This month we bring you some of our most popular articles from 2019, as well as an all-new Research Spotlight featuring upcoming events and research opportunities that may be of interest to you and others in the MS community.

There is no consensus or guidelines to follow when it comes to what a person with MS should eat. However, there is evidence that eating certain foods and nutrients and avoiding others may help with MS symptoms and disease activity. Our first article covers several dietary strategies for people with MS, including the scientific evidence to support, or refute, them.

Dietary supplements may be an attractive option for people with MS in their efforts to manage the disease and its symptoms. Several vitamins, minerals and herbs are thought to be beneficial in MS. However, being educated and careful about their use is very important. Learn more about dietary supplements and the scientific evidence surrounding their benefit in MS.

Protecting and repairing the nervous system, in particular myelin, holds significant promise as a strategy to develop treatments that will not only stop or reduce MS progression, but also restore the function that the disease steals. Learn more about where we stand with regenerative therapies for MS.
Are you interested in opportunities to participate in research, or MS events that may be occurring in your area? Check out our new Research Spotlight! This month we feature MS studies currently looking for new participants at the Ohio State University and UMass Medical School, as well as a patient symposium hosted by the Tisch MS Research Center of New York.

We hope you enjoy this newsletter and encourage you to share it with anyone you think may be interested in learning more about MS research.

**MS Diets – Is there enough evidence to recommend any of them?**

A nutritious, well-balanced diet combined with other healthy lifestyle choices (exercise and refraining from smoking) is the foundation of good health not only for people with MS, but also for the general public. Healthy eating includes foods that are rich in fiber and low in saturated fat, such as lean proteins, whole grains, vegetables and fruit. The foods you should avoid are just as important, such as processed foods, as well as those high in sugar and salt. Eating in this manner helps the body’s everyday functions, promotes optimal body weight and can help with disease prevention. While there is no specific diet that will prevent or cure MS, there is evidence to support that eating certain foods and nutrients, and avoiding others, may help a person’s MS symptoms and disease activity.

A recent study shows that diet can influence the course of inflammatory diseases in two ways. Dietary factors can directly impact the metabolic process of inflammation in cells. What you eat can also change the mix of “good” and “bad” bacteria in the digestive tract (the gut microbiome). A healthy digestive tract is populated by a great number of microorganisms living in balance. A disruption of this balance can have a significant impact on one’s health, specifically the chronic, systemic inflammation that occurs in diseases such as MS.

Nutrition is a hot topic in MS research. Many studies reveal an added benefit for people with MS to the “usual” benefits of adhering to a healthy diet. For example, there is
evidence that sodium (the primary component of salt) increases MS disease activity. In an observational study, people with MS who consumed a moderate or high amount of sodium had a higher rate of relapses and a greater risk of developing a new lesion on MRI than people who consumed a low amount of sodium. Another study shows that consumption of saturated fats (found in such foods as red meat and full-fat dairy products) not only increases the risk of developing MS, but is also linked to disease progression. In addition, a study published in February 2018 found that people who have MS are at an increased risk for heart problems compared to those who don’t have MS, adding more weight to the conclusion that people with MS should steer clear of saturated fats, as well as sweetened foods (which also negatively impact heart health). High sugar intake is also associated with weight gain. Research findings point to obesity as a possible risk factor for MS. Excess weight can also make it more difficult for those living with MS to be mobile and perform activities of daily living. In addition, obesity increases fatigue, which is a common symptom of MS. Interestingly, one study suggests that drinking cow’s milk may be linked to MS prevalence, however these results have not been confirmed.

According to the Harvard School of Public Health, certain foods may affect inflammation, either positively or negatively. For example, those that may cause inflammation include fried foods, sugar-sweetened beverages, red meat, processed meat and margarine. Some anti-inflammatory foods might include tomatoes, olive oil, green leafy vegetables, fatty fish, fruits and nuts (especially walnuts). This school of thought suggests choosing the right anti-inflammatory foods may decrease the risk of illness. Consistently picking the wrong ones may accelerate the inflammatory disease process.

Several diets have been proposed as treatments, or even cures, for MS. It’s important to note that, while they may provide some symptomatic benefit, most have not been subjected to rigorous, controlled studies, and the few that have been evaluated have produced mixed results.
The **Paleolithic (or Paleo) diet** gained popularity with **Dr. Terry Wahls**, a woman with secondary progressive MS that was wheelchair-dependent. However, after consuming a modified Paleolithic diet (along with physical therapy and **neuromuscular electrical stimulation**), she was able to walk again. The aim of the Paleolithic diet is to return to a way of eating that’s more like what early humans ate. The reasoning is that farming changed what people ate and established dairy, grains and **legumes** as staples in the human diet. According to the hypothesis, the human body has not been able to adapt to this change. While there are many variations of the Paleo diet, the commonly recommended foods are fruits, vegetables, nuts and seeds, lean meats, fish, and oils from fruits and nuts. Foods to avoid eating are grains, legumes, dairy products, refined sugar, salt, potatoes and highly processed foods. There isn’t much scientific evidence to support this diet’s role in MS. One **study** showed that the Paleo diet improved MS fatigue in people with secondary progressive MS, but the study was small and other interventions like stretching, massage, and meditation were used along with diet. As a result, it’s hard to determine which of the interventions benefitted study participants.

