THE INSTITUTE FOR FUNCTIONAL MEDICINE®

VERSION 9

Mito *Food Plan*

Comprehensive Guide

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Why the Mito Food Plan?

The Mito Food Plan is an anti-inflammatory, low-carbohydrate, high-quality-fats approach to eating designed to support energy production, overall vitality, and healthy aging. The plan focuses on supporting healthy mitochondria, which are structures in every cell that make energy. When mitochondria are working well, people are less likely to have symptoms of fatigue, pain, "brain fog," and others commonly associated with mitochondrial dysfunction. Mitochondrial dysfunction is also associated with diabetes and various neurological conditions, such as Parkinson's disease, Alzheimer's disease, multiple sclerosis (MS), and amyotrophic lateral sclerosis (ALS; often called Lou Gehrig's disease). Research indicates that nutrition, physical activity, sleep, and other lifestyle strategies can support mitochondrial health.

The cells in the brain, heart, nerves, and muscles all have higher concentrations of mitochondria. Poor nutrition, high stress, inflammation, and toxin exposure can decrease the function of mitochondria in these areas of the body. Eating adequate protein and high-quality fats, maintaining stable blood sugar, reducing toxin exposure, and choosing more plant foods can prevent or reverse mitochondrial dysfunction. Thus, this plan's focus is on determining the right quantity of carbohydrates, fats, proteins, and phytonutrients to fuel cellular energy production, decrease inflammation, and support blood sugar balance in your body.

Brain-derived neurotrophic factor (BDNF) is a protein that helps create and protect nerve cells, or neurons, in the brain. BDNF is important for thinking, learning, and a higher level of brain function. A sedentary lifestyle, poor sleep, chronic stress, the standard American diet (SAD), obesity and elevated blood sugar levels are all associated with lower levels of BDNF. Research shows that levels of BDNF are lower in those with Alzheimer's disease, Parkinson's disease, and multiple sclerosis. Increasing one's levels of BDNF is a first line of defense against neurological diseases.

There are several things that help your body produce more BDNF. These include exercise, DHA, (an omega-3 fat), mental stimulation (e.g., Sodoku, crossword puzzles), curcumin (a spice), sunlight exposure, meditation, intermittent fasting, and calorie restriction. Several of these strategies are outlined in this comprehensive guide.

Features of the Mito Food Plan

Food provides complex messages to the body, and the goal of personalized nutrition is to ensure that these messages encourage health and wellness. Leading experts have identified key foods that support mitochondrial health and delay the aging process. Current research and clinical experience guided this team in the development of the Mito Food Plan.

Therapeutic Foods for Energy—Energy production in the mitochondria requires an adequate supply of quality proteins, fats, and carbohydrates, along with a generous supply of B vitamins, coenzyme Q10 (CoQ10), and antioxidants. Phytonutrient-rich vegetables and fruits supply many of these nutrients, yet few people eat enough on a daily basis to provide nourishment on a cellular level. A complete list of the recommended Therapeutic Foods, along with suggestions for how best to prepare them, is provided in the "Therapeutic Foods for Healthy Mitochondrial Function" section of this guide.

Some key mitochondrial nutrients, such as CoQ10 and carnitine, are more difficult to obtain through diet alone, especially in a vegetarian diet. Your functional medicine practitioner may provide recommendations for supplementing these targeted nutrients.

Protective Antioxidants—Energy production creates byproducts called reactive oxygen species, or ROS. ROS cause "oxidative stress" which can damage cells and increase inflammation in the body. Oxidative stress is connected to many neurologic and chronic diseases. Smoking, a sedentary lifestyle, and high blood sugar levels have been shown to significantly increase oxidative stress in the body.

Eating nutrient-dense foods containing antioxidants helps to offset oxidative stress. Antioxidants are critical for protecting cells and neutralizing oxidative stress. Vegetables, spices, and proteins in the diet enable the body to produce and use antioxidants such as glutathione, vitamin C, and N-acetyl cysteine. A wide variety of spices and phytonutrients in the diet enhance the production of glutathione, one of the most important antioxidants in the body.

Anti-Inflammatory Nutrients—The incidence of Parkinson's and Alzheimer's disease has been observed to be lower in those who eat anti-inflammatory and antioxidant-rich foods on a regular basis. Eating at least 9 servings daily of colorful vegetables and fruits will guarantee a generous supply of anti-inflammatory phytonutrients, minerals, and vitamins needed for healthy mitochondrial function. Vegetables should be the primary focus, especially those in the cruciferous family (such as broccoli, cabbage and arugula). Polyphenols in many of the therapeutic foods, especially blueberries, extra-virgin olive oil, and green tea, have been shown in both human and animal studies to support brain function and decrease inflammation. They may even help to increase lifespan.

