. They assessed the amount of neural stem cells within the tissue, remyelination patterns, and traced proliferating cells. PEMFs significantly reduced the extent of the demyelinated area. They also helped the proliferation and migration of neural stem cells and enhanced the repair of myelin in the context of demyelinating conditions.



Stem cell therapy

Stem cell therapy has become the next best hope for curing MS. It is still very much in the developmental and early research stages. The hope that it offers is to regenerate existing damage to nerve cells but also to generate new neural cells. It is being studied extensively for many neurological conditions.

One of the mechanisms through which PEMF's affect the brain is through the increased production of brain derived neurotrophic factor (BDNF). In the brain, BDNF is known to improve neuronal survival, synaptogenesis, angiogenesis, and neurogenesis to regulate neuroplasticity. There are many studies that show that TMS affects the expression of BDNF, for example, in cultured hippocampal neurons.[4]

BDNF is known to have a broad range of functions that include enhancements of neuronal survival following CNS damage, neurogenesis, the migration and differentiation of neurons, the growth of dendrites and axons, and synapse formation.[7] TMS may affect BDNF content in the serum and cerebrospinal fluid (CSF). Studies have found that rTMS increases serum levels of BDNF.

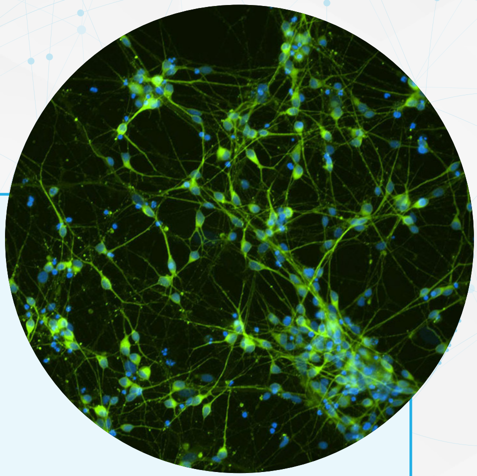
Prolonged exposure to rTMS (5 days with a 2-day break–11 weeks) significantly increases BDNF mRNA levels in the hippocampus and the parietal and pyriform cortices. The antidepressant effects of TMS can also be attributed to the influence of rTMS on BDNF production itself. BDNF is thought to be protective of synaptic transmission following ischemic brain injury. rTMS affects BDNF production in stimulated as well as remote brain regions. The effects of magnetic stimulation influence a variety of factors including neuronal morphology; glial cells; neurogenesis; cell differentiation and proliferation; apoptotic mechanisms; the concentrations of neuro-mediators, ATP, and neurotrophic factors; glucose metabolism; and the expression of certain genes.

Neural stem cells (NSCs) in the adult human brain self-renew and possess multi-differential ability to maintain cellular homeostasis and repair damage after acute central nervous system damage. A recent review, summarized the electrical activity of NSCs and the fundamental mechanism of electromagnetic fields and their effects on regulating NSC proliferation, differentiation, migration, and maturation.[9]

Stem cell therapy can fail at any one of the stages of proliferation, differentiation, migration, and maturation. Proliferation means the stimulation of the production of stem cells. Differentiation means turning those undifferentiated stem cells, most often mesenchymal stem cells, into the cells of interest, that is, neural stem cells. Depending on where these stem cells land, whether undifferentiated or differentiated, they often have to migrate to the location of tissue damage or the tissue of interest.

After that, the stem cells have to perform the nerve conduction functions of the cells they are replacing and survive as long as natural nerve cells would.

Mesenchymal stem cells (MSCs) are undifferentiated cells extracted from various tissues including bone marrow and fatty tissue that have the potential to to differentiate into multiple types of tissues. They have also shown the ability to promote tissue repair through the release of paracrine factors.[12] Intravenous used MSCs are protective against experimental autoimmune encephalomyelitis (EAE), a tissue model used to explore therapies for MS, having immunomodulatory actions. Based on this model, stem cells have been given orally, intravenously or into the brain or spinal fluid directly (intrathecal).