The **Mediterranean Diet** (MD) is based on the traditional foods that people used to eat in countries bordering the Mediterranean Sea (such as Italy and Greece). It is known to be beneficial for people with heart disease and Type 2 Diabetes, and possibly prevents cancer. This diet promotes a low consumption of added sugar, **refined grains**, **trans fats**, **refined oils**, processed meat, and other highly processed foods. The MD includes a moderate intake of red wine, and a high consumption of whole grains, vegetables, fruits, nuts, seeds, legumes, potatoes, breads, olive oil, and fish. A small 2016 **study** found that people who adhered to a MD had a lower risk for developing MS. Otherwise, there is no strong evidence linking its benefit to people with the disease.

The **McDougall diet** is based on the premise that the rich **Western diet** is the cause of several chronic diseases. It aims at eliminating animal-based food, as well as **vegetable fats**, and replacing them with low-fat plant-based foods. The suggested staples of the diet include wheat flour products, corn, rice, oats, barley, quinoa, potatoes, sweet potatoes, beans, peas, and lentils, fresh fruits and **non-starch green or colored vegetables**. This diet requires low sodium and sugar intake and consumption of dairy, oils, eggs, meat, poultry and fish is not allowed. There is no evidence that the McDougall diet provides benefit in
MS or other autoimmune diseases. However, a study from the McDougall Health & Medical Center showed that 7 days of the diet led to a reduction in weight, blood pressure, and cholesterol levels. This study did not look at on the long-term effects of the diet.

A study published in March 2011 found a higher incidence of celiac disease, an autoimmune disease characterized by gluten intolerance, among people who have MS than among the general population. Gluten is a protein found in wheat barley and rye. People who have celiac disease must avoid gluten entirely to avoid intestinal damage, but many people who don’t have celiac disease find they feel better overall when they adhere to a gluten-free diet. While there’s no evidence to suggest that avoiding gluten is beneficial for people with MS who don’t also have celiac disease, it may be an option for those not finding relief with other things.

The Ketogenic Diet is a very low carbohydrate diet designed to force the body to burn fat instead of glucose for energy. This process produces ketones (which gives this type of diet its name). Key foods include avocado, full-fat cheeses, heavy cream, butter, whole eggs, fatty nuts and seeds, bacon, beef, fatty fish, low carbohydrate vegetables, and olive oil. The Ketogenic Diet has been used to treat epilepsy since the 1920s. Researchers are examining its potential use for treating other neurological disorders, like MS. The resulting change in the body’s metabolism from glucose to fat is thought to improve the function of mitochondria, which is linked to the survival of nerve fibers. Because nerve fibers degenerate and die in progressive MS, scientists believe a Ketogenic Diet may benefit people with progressive forms of the disease. Further research is necessary in order to confirm this effect.

The Fast Mimicking Diet (FMD) follows the same general principles as regular fasting. The body is deprived of food in order to take advantage of health benefits like reduced inflammation and increased fat burning. The primary difference is that instead of eliminating all food for a single set period of time, calories are restricted for five days every one or two months. While some variation exists, the amount of food on the first day of the
fasting period is typically restricted to 1,100 calories, consisting of 34% carbohydrates, 10% protein and 56% fat. For the remaining four days, calories are typically restricted to 800 per day with a content ratio of 47% carbohydrates, 9% protein and 44% fat. A recent study found that periodic 3-day cycles (3 days of fasting every 7 days for 3 cycles) of a FMD were effective in relieving symptoms in a mouse model of MS. In fact, there was a complete reversal of symptoms in 20 percent of the animals. It’s important to note, however, that more research is needed to determine the role of fasting in humans with MS.