Features of the Mito Food Plan

High-Quality Dietary Fats—Mitochondria (and the brain) thrive when quality fats such as DHA, found in cold-water fish, seaweed and free-range egg yolks are eaten. DHA assists with communication between neurons and decreases inflammation, both necessary for optimal brain health.

When cooking and dressing salads or vegetables, choose a variety of healthy oils. Extra-virgin olive oil (EVOO) is a high-quality oil, rich in polyphenols that act as free-radical scavengers, protecting the brain from inflammation. When cooking with EVOO, the oil should not be exposed to high heat. Coconut oil, which contains brain-healthy medium-chain triglycerides (MCT), can be used at higher cooking temperatures but should be used in small amounts by most people. Your practitioner may recommend supplemental MCT oil alongside the Mito Food Plan to further support mitochondrial function.

Avocados and avocado oil also supply the body with heart-healthy monounsaturated fats. In addition, avocados contain about 20 different minerals, vitamins, and phytonutrients. The natural antioxidants in avocados protect the body from free radicals and inflammation.

Low Glycemic Impact—Maintaining a lower and consistent insulin level is key to optimal mitochondrial health. A highly-processed diet can lead to elevated insulin, increased inflammation, and mitochondrial dysfunction. Matching the amount of carbohydrates eaten to activity level, and using low-glycemic vegetables and fruits as the main source of carbohydrates, helps to stabilize blood sugar and protect mitochondria.

Maintaining healthy blood sugar may also have profound effects in preventing or slowing the trajectory toward Alzheimer's disease. Research has suggested that elevations of blood sugar over time increases the risk of dementia. "Type 3 diabetes" is a term used to describe insulin resistance in the brain. It is thought that continuous high blood sugar levels lead to changes in the brain, resulting in the altered learning and memory consistent with Alzheimer's disease.

Reduced Carbohydrates with Ketogenic Option—A ketogenic diet is characterized by both lower carbohydrates and protein, and higher amounts of fat. This shift, called "ketosis," causes the body to use ketones instead of carbohydrates as a primary source of fuel. Ketones are produced in the liver and are used to create energy in mitochondria. Being in ketosis may help protect neurons from damage by increasing the number of new mitochondria in the brain. Ketosis helps release BDNF, the protein that enhances learning and memory. The ketogenic diet was first used to treat epilepsy, a neurologic condition. Research is underway to investigate ketogenic diets and neurological conditions such as Alzheimer's disease and other forms of dementia.

Features of the Mito Food Plan

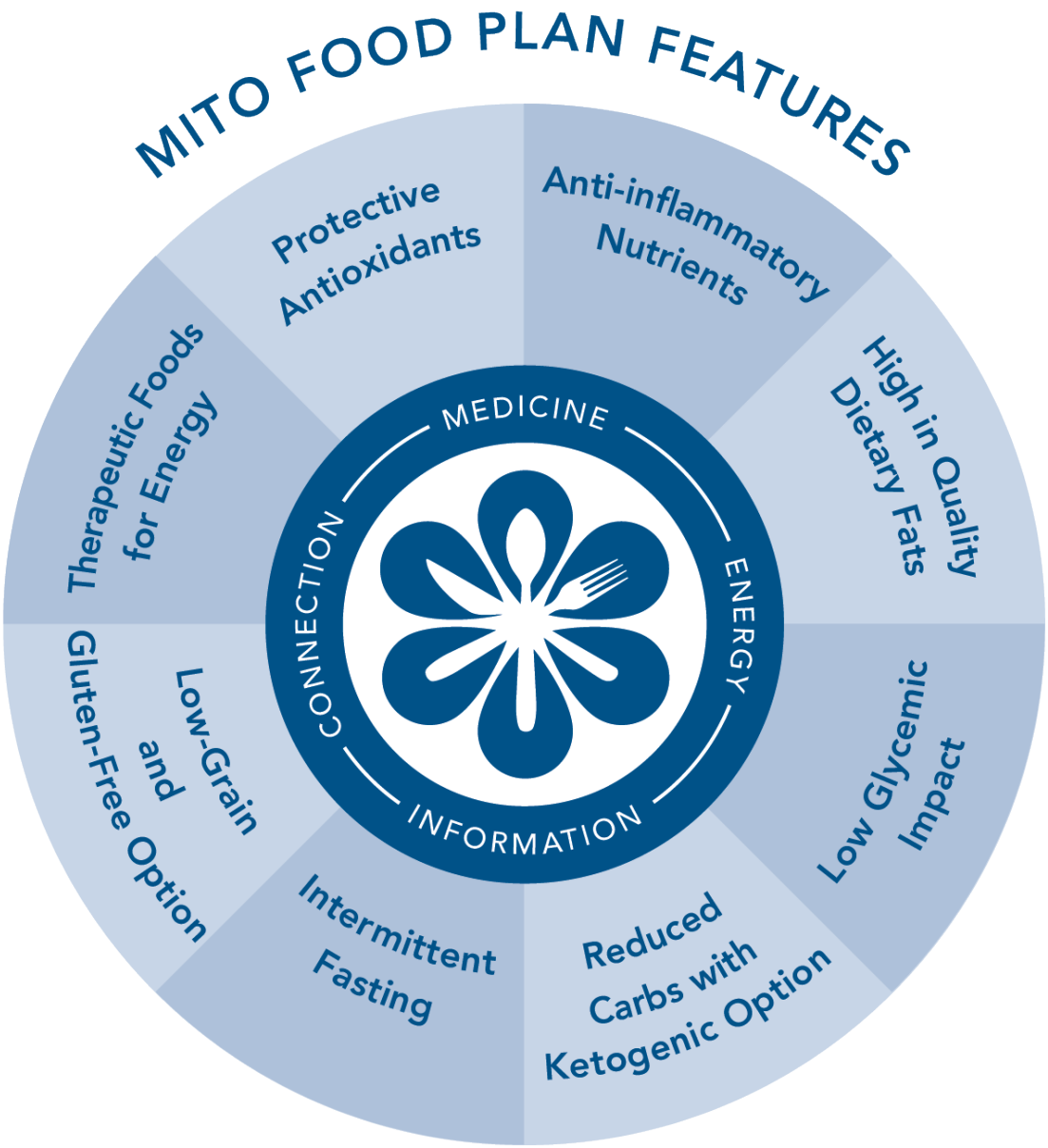
Intermittent Fasting—Intermittent fasting may have positive effects on brain function, longevity, and promote healthy aging. Intermittent fasting is a pattern that cycles between periods of eating and not eating. There are a number of options, which include fasting every other day or every third day; modified fasting in which a person refrains from eating for a specific number of days; and time-restricted feeding in which a person eats in a shortened period of time to prolong the typical nightly fast for a minimum of 12 hours.