Transplantation of autologous MSCs have also been attempted with MS. MSCs are also capable of neuroprotection, promotion of myelin precursor cells (oligodendrogenesis), and inhibition of scarring caused by inflammation (gliosis). So, stem cell therapy is thought to possibly impact multiple aspects of MS.

23

The MEsenchymal StEm cells for Multiple Sclerosis (MESEMS) study was devised to evaluate the safety, tolerability, and activity of autologous MSCs derived from bone marrow and infused intravenously in patients with active multiple sclerosis. It was a randomised phase 2 trial done at 15 sites in nine countries with 144 participants with active RRMS or PMS, disease duration of 2-15 years since onset EDSS of 2·5-6·5. They received a single IV dose of autologous bone marrow MSCs followed by placebo at week 24, or to receive placebo followed by autologous MSCs at week 24, with a follow-up visit at week 48. The goals was to see the number of gadolinium-enhancing lesions (GELs) - an MRI surrogate marker of acute inflammation - counted over week 4, 12, and 24 compared between treatment groups.[23]

Adverse events were recorded 213 times. The most frequent adverse events reported were infection and infestations. The study did not show an effect on GELs. Thus, this study does not support the use of IV bone marrow-derived MSCs to treat active multiple sclerosis.

MS pathology in the CNS

MSC-derived neural progenitors (MSC-NPs) are a subset of MSCs that neural characteristics with reduced capacity to undergo differentiation into other non-neural tissue cell lines. It has been found that intrathecal (IT) delivery of MSC-NPs during the chronic phase of EAE resulted in neurological recovery associated with increased spinal cord myelination, decreased immune infiltration in the CNS and increased recruitment of pre-existing, native endogenous progenitor cells. Researchers also found that multiple doses stem cell implantation rather than a single dose were necessary to show improvement of neurological function.[12]

This research group conducted a human clinical trial investigating the safety and tolerability of the patients' own (autologous) bone marrow MSC-NP treatment in 20 individuals with progressive MS. The harvested stem cells were given IT in three separate doses, spaced three months apart. The results studied were safety and tolerability of the treatment and whatever outcomes would be seen with this limited kind of study. They evaluated EDSS, timed 25-ft walk, muscle strength, and urinary function (urodynamic) testing.

This IT MSC-NP treatment was safe and well tolerated. All 20 enrolled individuals completed all 60 planned treatments without serious adverse effects. Minor adverse events included transient fever and mild headaches usually resolving in <24 h. After treatment EDSS showed improvement. More frequent improvement was seen in the SPMS group of individuals and in those who were still ambulatory (EDSS ≤ 6.5). Also, 70% and 50% of the individuals had improved muscle strength and bladder function, respectively.

Multiple doses of cells may be necessary for the sustained production of immunomodulatory and trophic factors in order to get above a therapeutic threshold. MSC-NPs express and secrete a number of tissue building factors including HGF, GDNF, IGF, and LIF shown to help various aspects of neural repair. The release of immunomodulatory factors by IT transplanted MSC-NPs may also target the localized inflammation seen with astrocyte and microglial activation in progressive MS.

Interestingly, since PEMF's stimulate stem cells throughout the body, targeted PEMF therapy to the brain and spinal cord would be expected to have similar actions to IT administered stem cells. This type of stem cell therapy carries some neurological risk, has potentially significant side effects, is neurologically invasive, expensive and not covered by insurance - still being considered experimental. Given these factors, it would suggest that PEMF therapy should be attempted first, before invasive stem cell therapy, at reducing inflammation and stimulating tissue repair. Even so, PEMF therapy applied alongside stem cell therapy, before, during and after should significantly improve the long-term value of the stem cell therapy.

rTMS has been found to increase neural stem cells.[1] The mean neural stem/progenitor cells (NS/PCs) cluster (neurosphere) diameter in 1-Hz treatment paradigm was significantly larger compared with sham stimulation at both 1 and 2 weeks. In contrast, 30-Hz treatment paradigm resulted in significantly larger neurospheres only after 2 weeks. Importantly, rTMS treatment at both frequencies increased neuronal differentiation of the harvested neural stem/progenitor cells (NS/PCs). Furthermore, one week of in vitro rTMS treatment of NS/PCs with both 1-Hz and 30-Hz increased NS/PCs proliferation and neuronal differentiation. The conclusion is that both 1-Hz and 30-Hz rTMS treatment increase NS/PCs proliferation and neuronal differentiation.