Dr. Roy Swank described the Swank diet in the mid-1950s. The Swank diet is low in fat, with no more than 15 grams of saturated fat permitted per day and no more than 20 to 50 grams of unsaturated fat and oils. Foods that are allowed on the diet include whole grain cereals and pasta, fruits and vegetables, white fish and shellfish, as well as skinned, trimmed poultry. Swank diet guidelines also recommend one teaspoon of cod liver oil and a multivitamin every day. Red meat is not allowed the first year, and is limited to three ounces weekly thereafter. Processed foods and dairy products that contain more than one percent of butterfat are also not allowed. Dr. Swank recommended this diet to MS patients under his care for several years, many of which followed the diet. Dr. Swank collected data from those patients on the diet and reported his results in 1970. These results were published in 1990. Dr. Swank’s data suggest the diet reduces occurrence of relapses, accumulation of disability and mortality in people with MS. It is important to note that Dr. Swank’s study did not have a comparison arm following healthy control subjects. Also, a standardized scoring system, like the Expanded Disability Status Scale (EDSS), was not available at that time, making quantifying the degree of disability and, in turn, comparing groups of MS patients challenging. Other researchers have not duplicated Dr. Swank’s results, so there is no scientific proof that the Swank diet really controls MS. However, there is anecdotal evidence from people with MS who say this diet makes them feel better.
sustainable changes to their diet and lifestyle in order to live longer, healthier lives. Their Recovery Program includes a modified version of the Swank diet that takes into consideration more recent data on dietary fats. Amanda Windhof, a member of the iConquerMS research committee and the lead of ACP’s Next Steps Committee on nutrition, is a firm believer in the OMS lifestyle. For those interested, Amanda shares recipes that fit the OMS program on her website. In her words, “I share recipes that fit the Overcoming MS lifestyle in hopes that others will see healthy food does not mean lacking in taste.”

While many different dietary strategies are being promoted for people with MS, currently there is insufficient evidence to recommend any of them. Interestingly, despite their differences, these diets have several themes in common. Almost all advocate avoiding highly processed food, food that increases blood sugar levels and food that is high in saturated fat. Most diets also recommend reducing consumption of fatty red meat and increasing consumption of fruits and vegetables. It is important to consult with a doctor or nutritionist before making significant changes in the foods that you eat. One concern about adopting a specific diet is that it may be too restrictive, meaning a person may end up being deficient in important nutrients, causing more harm than good. More research surrounding dietary strategies in MS is needed to determine their benefit and risk. These studies are underway, an exciting development as diet is a factor that is easily controlled, giving people with MS some power over the disease.
Dietary Supplements in MS – Do They Help?

According to Merriam-Webster, a dietary supplement is defined as “a product taken orally that contains one or more ingredients that are intended to supplement one’s diet and are not considered food.” This includes vitamins, minerals, herbs, amino acids, enzymes, and many other products. With the exception of vitamin D (which will be discussed later), researchers believe it is best to get the nutrients your body needs from eating a healthy, balanced diet. Even though synthetic vitamins are made to have the exact chemical composition of naturally occurring ones, food is a complex source of nutrients that all work together. In contrast, dietary supplements tend to work in isolation. In addition, while some supplements may help supply adequate amounts of essential nutrients, it’s important to remember they can’t take the place of the variety of foods that are important to a healthy diet.

Vitamins are classified in two groups. Water-soluble vitamins, as the name implies, dissolve in water and are not stored in the body. This group includes all of the B vitamins and vitamin C. If an individual consumes more of a water-soluble vitamin than they need, the excess is excreted. Because they are not stored in the body, people who choose to take them should do so regularly. Fat-soluble vitamins, on the other hand, dissolve in the fat tissue of the body and are stored there until the body needs them. This group includes vitamins A, D, E and K. Because fat-soluble vitamins can build up in the body, it’s important not to consume too much of them.

Vitamins or minerals taken at a certain dose may be beneficial. However, taken at a higher dose, the same vitamin or mineral may be harmful. The Food and Nutrition Board of the National Academy of Sciences has established a recommended daily allowance (RDA) for vitamins and minerals. This represents the minimum amount of a nutrient per day necessary for maintenance of good health. In general, it is important to discuss which supplements are most appropriate (including dosage) with your healthcare team before taking them, just as you would any other medication.

In the United States, dietary supplements are not evaluated by the Food and Drug Administration (FDA) for safety and efficacy in the same rigorous way that medications are.
Because of this, labels on these products are not permitted to make specific claims about their ability to treat or cure any particular illness. Manufacturers of supplements are not required to prove the effectiveness of their products, or accurately report what is contained in them. As a result, supplements may vary widely in both the amount and quality of their ingredients.

A number of vitamins, minerals and herbal supplements are of interest in MS. However, it is important to note that there is a lack of sufficient evidence to make recommendations regarding the effectiveness and safety of any of them for all people with MS. In general, any supplement that claims to boost or improve the immune system should be avoided because MS is an autoimmune disease in which the immune system is already “hyperactive.”