In addition to intermittent fasting, calorie restriction may improve inflammation and blood sugar markers. Memory and cognition are thought to be enhanced by eating fewer calories overall. Eating fewer calories than required by one's basal metabolic rate (BMR) allows the brain to make new neurons by decreasing free radicals, enhancing energy production, and increasing the number of mitochondria. Your functional medicine provider will help you determine if calorie restriction and intermittent fasting are supportive of your overall health goals.

Low-Grain and Gluten-Free Option—All grains are minimized or avoided on the Mito Food Plan in order to achieve the desired goals of mild ketosis and low glycemic impact. Grains can easily be replaced by more nutrient-dense foods, such as phytonutrient-rich vegetables. Your functional medicine practitioner may emphasize the grain-free aspects of this food plan, especially if you are experiencing inflammation, pain, fatigue, and cognitive decline.

There is a gluten-free option included in this food plan. Gluten is a protein found in many different grains such as wheat, barley and rye. Some people may have a sensitivity, intolerance, or allergy to gluten which can result in gut inflammation or other symptoms. People with celiac disease or non-celiac gluten sensitivity should avoid gluten containing grains. Your functional medicine practitioner may recommend following a gluten-free version of this food plan.

Features of the Mito Food Plan



Touring through the Mito Food Plan

The Mito Food Plan is designed to give you a "snapshot" of the suggested foods from which to choose each day. For recipes and shopping tips, refer to **IFM's Mito Food Plan—Weekly Planner and Recipes** Guide.

Protein

Protein helps stabilize blood sugar, which is important for brain health. This in turn minimizes hunger and cravings. Ideally, some protein should be included in every meal. High-quality proteins are preferred, including grass-fed, organic, non-genetically modified organism (GMO) animal and plant sources. For fish, remember to choose wild-caught sources or sustainably farmed to reduce exposure to chemicals. It is probably wise to avoid large portion sizes of any animal proteins, even the therapeutic choices listed below. Appropriate portion sizes might be in the range of 2-3 ounces, perhaps used as a compliment to a primarily plant-based meal.

Therapeutic foods: Omega-3 rich fish (wild-caught salmon, mackerel, sardines, cod)

Legumes

Legumes are an important source of the B vitamin folate. They are a healthy alternative to animal protein, as they contain quality vegetable protein. They are also a complex carbohydrate, which helps keep blood sugar stable and promotes a feeling of fullness. Legumes can be sprinkled on salads, eaten in the form of soup, cooked beans, dips, or hummus. Keep in mind that legumes are also a source of carbohydrates and should be factored into your daily carbohydrate allowance.