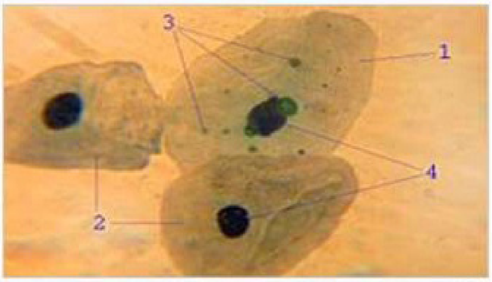
Infections and MS

Infectious involvement can be primary or secondary. Symptomatic episodes can occur without warning, but common secondary infections like influenza and gastroenteritis increase risk of relapse, although they probably do not cause the initial infection.

Interestingly, people with MS have elevated circulating cytokines/chemokines; many of these immune modulators have also been detected in the CSF.[16] These chemokines likely promote the infiltration of reactive T cells into the brain, leading to the neuron death. Monocytes also infiltrate the CNS. How these cells gain access to the brain is not well understood, but evidence points to the cytokines breaking down the blood-brain-barrier (BBB) and affecting the normal brain resident immune cells.

Chlamydia pneumoniae (not the STD form of Chlamydia) has been connected to MS. One landmark study found C. pneumoniae DNA in the CSF of 36/37 MS patients vs. 5/27 control patients with other neurological disorders. They also did special immunohistochemical staining techniques to see these intracellular organisms. These same MS patients were also more likely to have anti-C. pneumoniae IgG antibodies (32/37 in MS vs. 0/27 in controls).[22] Other studies have not found C. pneumoniae in the CSF or brain tissue of MS patients. Some of these technical diffculties may result from the complicated intracellular lifestyle of C. pneumoniae; because it only lives in an intracellular environment, it cannot freely replicate in other niches like the CSF and is very diffcult to culture outside the body. Because of these restrictions, the presence of C. pneumoniae in the CNS of MS patients and the implications of these findings for C pneumoniae as a cause of MS pathogenesis remains clouded.

Regarding whether infection can trigger neurodegeneration, it is impossible to prevent all exposure to infections. Infections are everywhere, every day. They are critical for the development of robust and responsive immunity. Any given infection creates immune responses that help with many other infectious organisms. Determining whether a specific infection causes a particular neurodegenerative disease is almost impossible. Most MS patients will have been exposed to many