Vitamin D is important for absorption of calcium and for bone growth, and has an important role in cell, neuromuscular and immune function. There are two main forms of Vitamin D, which are D2 (also known as ergocalciferol) and D3 (known as cholecalciferol). Regular sun exposure is the most natural way to get enough vitamin D, however, too much sun is associated with health risks. Dietary sources include fish, cheese, mushrooms and egg yolks. Some foods that don’t naturally contain vitamin D are fortified with this nutrient, such as milk and some breakfast cereals. Supplements can also help increase intake, in which case vitamin D3 is generally considered the preferred form. The RDA for vitamin D is 600–800 international units (IU) for adults. The generally accepted safe upper limit for daily vitamin D intake is 4,000 IU, however higher amounts may be recommended based on specific circumstances. Symptoms associated with vitamin D toxicity may include a buildup of calcium in your blood (hypercalcemia), which can cause nausea and vomiting, weakness, frequent urination, bone pain and the formation of kidney stones. Research shows higher vitamin D intake and higher vitamin D levels are associated with lower risk of developing MS as well as reduced disease activity. People with MS are also at increased risk for bone loss (osteopenia and osteoporosis), for which vitamin D supplementation may be of benefit. People with MS should talk with their healthcare providers about whether blood testing of vitamin D levels and supplementation would be of benefit.

Antioxidant vitamins decrease the damage caused by oxidants or free radicals. A free radical is a molecule in the body that has an unpaired electron. These molecules are very unstable because they are constantly trying to pair their unpaired electron. This causes them to react with other cells in the body, resulting in oxidative damage. Free radicals contribute to illness and aging.
Studies suggest that the damage caused by free radicals may be involved in the disease process in MS. However, there are no well-documented published studies of people with MS that show a clinical benefit related to antioxidant supplements. In fact, this class of vitamin is known to stimulate the immune system, which (as mentioned earlier) is not recommended for people with MS.

Antioxidant Vitamins

Vitamin A is important for maintaining healthy vision and proper function of the immune system, among other things. Dietary sources include cod liver oil, eggs, as well as orange and yellow vegetables and fruits. The RDA for men and women ranges from 2,300 to 3,000 IU and daily intake should not exceed 10,000 IU. Pregnant women, in particular, should not consume high amounts of vitamin A, as there is evidence this may produce birth defects. In MS, research shows vitamin A does not play a role in the disease course of RRMS.

Vitamin C, also known as ascorbic acid, is necessary for the growth, development and repair of all body tissues. It’s involved in many body functions, including the immune system. Vitamin C is readily available in foods such as citrus fruits and tomatoes. The RDA for this vitamin is 90 milligrams (mg) for men and 75 mg for women. Interestingly, the RDA for smokers includes an additional 35 mg. Daily doses greater than 2,000 mg may cause diarrhea or even kidney damage. Researchers have long believed that vitamin C may be useful in helping prevent urinary tract infections, which frequently occur in people with MS, by making urine more acidic and making it more difficult for bacteria to colonize the urinary tract. However, recent research indicates that vitamin C does not acidify urine. There is more evidence to support the use of cranberry to prevent urinary tract infections than there is for vitamin C (see the herb section of this article). With regards to this vitamin’s role in the treatment of neurological diseases such as MS, researchers have found it to have benefit in animal studies, however it hasn’t been studied sufficiently in humans to make a definitive conclusion.

Vitamin E plays many important roles in the body, including helping to keep the immune system strong against viruses and bacteria. It can be found in such foods as vegetable oils, nuts, seeds and green leafy vegetables. The RDA for vitamin E is 22 IU for both men and women. A diet high in polyunsaturated fatty acid (PUFA), which is thought to be beneficial in MS, increases the RDA by approximately 0.9–1.3 additional IU of vitamin E for each additional
gram of PUFA consumed. Daily vitamin E doses greater than 1,500 IU should be avoided. One study identified an increased mortality among consumers of 400 IU or more of vitamin E. Another study shows vitamin E may increase the risk of lung cancer in people that smoke. With regards to MS, Norwegian researchers found that increased levels of vitamin E are associated with reduced odds for MRI-detected disease activity in RRMS patients undergoing interferon beta-1a treatment.

Vitamin B6, also known as pyridoxine, helps to maintain a healthy metabolism, as well as healthy skin and eyes. This vitamin also supports nerve and liver function. Foods rich in vitamin B6 include fish (especially salmon and tuna fish), pork, chicken, beans and bananas. The RDA for vitamin B6 is 1.3–1.7 milligrams for adults ages 19–50. It’s important to note that high doses of pyridoxine can cause nerve symptoms that mimic MS, such as numbness, tingling or pain. These symptoms are reversible once supplementation is decreased.