Dairy and Alternatives

Organic dairy products, such as Greek yogurt and kefir, are good sources of protein. Many people, however, avoid dairy because of allergies or sensitivities. Not all people respond to dairy the same. Research for dairy has been mixed, with some evidence showing protective effects for conditions like Alzheimer's and some evidence showing negative effects for conditions like Parkinson's disease. For these reasons and others, the inclusion of dairy on this food plan should be discussed on a case-by-case basis with your functional medicine practitioner.

There are several dairy alternatives to choose from, such as almond, hemp, oat, coconut, or soy milk (rice milk is not on this food plan, as its glycemic impact is high). Labels should be read carefully to ensure the absence of added sweeteners; evaporated cane juice and brown rice syrup are commonly added to dairy alternatives. It is recommended to purchase milks that say "unsweetened" on the front of the box. Soy milk is the only dairy alternative with a similar protein content to cow's milk. When choosing soy milk, select only organic to avoid GMOs.

Note that the coconut milk listed here refers to the boxed variety rather than to its canned form. The canned form of coconut milk is found in the fats and oils section. Coconut yogurt (cultured coconut milk) also has some added health benefits from the beneficial bacteria and fats.

Yogurt and kefir, from both dairy and alternative sources, have numerous health benefits for those who are able to tolerate them. They contain beneficial microbes known as probiotics, which are important for a healthy digestive system. Unsweetened non-fat or low-fat Greek yogurt has lower carbohydrate and higher protein content which may be a good option for boosting daily protein intake. Note that cheeses are therefore included in the protein category because they have negligible carbohydrates.

Therapeutic foods: Unsweetened yogurt and kefir

Nuts & Seeds

While all nuts and seeds are healthy for the brain, this plan highlights nuts that are significant sources of beneficial omega-3 oils. Be sure to buy nuts that aren't heavily salted and roasted in oil. Eating a variety of nuts and seeds provides a variety of phytonutrients.

Nut butters are easy to incorporate into snacks and meals. For example, tahini (sesame seed butter) can be drizzled over vegetables, or dip apple slices in almond butter. If you are following a dairy-free version of this plan, a good alternative for ricotta is a "cheese" spread made from almonds, cashews, or other nuts. Another option is adding ground flaxseeds, chia seeds, or hemp seeds to a smoothie or salad. Hemp seed and ground flaxseed may easily become rancid if not stored in the refrigerator or freezer. Chia seed is protected with its own antioxidants, so is stable at room temperature. These seeds have differing nutritional benefits, so consuming a variety of them is beneficial when possible.

Therapeutic foods: Almonds, walnuts, flaxseeds, chia seeds, hemp seeds, and pumpkin seeds; all of the respective butters or pastes made from these nuts and seeds

Touring Through the Food Plan

Fats & Oils

Good quality fats are a cornerstone of this food plan. A vast selection of fats and liquid oils can be used for salad dressings (cold preparation) and cooking (warm to hot preparation). Minimally refined, cold-pressed, organic, non-GMO fats and liquid oils should be used whenever possible, as these will be the highest quality. Several servings per day of these healthy fats are beneficial.

When possible, extra-virgin olive oil should be used to dress salads and vegetables. While butter and ghee (clarified butter) made from the milk of grass-fed cows is preferable, this may not be easily available; organic butter is a suitable alternative. In general, for medium to high-heat cooking, small amounts of coconut oil or butter may be used. Canned coconut milk (BPA-free), which is included in this category, adds nice flavor to casseroles and stir-fries.

Remember that fats and liquid oils break down in heat, light, and oxygen and become rancid. Paying attention to the quality of these oils is important. Oils should be stored in dark glass containers and thrown out if they smell rancid.

Therapeutic foods: Avocado, olives (black or green), olive oil (extra virgin, cold pressed), flaxseed oil

Non-Starchy Vegetables

Colorful vegetables and fruits are excellent sources of phytonutrients and antioxidants which support healthy levels of inflammation in the body. There are more selections in this category than any other on the food plan, because non-starchy vegetables should make up the bulk of each meal. The best way to eat an abundance of vegetables daily is to include them in at least two meals (three if possible). Also, seasonal ingredients should be eaten when possible. Try new vegetables and strive to eat at least 9 servings of phytonutrient-rich foods, comprised mostly of vegetables every day.

A serving is only ½ cup of most vegetables or 1 cup of raw leafy greens. A plate filled with vegetables or a hearty salad can provide up to four servings. All greens (including collard, dandelion, kale, mustard, and turnip greens), along with chard, spinach, sea vegetables, and the cruciferous family have been found to support mitochondria in the brain (see page 15 for a list of cruciferous vegetables). Fermented vegetables, such as sauerkraut and kimchi, and vegetables high in prebiotic fibers are also recommended as they have been shown to support a healthy microbiome.