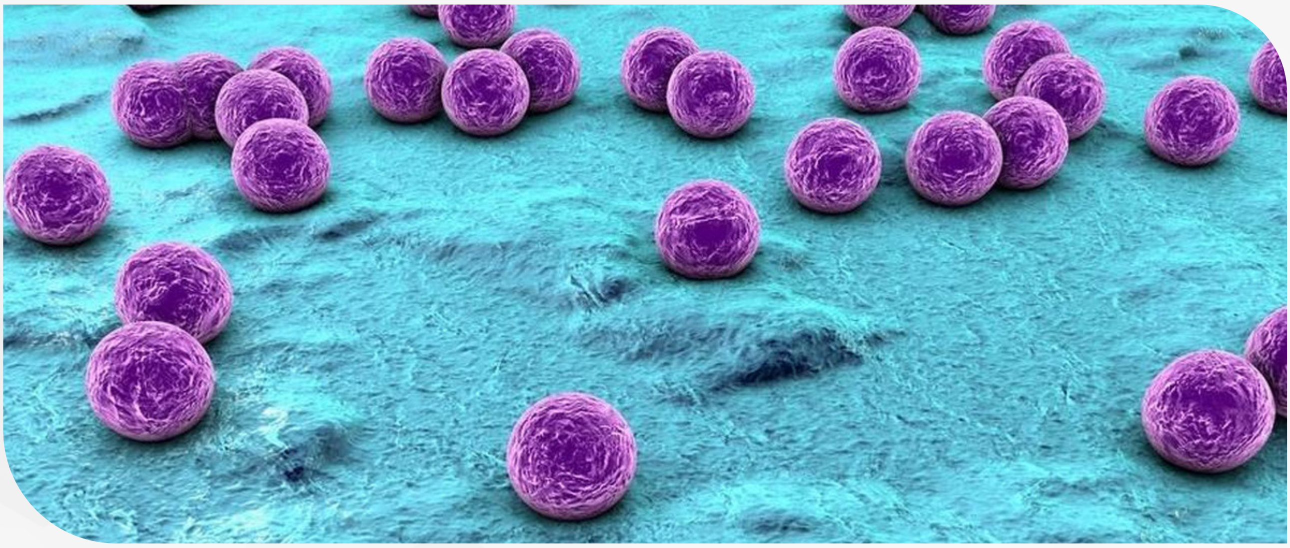


Micrograph of *Chlamydia pneumoniae* in an epithelial cell in acute bronchitis: 1 – infected epitheliocyte, 2 – uninfected epitheliocytes, 3 – chlamydial inclusion bodies in cell, 4 – cell nuclei

bacterial infections over the course of their life, as well as multiple viruses, many of which are associated with neurodegenerative diseases. For example, a recent study tested this "multiple hits" theory in those with Parkinson's disease (PD) and found that PD risk increased in those who were positive for five or six of the organisms tested (CMV, EBV, HSV- 1, B. burgdorferi, C. pneumoniae, and H. pylori).

The viruses found to be associated with MS are many and include Rabies, Herpes simplex, Scrapie agent, MS-associated agent, Parainfluenza virus, Measles, Simian virus, Chimpanzee cytomegalovirus, Coronavirus, SIMON-like virus, Tick borne encephalitis virus, HTLV, MSRV, HSV, MS1533 retrovirus, HHV- 6, Borna, EBV, VZV, Torque Teno virus. (Virtanen) The most evidence recently has accumulated for Epstein-Barr virus (EBV) and human herpesvirus 6 (HHV-6) involvement. For that reason I have been recommending the book "The Epstein-Barr Virus Solution" to help with the virus. There are no good medical therapies for EBV.

MS is truly a complex disease with genetic, environmental and immunological aspects. The variability of MS suggests that MS is not caused or triggered by only one virus, but probably a more complex set of viral infections could act as triggers in genetically susceptible individuals but could also affect the course of the condition in any given individual. CNS-related genetic mutations associated with CNS dysfunction could impact susceptibility to infection, further complicating the "chicken or egg" question. In addition, those with mutations in disease-related genes may need another stressor, such as inflammation, to trigger disease progression.



PEMF role in helping with infections

PEMFs can be very useful in helping the body deal with infections, whether bacterial or viral. Many bacteria have been studied in the laboratory setting with bacterial cultures. Bacterial growth inhibition was present in each culture but was much more dramatic with higher intensity magnetic fields, with actions becoming obvious within ten hours after the initial exposure. Longer continuous exposure times (six hours, for example) yielded better results. Studied microorganisms were not always killed outright by the magnetic fields. The same is true for many antibiotics and antivirals, which only inhibit growth but don't kill the organisms. In this sense, PEMFs act like some antibiotics.

Besides the direct action of PEMFs on bacteria, PEMFs also help the person's body to fight infections.[17] A living being employs numerous mechanisms to control growth of bacteria and therefore infection. The process of controlling infection in a body would be helped even more with appropriate PEMFs designed to stimulate the defense mechanisms of the tissues and bacteria killing cells of the host. Combined use of these two approaches would help to heal infections much more rapidly, without risk to the host. PEMFs help to heal infections in many ways. PEMFs improve the function of cells that kill bacteria (phagocytes), leading them to become better bacterial hunters. White blood cell neutrophils create better neutrophil extracellular traps (NETs) to bind pathogens. PEMFs improve the adaptive and the innate immune system and have many other actions to help with infections.