Vitamin B12, also known as cobalamin, is key to the normal function of the brain and nervous system. It is also involved in the production of red blood cells and DNA, the genetic material in all cells. Vitamin B12 is naturally found in animal products, such as fish and organ meat, but not in plant-based foods. Fortified breakfast cereals are another potential source. The RDA for cobalamin is 2.4 micrograms for both men and women. Research suggests that people with MS may have low levels of vitamin B12, compared to the general population, indicating there may be a relationship between the two. Vitamin B12 deficiency can be evaluated through a blood test. People with MS who have low levels might benefit from vitamin B12 supplementation. For people with MS with normal levels, there is no evidence that vitamin B12 supplementation either improves neurological symptoms or favorably alters the course of the disease.

Minerals are inorganic nutrients. Macrominerals are the minerals your body needs in large amounts, such as calcium and magnesium. Minerals needed in only small amounts are called trace minerals.

**Minerals**

Selenium is a trace mineral that has antioxidant effects, and it also plays an essential role in the production of thyroid hormone. Good sources include legumes, seafood, whole grains, lean meats, and dairy products. For those 14 years of age and older, the RDA of selenium is 55 micrograms. Toxic effects may occur with daily doses greater than 400 micrograms. Given its
antioxidant properties, selenium may also stimulate the immune system, which, as mentioned
earlier, is already overactive in people with MS. Research suggests that selenium levels may be
lower in people with MS than in the general population, however it is unclear whether selenium
supplements would benefit those with MS.

Calcium is the most abundant mineral in the human body. It plays a key role in the formation of
teeth and bone, as well as muscle contraction, transmitting messages through the nerves and the
release of hormones. Dietary sources of calcium include dairy products, leafy vegetables, and
eggs. The RDA for adults is 1,000–1,200 mg of calcium per day. Calcium taken in excess
amounts (more than 2,000 mg) may result in toxic effects. There is no scientific evidence to
support the once held hypothesis that consuming large amounts of calcium during childhood
(milk and other dairy products) followed by a sudden decrease in consumption at adolescence
causes MS. However, people with MS are at increased risk for bone loss (osteoporosis), so
adequate calcium intake is crucial.

Zinc is a trace mineral needed for a healthy immune system. It plays a role in cell division, cell
growth, wound healing and the breakdown of carbohydrates. Zinc is also needed for the senses
of smell and taste. Meat and shellfish are excellent sources of zinc, as are whole grains and dairy
products. The RDA for zinc is 11 mg for men and 8 mg for women. High intake of zinc can
result in copper deficiency, which may result in MS-like neurologic symptoms. A recent study
in an animal model of MS suggests that zinc is involved in spinal cord demyelination and in
generation of motor deficits. More research is needed to demonstrate these effects in humans.

An herb is a plant, or part of a plant, that can be used for
medicinal purposes. Herbs, like drugs, interact with the cells of
the body and can sometimes produce changes in body processes.
It is important to recognize that there are many unknown aspects
to herbs. Their effects may be beneficial, but they can also be
harmful. Herb users should be aware of proper dosing, potential
side effects, and how the herbs consumed may react with drugs,
as well as other herbs.

**Herbs**

Ginkgo Biloba comes from one of the oldest tree species and has been used in China for
medicinal purposes for thousands of years. Ginkgo is a known antioxidant. It also inhibits a
substance known as **platelet activating factor**, which in turn causes a decrease in the activity of certain immune cells. This mechanism of action is why some recommend this herb as a therapy for MS. Recent clinical studies surrounding the therapeutic benefit of this herb have had mixed results. One suggested a **benefit** with regards to fatigue, symptom severity and functionality in some individuals with MS. Another showed that treatment with ginkgo biloba does not improve cognitive performance in people with MS. It’s important to note that ginkgo may interact with many different prescription medications so its use should be discussed with healthcare providers.

Echinacea is a flowering plant native to North America and a member of the daisy family. Some people believe that it is helpful for decreasing the duration and symptoms of the common cold, but there is no **scientific evidence** to support this effect. Echinacea appears to stimulate the immune system, by increasing the number of white blood cells (which fight infections). As mentioned earlier, boosting the immune system could theoretically worsen MS, therefore, echinacea is not recommended for people with the disease.

St. John’s Wort is a yellow flower that grows in many parts of the world. It is generally used as an antidepressant. This herb is generally well tolerated and has no known effect on the immune system that could be concerning to people with MS, however the herb has known drug interactions with many medications. There is a relatively high incidence of depression among people with MS and St. John’s Wort may be helpful in cases of mild depression. St. John’s Wort is not suitable for anyone with severe depression. It is important to recognize that depression should not be self-diagnosed or self-treated, and treatment with St. John’s Wort should be done only under a doctor’s supervision.

Valerian is a perennial flowering plant native to Europe and Asia. The medicinal part of the plant is its unpleasant-smelling root. Valerian is sometimes used as a sleep aid. People with MS may have difficulty sleeping, and difficulties with sleep may contribute to MS-related fatigue. Thus, a sleep aid may be very useful to some people with MS. Valerian is usually well tolerated. However, its effects on the immune system have not been studied. It’s important to note that valerian may have a lingering sedating effect, which may worsen fatigue in some cases. Also, valerian may increase the sedating effects of some prescription medications.