Touring Through the Food Plan

In addition to the therapeutic vegetables, aim to eat a "rainbow of colors" such as, red: peppers, tomatoes, and radishes; orange: carrots, peppers, and pumpkin; yellow: summer squash and peppers; green: asparagus, avocado, and green beans; blue/purple: eggplant and cabbage; and white/tan: mushrooms, jicama, and onions. Organic vegetables (and fruits) should be purchased whenever possible (see **Frequently Asked Questions** for more information on organic foods). If organic produce is not available, be sure to wash vegetables carefully and peel (if possible) before eating.

Therapeutic foods: Spinach, cruciferous vegetables, seaweeds, asparagus, chard, daikon radish, beet greens, dandelion, okra, alliums (garlic, scallion, leeks, shallot), fermented vegetables, sprouts

Starchy Vegetables

Starchy vegetables are included on this food plan in limited quantities, especially if you are leaning toward a more ketogenic version of this food plan. In general, your total carbohydrate intake should match your activity level. Athletes and highly active people will require higher amounts of carbohydrates in order to optimize performance while less active and sedentary people will require fewer carbohydrates daily. Starchy vegetables should be consumed alongside protein in order to help balance blood sugar. Sweet potatoes and winter squash varieties provide additional anti-inflammatory nutrients.

Fruits

Fruits are packed with phytonutrients. Fruits with low-to-moderate glycemic response are ideal when patients are feeling the need for something sweet. Therapeutic foods in this category include all berries, pomegranate seeds, and grapes with the skin. In addition to improving memory and cognition, blueberries contain one of the highest antioxidant levels of all fruits and also help with blood sugar control. Fruit juices are not recommended, as they are dense sources of sugar and can increase blood sugar levels. Small amounts of dried fruit may be eaten on occasion. Eat fruit with a little bit of protein, such as nuts or nut butter, to offset a rise in blood sugar. As with vegetables, it is important to purchase organic fruit whenever possible.

Therapeutic foods: Apple, all berries (blueberries, blackberries, raspberries, strawberries, etc.), cherries, grapes, pomegranate seeds

Touring Through the Food Plan

Whole Grains

While the Mito Food Plan focuses on consuming non-starchy vegetables as the primary source of carbohydrates, grains may be consumed in small amounts. Athletes and highly active people will require higher amounts of carbohydrates in their diet and should work with a nutrition professional to make sure they eat enough to meet the demands of their activity. On ketogenic versions of this food plan, you may omit fruit and starchy vegetables on days when you eat grains.

People with celiac disease or non-celiac gluten sensitivity will need to eliminate gluten containing grains such as wheat, barley, and rye. Gluten is also commonly found in various sauces, dressings, seasonings, and many other foods. In some people, proteins in gluten can break down the cells in the small intestine leading to a problem called leaky gut. Leaky gut has been associated with food allergies, sensitivities, or intolerances, as well as other digestive disturbances and autoimmune conditions.

Your functional medicine practitioner may recommend avoidance of this category entirely, avoidance of gluten-containing grains, eating only one serving (approximately 15 grams of carbohydrate) daily, or eating no more than 1-2 servings weekly.

Beverages, Spices and Condiments

Staying hydrated helps rid the body of toxins, builds resilience to stress, enhances metabolism, and promotes satiety. **Everyone should drink clean, filtered water throughout the day.** However, recommended intake depends on your weight and activity level. Those who are very active or those living in warmer climates may have increased needs for hydration. Your functional medicine practitioner can provide personalized water recommendations suited to your lifestyle and health goals.

In addition to filtered water, broths (vegetable, bone), meat stocks, and other beverages like fresh, raw, cold-pressed vegetable juices are also good choices. Herbal teas (like yerba mate, gingko biloba), black and white tea, as well as, coffee are other unsweetened are beverages allowed on the Mito Food Plan. Some water intake may be replaced with unsweetened coconut water, which is high in minerals and electrolytes. It can be added to smoothies and mixed with green tea or fresh vegetable juice. Green tea is the main therapeutic food in this category. Consider adding two cups of green tea daily.

This food plan is a low-glycemic way of eating to support mitochondrial health and reduce inflammation and oxidative stress. **In general, all added sweeteners should be avoided.** Stevia is an herbal sweetener that is acceptable in very small amounts. In time, your taste buds will be able to recognize the natural sweetness in fruits and vegetables and the desire for sweeteners will subside (See FAQs for more on sweeteners).

Touring Through the Food Plan

Most modern condiments, like teriyaki sauce, ketchup, barbecue sauce, and glazes, have quite a bit of sugar, salt, and preservatives added. It is usually best to avoid them entirely, as they provide no needed nutrients. Reading and understanding food labels can help you avoid unwanted additives. Additionally, additives can be avoided altogether when making condiments at home using common ingredients like herbs and spices.