Just as with some bacteria, viruses can also cause chronic inflammation of joints and create inflammatory arthritis. Research found that a PEMF applied to herpes virus infected cells did not affect the growth and viability of the cells. However, the viruses developing under PEMF exposure had mainly defective viral particles. This therefore gives the PEMF an opportunity to heal the tissue while rendering the virus less active.

Laboratory exposure of cells to PEMF for at least twenty-four hours induces

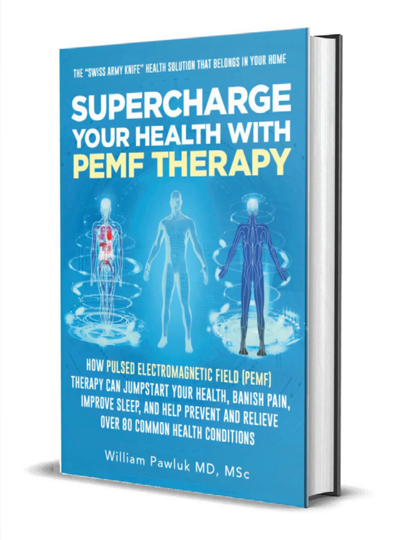
- **significant resistance of cells to virus challenge by several viruses**
- **the production of natural cellular substances that markedly suppress virus infections when transferred to unexposed cells**

The virus suppressor substances induced by the magnetic field are neither virus- nor species-specific, are not apparently interferon-like, and are important in the regulation of replication of any virus. This makes it appear that routine use of PEMF therapy may be able to help reduce the risk of any viral infection.[Winters] This also makes it possible that PEMF therapy may reduce the risk of reactivation of latent viruses.

Whole body health and MS

Whole body health affects the onset and progression of MS and quality-of-life. Therefore, overall health needs to be very strongly considered as well and what PEMFs can do for other health conditions.

The table below shows the basic biologic actions of PEMFs. These basic actions affect physiology, regardless of pathological conditions. It's more relevant to consider all these actions of PEMFs than to consider a particular diagnosis. Most diseases have considerable overlap in their physiologic responses. The body has only so many ways to respond to cell injury and disease.



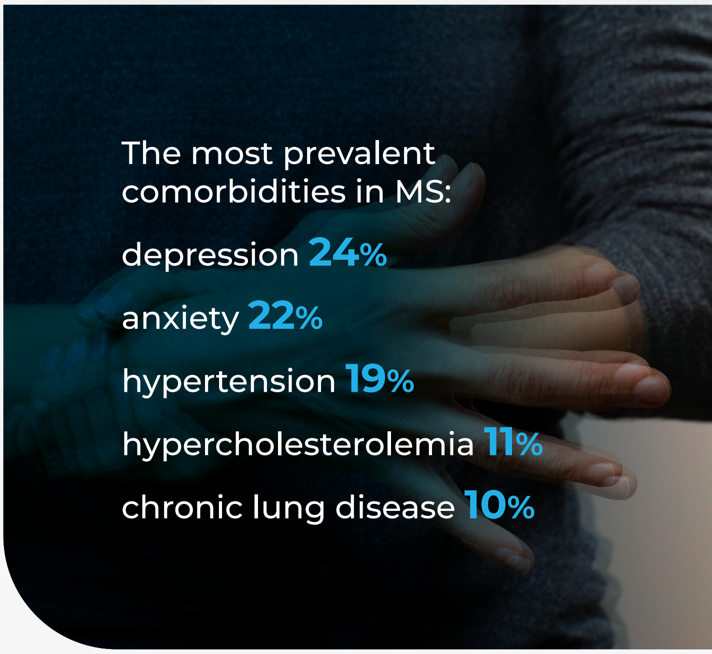
From an MS perspective all these actions of PEMFs are relevant to not only helping the MS process itself, but also maintaining the health of the body overall. PEMFs would help to decrease the risks of neuronal inflammation, cell death, immune function, activity levels, cognitive function, energy levels, circulation, and many more. The book *Supercharge Your Health with PEMF Therapy* reviews all these.