Asian ginseng is a plant that grows in Korea, northeastern China and far eastern Siberia. Its root has been used to make medicine in China for centuries. Ginseng’s many beneficial effects
supposedly include boosting energy, lowering blood sugar and cholesterol levels, reducing stress, and promoting relaxation. While an herb that increases energy and strength would be of great use to people with MS who sometimes suffer from debilitating fatigue, there is insufficient data to support these benefits. Although some evidence suggests ginseng might reduce fatigue and have a significant positive effect on quality of life in people with MS, other studies raise the possibility that ginseng may stimulate the immune system in ways that may be detrimental to people with MS. Further studies are needed to conclude whether ginseng is safe or not, and to confirm any of its therapeutic effects.

Cranberries are grown in bogs in North America. As alluded to earlier, this herb is frequently used to prevent or treat urinary tract infections. There is an active ingredient in cranberries, proanthrocyanidin, which can prevent adherence of bacteria to the bladder wall. Some, but not all, clinical trials of cranberry have shown that this herb prevents urinary tract infections. Bladder issues are common among people with MS and taking cranberry may be a helpful preventive measure. Increased fluid intake and improved hygiene may also be helpful in this regard. Cranberry has very few side effects and is reasonable for most. Cranberries should never be used to treat existing urinary tract infections. Urinary tract infections can have serious consequences for people with MS and often require antibiotic treatment from a physician.

Dietary supplements may be an attractive option for people with MS in their efforts to manage the disease and its symptoms. However, supplements can cause side effects or harm when taken in combination, at high doses, or when taken instead of prescribed medications. Supplements can also interact with certain prescription drugs in ways that might cause problems. Many contain active ingredients that can have strong effects in the body and the scientific evidence surrounding their benefits is inconclusive. Because supplements are not regulated in this country, being educated and careful about their use is very important. It’s important to let your health care providers know which supplements you’re taking, and which ones you are considering so you can discuss what’s best for your overall health.
Regenerative Therapies for MS – How Close Are We?

All bodily functions are dependent on the conduction of nerve impulses through the central nervous system (CNS). Rapid conduction of signals through the CNS is dependent on the integrity of the myelin sheath (a fatty layer that surrounds nerve fibers). Multiple sclerosis (MS) is a disease that causes the immune system to attack, or erode, the myelin inside the CNS. This disrupts the signals from the brain to the rest of the body. Myelin production and repair is a very complex process that is naturally regulated in the body and is usually efficient. In MS, this process becomes less efficient over time and, in some people living with MS, stops working altogether, leading to mounting disability.

There are currently 15 FDA-approved therapies for MS. Although these therapies are “disease-modifying,” none can repair the damage done by the disease. Researchers are working hard to figure out the intricacies of remyelination and to develop more effective treatments. While the many steps, factors and pathways involved are challenging to understand, they offer many opportunities to intervene for better clinical outcomes.

Myelin repair is a promising area of science that has the potential to improve function and quality of life for thousands of people living with MS and other demyelinating disorders.

One exciting area of focus in MS research is how to regrow myelin. Stem cell therapies have recently emerged as a possible regenerative approach to treating MS. A number of research teams are pursuing this line of study and have made exciting discoveries. As discussed in our April 2018 newsletter, stem cells can replicate and develop into every organ and tissue in the body. Mesenchymal stem cells are found in several places in the body (including the skin) and can differentiate into a variety of cell types. Researchers at Case Western Reserve School of Medicine have recently discovered how to turn ordinary skin cells into oligodendrocyte precursor cells (OPCs) through a process known as cellular reprogramming. When transplanted into mice created specifically to be deficient in myelin, these “induced” OPCs were successful in generating new myelin. The research team was able to quickly grow billions of these cells. This discovery may help scientists generate building blocks for myelin regrowth from readily abundant, common skin cells. It’s important to note that, while this exciting research seems very promising in animal
models, further research is necessary to demonstrate that the same cellular manipulation technique can be applied to human skin cells.

**Athersys, Inc.** is a biopharmaceutical company, established in 1995, that is developing a stem cell product for the treatment of MS called **MultiStem**. It is an “off the shelf” product that is manufactured from human stem cells obtained from non-embryonic tissue sources, such as bone marrow. It has the ability to form multiple cell types and the potential to deliver therapeutic benefit in several ways. In preclinical testing, MultiStem appears to stimulate production of cells that reduce inflammation, protect damaged or injured tissue, and promote myelin repair. More research in both animal models and the clinical setting is needed to fully understand the therapeutic benefit and risk profile of this product.