All spices and herbs are considered therapeutic. Herbs are the fresh leaves of edible plants. Common herbs include cilantro, parsley, rosemary, oregano, and thyme. When herbs are dried, they are referred to as spices. Spices are edible and aromatic, and can come from a plant's root, stem, bark, bud, leaves, flower, fruit, or seed. Spices provide high levels of phytonutrients that support overall health. When buying spices, fillers (like sugar, maltodextrin, gluten, artificial colors, preservatives, or synthetic anti-caking agents) should be avoided. Ideally, spices should be stored in glass containers, rather than plastic, to avoid exposure to toxins. Organically-grown herbs and spices are preferred whenever possible. Both herbs and spices can give meals a boost of flavor, which will make it easier to avoid highly processed condiments. In addition to the flavor and taste they provide, herbs and spices also have health benefits.

Therapeutic foods: All spice and herbs, green tea

Therapeutic Foods for Healthy Mitochondrial Function

This section provides more information on therapeutic foods, as well as how to include them in your eating routine. Think of these foods as "medicine" for mitochondria. While the top choices are detailed below, there are many more therapeutic foods in each category highlighted on the food list.

Almonds

Eating a handful of nuts each day reduces chronic disease risk. Almonds are a nutritious source of healthy fats, minerals, phytonutrients, and two important antioxidants, vitamin E, and glutathione. Other nuts like walnuts are also brain-healthy because of their omega-3 fat content.

Serving suggestions: Almonds can be whole, sliced, slivered, or chopped and tossed into a salad, or added to rice dishes, oatmeal, yogurt, and cooked veggies (e.g., string beans almondine). Snack bags of almonds can be kept in a purse or the car for a quick and easy snack. Almond butter is a healthy alternative to peanut butter, and almonds may also be ground into almond meal, a flour substitute ideal for lower carbohydrate or gluten-free cooking.

Avocado

Avocados are often referred to as brain food. They are a healthy source of quality fat and potassium, as well as glutathione and vitamin E, both powerful antioxidants. The monounsaturated fat contained in avocados also increases the body's ability to absorb phytonutrients in other fruits and vegetables that offer antioxidant protection.

Serving suggestions: Avoid purchasing avocados with bruises or soft spots. To ripen, place the avocado in a paper bag and store at room temperature for 2 to 5 days, away from direct sunlight. Use to garnish omelets or other egg dishes, hamburgers, soups, and salads; serve guacamole with raw veggies; or slice into a hummus/cherry tomato wrap. Avocado oil can be used for cooking or to dress salads or vegetables.

Berries

Berries, particularly the dark-blue or purplish kind like blueberries and blackberries, are an excellent source of fiber and potent antioxidants that have been shown to improve memory and cognition. Their powerful antioxidants may improve blood flow in the brain, while protecting it from free radical damage. Berries are also a brain food because they are relatively low in carbohydrates and have a low glycemic impact. Frozen berries are an excellent choice, as they have been found to retain their nutrients when frozen. Organic berries tend to be higher in phytonutrients compared with their conventionally grown counterparts.

Serving suggestions: Fresh or frozen berries can be added to a smoothie or a fruit salad, used as a topping on oatmeal, or eaten as a snack.

Therapeutic Foods for Healthy Mitochondrial Function

Cruciferous Vegetables

Cruciferous vegetables (also called Brassicas) include broccoli, cauliflower, cabbage, Brussels sprouts, kale, collard greens, turnips, turnip and mustard greens, arugula, watercress, bok choy (Chinese cabbage), kohlrabi, radishes, and daikon. While all vegetables provide health benefits, those in the cruciferous family play a key role, as they are associated with slowing and reversing decline in brain function. Research has shown that cruciferous vegetables help in detoxification, stimulate the immune system, and act as powerful antioxidants. They are also associated with a reduced risk of heart disease and many cancers.

Serving suggestions: Chop any vegetable in the broccoli family and allow it to rest for a few minutes before cooking to enhance special cancer-protective properties. Raw and cooked broccoli offer different benefits, so prepare your broccoli both ways. Steaming for only a few minutes is recommended when cooking broccoli.

Green Tea

Green tea contains powerful antioxidants that may protect mitochondria and improve insulin sensitivity. Research has shown that, aside from helping to prevent cancer and heart disease, green tea offers protection from the development of Parkinson's disease and other brain disorders.

Serving suggestions: While green tea contains less caffeine than coffee, this may still be more caffeine than some can tolerate. If so, try decaffeinated green tea. If the taste of green tea is bitter, try using cooled green tea as the liquid in a smoothie for breakfast. Try iced green tea in summer with lemon juice and fresh mint; poach pears in green tea with some cinnamon or other spices; or soak peeled hard-boiled eggs in a mixture of green tea and tamari for several days. Also try poaching cod or other fish in green tea (recipe provided in the Mito Food Plan—Weekly Planner and Recipes Guide).