Basic biologic actions of PEMFs

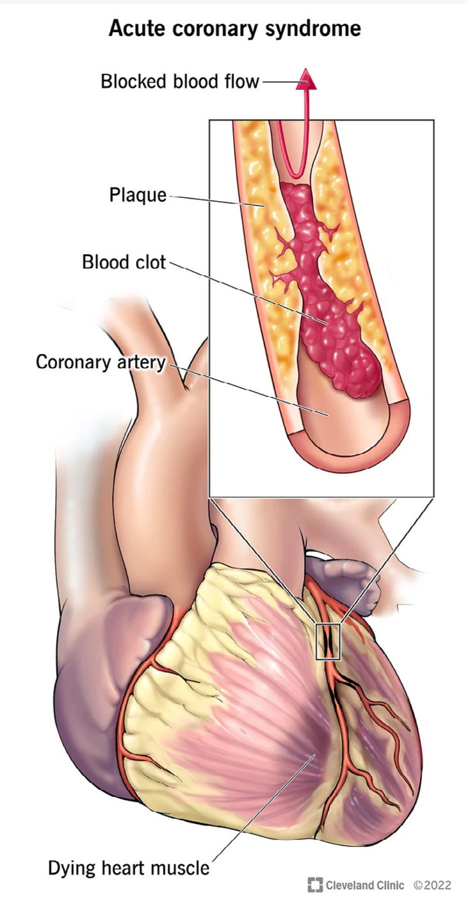
- Acupuncture Stimulation
- Adenosine receptor
- Antibacterial, Antifungal, and Antiviral Actions
- Anti-Coagulant effects
- Anti-Edema/ Lymphedema activity
- Anti-Inflammatory response
- ATP and Mitochondria
- Autophagy
- Circadian Rhythms
- Circulation
- Collagen, Hyaluronic Acid, and GADs
- Endocannabinoid system
- Detox
- Growth Factors Nitric Oxide
- Healing Acceleration
- Heart Immunology
- Nerves and Nerve Conductivity
- Nitric Oxide
- Oxygen
- Pain
- Psychological, Cognitive, Brain Function
- Recharge the "body battery"
- Red blood cells
- Skin
- Stem cell stimulation
- Stress
- Tissue healing and regeneration
- Water

Cofactors and PEMFs

Behaviors such as smoking, alcohol intake, and sedentary lifestyle affect the risks and also the outcomes of MS. Comorbidities influence the course of MS. Multi-morbidity increases with age and the risk is increased in those with a chronic disease.[15] Polypharmacy due to medical treatment of comorbidities may also obscure the clinical the initial or ongoing presentation of the person with MS. The most prevalent comorbidities in MS are depression (24%), anxiety (22%), hypertension (19%), hypercholesterolemia (11%), and chronic lung disease (10%). There is also a higher occurrence of cerebro- and cardiovascular comorbidities compared with a population without MS.



Those with MS have an overall elevated risk for deep vein thrombosis and those with primary progressive MS had a 3-fold higher risk. In studying those with MS over an 11-year period, there was a 28% increased risk of acute coronary syndrome (MI or heart attack), 59% increased risk of cerebrovascular disease, and 32% increased risk of disease of any larger blood vessels.



There is also a 3-fold-higher incidence of MS in those with DM type 1. In a pediatric and adolescent diabetic population below the age of 21 years there was a considerably higher risk of co-occurrence of MS. Thyroid dysfunction is a known side effect of some Disease Modifying Therapies. Other autoimmune diseases, such as inflammatory bowel disease (IBD) and psoriasis, were also found to be more prevalent in the population with MS, that is, for IBD it is 50%.

Comorbidities affect those with MS in many ways. In those with MS and one or more comorbidities there is a 2-fold higher all-cause hospitalization rate than MS patients without any comorbidity. Fatigue and three or more physical comorbidities were associated with significantly higher rates of physician visits, prescriptions, and hospitalizations.