Other efforts to regrow myelin are also underway. **Human growth hormone** (HGH) helps control a number of body functions, including metabolism, as well as muscle and bone growth. It is also known to stimulate the immune system and may play a role in increasing inflammation in MS. HGH causes the production of **insulin-like growth factor** (a type of growth factor and a type of cytokine), which in turn facilitates OPC differentiation. Researchers in Germany recently conducted a **pilot study** with 25 MS patients on the inflammatory effect of HGH treatment and its potential to encourage myelin production. Initial results from this investigation are promising, but more studies are necessary to draw definitive conclusions.

In 2010, **fingolimod** (Gilenya) was approved as the first oral treatment for people with relapsing remitting MS (RRMS). It works by preventing nerve inflammation. Researchers in Germany discovered it also appears to enhance peripheral nerve regeneration and remyelination in mice. **Results** show fingolimod can not only reduce nerve inflammation, but also promote nerve regeneration and improve myelin thickness. It does this by inhibiting the action of cell signaling molecules known to damage myelin. This newfound action appears to be independent of its anti-inflammatory characteristics. While further study is necessary to determine if the same is true in humans, this research suggests a powerful added therapeutic benefit for an FDA-approved treatment.
Another approach to regenerative therapy is examining the key molecules that are important to oligodendrocytes (ODs) that may also serve as therapeutic targets for promoting myelin repair. The ReBUILD Trial is the first randomized clinical trial of a treatment to restore myelin damage in MS. Clemastine fumarate is an antihistamine that is commonly used to relieve symptoms of allergy, hay fever and the common cold. The groundbreaking results from this study show this over-the-counter drug can also improve the demyelinating optic neuropathy in patients with RRMS. This effect was sustained, suggesting that the observed improvement was not due to a transient effect of medication on transmission, but rather a persistent structural change induced by treatment. Results also suggest that myelin repair can be achieved even following prolonged damage. Clemastine treatment was associated with fatigue, however no serious adverse events were reported during the trial. Although clemastine is an over-the-counter medication, it’s important to note that doses in this trial exceeded the maximum recommended dose. More research with larger numbers of people is needed before doctors can recommend this as a treatment for people with MS.

Researchers at the Mayo Clinic developed an antibody (a protein produced by the immune system to fight against infection) called rHlgM22 that binds to the surface of ODs and facilitates the clearance of myelin debris from damaged axons. rHlgM22 treatment resulted in improved brain remyelination and motor function in preclinical studies (in mice). Phase I clinical testing of this antibody is underway. Results of the first phase I study (done in subjects with stable MS) show a single dose of rHlgM22A is well tolerated, has a long duration of action (3 to 4 days), and crosses the blood-brain barrier. Investigators conducted a second Phase I trial, the results of which are still pending, to determine if a single dose of rHlgM22 is safe and tolerable during relapse. Phase II clinical trials with this antibody are planned for the future.

Endece is a biopharmaceutical company based in Wisconsin. Their lead investigational product, NDC-1308, is being developed to promote myelin repair in people with secondary progressive MS. It is intended for use either as a mono-therapy or in combination with other disease-modifying therapies. The molecule works by inducing differentiation of OPCs. NDC-1308 facilitates remyelination and shows a neuro-protective effect in animal models. This treatment
crosses the blood-brain barrier and is well tolerated in mice. Further testing is needed to determine its safety, tolerability and efficacy in humans. Endece hopes to initiate a Phase I clinical trial in the near future.

**Endece**

**Longevity Biotech, Inc.** is a preclinical-stage biopharmaceutical company working to develop a synthetic peptide (a small protein) called **LBT-3627**. This product is a potential disease modifying therapy for MS, Parkinson’s Disease and other neurological disorders.

**Vasoactive intestinal peptide** (VIP) is a well-known anti-inflammatory agent. LBT-3627 targets the VIP family of receptors, which plays multiple roles in neuroprotection. The hope is that LBT-3627 will bolster the immune response for neuroprotection while potentially also promoting the growth and maturation of OPCs. LBT-3627 has demonstrated a significant neuro-protective effect in animal models. Longevity Biotech is actively progressing this program through preclinical development and toward clinical trials.