Olive Oil (Cold-Pressed, Unfiltered/Cloudy, Extra-Virgin)

Olive oil contains protective phytonutrients called polyphenols that also have anti-inflammatory benefits. Olive oil should be labeled "cold-pressed" and "extra-virgin." It is green, has a stronger flavor, and is the most nutrient-rich. Store your olive oil in an airtight, dark glass container.

Serving suggestions: Only use EVOO when cooking over low to medium heat, as it will become oxidized and rancid if cooked at high temperatures. Use olive oil to dress vegetables after cooking, or use in salad dressings combined with balsamic vinegar, pomegranate juice, or other favorites. If using unfiltered, cloudy olive oil, do not cook with it at all; it is best for topping veggies and salads.

Therapeutic Foods for Healthy Mitochondrial Function

Pomegranate Seeds

Pomegranate seeds are one of the richest sources of antioxidants with additional anti-inflammatory benefits. The seeds (arils) are high in fiber and are a good source of vitamin C and potassium. The seeds should be refrigerated and used within 4-5 days, but the whole fruit will keep for several weeks in the refrigerator.

Serving suggestions: Pomegranate juice can be used to flavor sauces, dips, and salad dressings. The seeds can be used as a garnish for fruit or vegetable salads. Pomegranate seeds also pair well with olives. Sprinkle hummus or other dips with a few pomegranate seeds and sliced olives for a tart-sweet-salty-bitter burst of flavors.

Wild Salmon

Wild salmon is a rich source of DHA, the omega-3 fat that is one of the keys to a healthy brain. Salmon contains phytonutrients called carotenoids, which give salmon its distinct color. Salmon is a good source of CoQ10, which is an antioxidant that participates in the production of cellular energy. Choose wild-caught or sustainable farmed salmon to reduce exposure to toxins.

Serving suggestions: Salmon can be added to stews and soups, or can be baked, slow-roasted, poached, and added to salads.

Seaweed

Sea vegetables have been found to have antibacterial, antioxidant, and immune supporting properties. Sea vegetables are an excellent source of minerals such as selenium and magnesium. Certain seaweeds are very high in calcium (hijiki, arame, and wakame), while others contain abundant amounts of iron (sea lettuce, hijiki, wakame, and kelp), and still others are excellent sources of iodine (kelp, kombu, and arame).

Serving suggestions: Use fresh seaweeds from safe waters and wash before using. Dried seaweed can be found in sheets (nori and dulse), strands, or powdered forms. Most are prepared by soaking in water. Once soaked, seaweed can be chopped and stirred into stir-fries, soups, stews, and salads, or made into marinated relish. Other serving ideas include snacking on dried nori sheets, sprinkling dulse flakes on a salad, or making a nori roll stuffed with vegetables and sprouts.

Leafy Greens

Green leafy vegetables contain many antioxidants that help with improving memory and cognition. Leafy greens are also high in carotenoids and flavonoids that provide anti-inflammatory and anti-cancer antioxidant protection.

Serving suggestions: Leafy greens should be washed well before consuming. Greens can be consumed both raw and cooked. Try adding a handful of spinach to smoothies, sautéing kale in olive oil, or enjoying a salad topped with colorful vegetables and a drizzle of extra-virgin olive oil.

Brain, Pain, and Drain Strategies

Mitochondrial function naturally declines as part of normal aging. The Mito Food Plan can guide you to support these areas of concern:

Brain Health

Higher levels of inflammation are associated with brain aging. Eating to support mitochondrial function is recommended for those who:

- Have a family history of Parkinson's disease, Alzheimer's disease, multiple sclerosis, and amyotrophic lateral sclerosis, or ALS (Lou Gehrig's disease)
- Are in the early stages of neurological disease
- Want to protect their brain as they age

New research shows that limiting exposure to inflammatory substances (e.g., smoking, chronic stress, air pollution, toxins) while maintaining a healthy lifestyle (e.g., exercise, good nutrition, adequate sleep, and a healthy diet) can improve cognitive function. Those interested in preventative measures for brain protection are encouraged to follow the traditional Mito Food Plan. For those who are in the early stages of neurological disease, a more ketogenic approach may be recommended.

Pain Reduction

Mitochondrial dysfunction has been associated with chronic pain. Protecting and enhancing mitochondrial function through nutrition is a key part of managing chronic pain. While food doesn't have the immediate benefit that pain medications provide, eating phytonutrient-rich vegetables reduces inflammation. Anti-inflammatory foods and herbs that relieve pain may also reduce the risk of dementia.

There are several key nutrients that support mitochondrial health and help to reduce pain due to inflammation. In addition to phytonutrient-rich vegetables, fats like EPA and DHA found in cold-water fish and antioxidant-rich spices can have powerful anti-inflammatory effects. Foods high in B vitamins, vitamin D, and other minerals such as calcium, magnesium, and zinc, support the body's musculoskeletal system. Magnesium and potassium work together to regulate healthy blood vessel function and lessen muscle pain.