Comorbidities are associated with increased mortality. Mortality is increased in persons with MS with coexisting psychiatric, cerebrovascular, cardiovascular, lung, diabetes, cancer, or Parkinson's disease comorbidities. Those with

MS with cerebrovascular diseases have lower survival rates. In fact, the mean survival time is lower for MS patients with any coexisting circulatory condition. In a study of those with cerebrovascular changes and having had a brain MRI, it was found that diabetes mellitus (DM) type 1 was associated with a significant reduction in gray matter, indicative of reduced cortical function. The presence of autoimmune comorbidities, especially psoriasis, thyroid disease, and DM type 2, was associated with more severe MRI outcomes of neurodegeneration and demyelination. Those with MS with vascular comorbidities at any time during the course of their disease progressed to a lower kidney function the Expanded Disability Status Scale (EDSS) score of 6 on average. This happened 6 years faster than MS patients without vascular comorbidity. Comorbidities also increased visual disability.

Depression was associated with a significantly higher subsequent disability over an average of 10 years of follow-up in women. MS patients with depression or bipolar disorder showed a significantly higher risk of progression on EDSS score.

The prevalence of comorbidities increases with age, and more elderly patients with MS may suffer with age-related comorbidities. Comorbidities modify disease activity, worsen disability and chronic symptoms, and, overall, negatively affect the quality of life.

The purpose of this review regarding comorbidities is to indicate that PEMF therapy, given all the things that it does for the body, body function and slowing disease progression, should be strongly considered, not only for the MS but also maintain and improve the general health of the body. This should decrease disease progression, relapses, and often significantly improve overall function.

Many of these other comorbidities also have their own components of inflammation which would be helped significantly with whole body and local PEMF therapy.

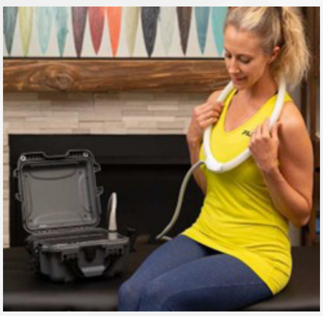
Getting and using the right PEMF system

The biggest mistake people make in purchasing a PEMF system for use with MS and/or comorbid conditions is that the PEMF system is not strong enough. Symptom improvements and improvements in function may be seen with lower intensity PEMF systems but their benefits often do not lead to a reduction in progression or healing of brain or spinal lesions. In addition, if there are any comorbid conditions, including other autoimmune conditions, arthritis, lumbar disc disease, MS-related spasticity or fatigue, higher intensity PEMF systems are likely needed.

A key element in helping MS in the short-term and long-term and any other comorbid conditions is the need to reduce inflammation in the brain and spinal cord. This is covered to a significant extent in a blog: https://www.drpawluk.com/blog/pemfs-and-adenosine/

The key here is that research is shown that inflammation is optimally managed when the magnetic field intensity is at 15 gauss at the site of inflammation. Because magnetic fields decrease in intensity with distance from the source, very dramatically, at the very least according to a law of physics, the inverse square law, the depth of treatment into the body needs to be considered.

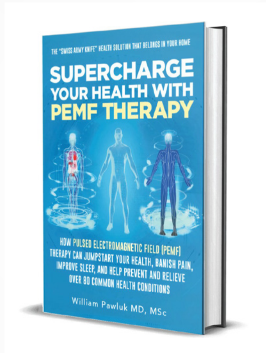
The above blog has tables that show you the magnetic field intensity needed to treat inflammation at various depths into the body. For example, applying a magnetic field on one side of the head with the goal to deliver an adequate magnetic field on the other side of the head would require a magnetic field intensity of around 4000 Gauss, assuming the width of the head is about 6 inches. Since inflammation is the limiting factor for determining the intensity of the magnetic field required, having the right PEMF system is critical for the best results. A system at this level of intensity is also most likely to help with almost any other condition in the body as well.