Current MS research is also focused on potential therapies that will protect the nervous system in order to allow natural myelin repair to occur. For example, **Ibudilast** is a medication used in mainly in Japan to treat asthma and stroke. In a recent study, Ibudilast reduced the progression of brain atrophy or shrinkage in those with progressive MS by nearly 50 percent. More research is needed to determine why and how this drug works in progressive MS, before it can be made available to people with this stage of the disease. **Lipoic acid** is an antioxidant available as an over-the-counter supplement. In animal models of MS, it has been shown to reduce inflammation and degeneration of the optic nerve and spinal cord. Results of a Phase II clinical trial, published in September 2017, showed lipoic acid reduced brain atrophy in subjects with SPMS by 68 percent, suggesting a clinical benefit for this form of the disease. **Phenytoin** is an anticonvulsant, commonly used to manage seizures in epilepsy. It is also used to help manage pain in MS. Subjects with optic neuritis (ON) who took phenytoin as part of a Phase II clinical trial had 30% less damage to the retina compared with those taking a placebo. This suggests that phenytoin is neuro-protective in patients with acute ON. **Estriol** is an estrogen that naturally increases to high levels in serum during the last half of pregnancy (a time when MS relapse rates typically decrease). Estriol treatment is anti-inflammatory and neuro-protective in animal models. Clinical studies demonstrate a similar effect in humans. For example, results of a
A small study of people with MS indicate that estriol reduces the number of gadolinium-enhancing lesions. A 2016 study also shows Copaxone treatment combined with estriol provides a protective effect on the brain.

Protecting and repairing the nervous system, in particular myelin, holds significant promise as a strategy to develop treatments that will not only stop or reduce MS progression, but also restore the function that the disease steals. While the development of therapies that encourage myelin repair is gaining more traction in the MS research community, many questions remain. Scientists from around the globe are focused on this compelling area of research. The Accelerated Cure Project’s mission is to facilitate research like this toward a meaningful and significant impact for those living with MS.
Research Spotlight

22nd Annual Tisch MS Research Center of New York Patient Symposium

Every year the Tisch MS Research Center of New York hosts a free educational event for all people with MS, friends, family, caregivers, health professionals or anyone else that would like to learn more about the latest treatments, ways to manage MS symptoms and research initiatives for MS. This event will be held on Sunday, October 6, 2019, 9:30am – 1:00pm, at the New York Hilton Midtown. Speakers will include leading MS clinicians and Tisch MS researchers who will be sharing innovative therapies and research discoveries in the Tisch MS Laboratory. For more details or to register for the event, click here. Registration is also available at www.tischms.org/events or by calling 646-557-3919.

RESEARCH OPPORTUNITIES

CLINICAL NEUROSCIENCE LAB
Using neuropsychology and neuroscience to investigate mind-body approaches

Help us learn ways to improve thinking in people with MS
Purpose of this study: The Clinical Neuroscience Laboratory at The Ohio State University is conducting a 6-month study to potentially improve thinking in people with MS.

Researcher: Dr. Ruchika Prakash, The Ohio State University

Participating locations: Ohio State University, Columbus OH

This study involves:

- Wearing a device to monitor your step-count or water intake
- 5 study visits over a 6 month period, as follows
  - 2 visits before wearing the device
  - 1 visit while wearing the device
  - 2 visits immediately afterward
- Each visit will last about 3 hours, and will be scheduled at your convenience
- Parking will be covered
- Participants will be compensated

Recruiting: Individuals must be diagnosed with relapsing-remitting MS, aged 30-59, with no other psychiatric or neurological illnesses

Contact information: If you are interested in participating, please contact laboratory staff

- By email: ra@clinicalneurosciencelab.com
- By phone: (614) 292-9568
  By visiting the Clinical Neuroscience Laboratory’s website
Help us promote psychological wellbeing and mental health in people with MS!

A group of health care providers is interested in promoting the psychological wellbeing and mental health of every person with MS. They would like to better understand how people with MS from different backgrounds think about and experience mental health.

If you have MS and are 18 years or older, you are invited to complete a research survey and share your thoughts:

https://arcsapps.umassmed.edu/redcap/surveys/?s=8EEEMN4P3F

This survey should take about 30 minutes to complete. Your participation is entirely voluntary. Your information will remain confidential and there will be no way of tracking your answers back to you. If you have any questions, please contact Daniela.PimentelMaldonado@umassmemorial.org.

This study is part of the University of Massachusetts Medical School.

Un grupo de profesionales de la salud esta interesado en promover el bienestar psicológico y la salud mental de todas las personas con esclerosis múltiple. Ellos buscan entender como las personas con esclerosis múltiple de diferentes orígenes piensan y experimentan el bienestar mental.

Si eres mayor de 18 años y tienes esclerosis múltiple, por favor comparte tu opinión contestando esta encuesta de investigación.

https://arcsapps.umassmed.edu/redcap/surveys/?s=8EEEMN4P3F

Completar la encuesta toma alrededor de 30 minutos. Tu participación es completamente voluntaria. Tu información va a permanecer confidencial y no habrá forma de saber cuáles respuestas fueron tuyas. Si tienes alguna pregunta, favor de escribir a Daniela.PimentelMaldonado@umassmemorial.org.

Este estudio es parte de la Universidad de Massachusetts.
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