The best PEMF system will include, at the very least one whole body mat and a local applicator. The whole-body mat is important to maintain the health of the whole body, reducing inflammation anywhere throughout the body. The local applicator, which almost always has a higher field intensity, would be required to treat the brain and spinal cord. Since spasticity is a very common problem with MS, treatment of the brain and possibly the spinal cord requires




a higher intensity magnetic field. The optimal system would include two whole body pads, to create a magnetic sandwich, and two smaller higher intensity applicators, allowing treatment of two areas of the body at the same time, for example, the brain and the bladder area.



Because treatment of MS can be complicated in order to produce the best results, consultation with a clinician is recommended to tailor the appropriate PEMF system to the individual. A list of possible PEMF systems is provided in the ***Supercharge Your Health book*** and also at https://www.drpawluk.com/landingpages/product-comparison/

To obtain a free consultation with a health professional expert in PEMF therapy go to https://www.drpawluk.com/consult/

How quickly results will be seen with PEMF therapy with an adequate magnetic field intensity

The ultimate goal with PEMF therapy is to heal as much and many of the MS lesions as possible. Lesions (plaques) that have mostly dead tissue are not likely to be revived or approved. Around every plaque is a zone of more intense inflammation that compromises the surviving brain cells both in terms of function,

longevity and recovery. It is hard to objectively assess the status of these lesions, having to mostly rely on the improvement of symptoms and function. Symptoms and function improvements with the use of PEMF therapy that do not regress when therapy is stopped, temporarily or longer-term, may be more likely to be considered relatively healed. This can be a very long-term process, because brain tissues don't heal quickly. Patience is necessary. Even though PEMF therapies improve function and can stimulate stem cells and cellular repair, the results will depend entirely on the level of damage in the individual with TMS. The sooner somebody with MS starts PEMF therapy, with the right PEMF system and the right daily use, the better the results. When somebody is already using canes or requires wheelchair support, the degree of benefit is likely to be less obvious. In many cases people are able to start walking or stop using canes, but we would never know until PEMF therapy has been used adequately for at least several weeks.

The Supercharge Your Health with PEMF Therapy book also has recommendations for the use of PEMFs for about 80 health conditions.

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Appendix A

The Expanded Disability Status Scale (EDSS) – Long form

0	No disability.
1	Minimal symptoms impacting one functional system, but no disability.
1.5	Minimal symptoms impacting more than one function system, but no disability.
2	Minimal disability symptoms in at least one functional system.
2.5	Mild disability symptoms in one functional system or minimal disability in two functional systems.
3	Moderate disability symptoms in one functional system, or mild disability in three or four functional systems. No difficulty walking.
3.5	Moderate disability in one functional system and more than minimal disability in several others. No difficulty walking.
4	Significant disability but able to perform self-care activities and live independently. Able to walk without assistance or rest for at least 500 meters (1,640 feet).
4.5	Significant disability and some limits to the ability to perform daily tasks. Still able to work and independently do most activities. Able to walk without assistance or rest for at least 300 meters (984 feet).
5	Disability is significant enough that daily activities are impacted. Might need assistance to work or perform self-care. Able to walk with assistance or aid for at least 200 meters (656 feet).
5.5	Disability is significant enough that self-care and other daily activities might not be possible. Able to walk without assistance or rest for at least 100 meters (328 feet).
6	Need a walking aid but can walk 100 meters (328 feet) without resting.
6.5	Needs two walking aids but can walk 20 meters (66 feet) without resting.

7	Uses wheelchair exclusively but able to transfer self in and out of the wheelchair. Able to use a wheelchair independently. No longer able to walk more than 5 meters (16 feet) even with aid.
7.5	Might need help transferring in and out of the wheelchair. Might require a motorized wheelchair. Unable to walk more than a few steps.
8	Needs assistance to use a wheelchair. Still able to use arms and perform some self-care.
8.5	Restricted to bed for most of the day. Still has some use of arms for self-care.
9	Unable to leave bed. Able to communicate and eat.
9.5	Unable to leave bed. Completely dependent and unable to communicate. Cannot eat or swallow independently.
10	Death from MS.

Multiple Sclerosis (MS)

Benefits from PEMFs

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