Brain, Pain, and Drain Strategies

Feeling Drained

Fatigue or "feeling drained" is often a result of poor mitochondrial function. Eating processed and high-glycemic foods can cause high blood sugar levels and inflammation, which can further impair mitochondrial function. Eating low-glycemic foods, following the Mito Food Plan, consistently getting enough sleep, being active, and reducing stress allow for lower blood sugar levels and inflammation.

In the case of persistent fatigue, there are additional nutrients to consider. CoQ10 is essential to make cellular energy in the body; reduced levels have been found to have a strong connection with fatigue. Functional medicine practitioners may recommend CoQ10 and other supplements when fatigue is persistent. Low levels of vitamin B12, folate, and iron also play a role in supporting energy levels. Those following vegan, vegetarian, or restrictive diets may need to pay special attention to ensure they are eating enough iron.

Personalizing the Mito Food Plan for Success

Exercise and Sleep

It is important to remember that dietary changes are just one part of an overall approach to optimizing mitochondrial function. Exercise, movement, stress management, and sleep also play a key role in mitochondrial health.

Exercise has been shown to improve cellular energy production by increasing the number and size of mitochondria. Exercise is critical for brain health in general and has been shown to reduce the risk for Alzheimer's disease.

Exercise is one of the best ways to boost BDNF levels in the brain. BDNF acts like a growth hormone for the brain, and also activates an antioxidant pathway called Nrf2, which increases the production of antioxidants and detoxification enzymes. Exercise is protective of the heart, supports healthy bones, helps relieve stress, improves mood, reduces anxiety, reduces symptoms of depression, and reduces the risk of falls. Exercise is a key component of a healthy lifestyle and helps people maintain their independence as they age.

Getting enough sleep is also important for mitochondrial health. Animal studies have shown that getting adequate sleep helps to reduce mitochondrial stress. Without enough sleep, there is an increased risk of dementia. During sleep, a process called the "glymphatic flush" happens whereby the brain cleans out toxins and harmful proteins called tau and amyloid beta. This only happens while we are asleep. The buildup of tau and amyloid beta have been strongly associated with the development of dementia and Alzheimer's Disease. For most adults, 7-9 hours of sleep each night are needed for optimal brain function.

Your functional medicine practitioner can help you customize this food plan to meet your health goals and needs. Some common adjustments include:

- Avoiding any foods that trigger adverse food reactions (e.g., dairy, grains, eggs, etc.)
- Avoiding certain high-carbohydrate foods like grains, or limiting consumption to once or twice per week
- Incorporating intermittent fasting to extend the time between your evening meal and morning breakfast
- Modifying meal timing and the inclusion/exclusion of snacks
- Implementing a more ketogenic food plan, as described on the next page
- Including or excluding additional foods based on your genetics, cultural eating preferences, or health goals

Personalizing the Mito Food Plan for Success

Meal Timing and Other Therapeutic Food Plans

Meal timing is an important aspect to consider on the Mito Food Plan. Some people feel better with smaller, more frequent meals, while others may feel better with larger, less frequent meals. Meal frequency typically becomes less important when blood sugar is stable. Eating foods that do not cause peaks and valleys in blood sugar and insulin helps the body feel fuller for a longer period of time. A ketogenic approach uses few carbohydrates in an attempt to keep blood sugar and insulin consistently low. This approach typically results in decreased hunger and cravings.

For people with insulin resistance, type 2 diabetes, or metabolic syndrome, there are other IFM food plans that may be beneficial besides the Mito Food Plan. These include the Cardiometabolic and Core Food Plans which have an emphasis on foods that support healthy blood sugar management. Your functional medicine practitioner will discuss these options to determine which food plan will meet your specific health needs and dietary preferences.

Ketogenic Diets

There are various opinions regarding how many carbohydrates should be eaten when following a ketogenic food plan. The most rigid approach allows no more than 20 grams of total carbohydrate per day. This is often recommended for those who are experiencing seizures or severe neurologic symptoms. Some food plans allow up to 40 or 50 grams per day for a mildly ketogenic approach.

It is very important to work with your functional medicine practitioner to determine if a ketogenic diet is right for you. One challenge of a more restrictive ketogenic diet is that it is not possible to eat the 9+ servings of phytonutrient-rich vegetables and fruits needed for mitochondrial and brain health. Additionally, ketogenic diets may change the gut microbiome because fewer prebiotic foods are eaten. It is important to work with your functional medicine practitioner to make sure your nutrient needs are being met through food or supplementation.

Calorie Restriction

Tracking "calories in and calories out" doesn't necessarily lead to optimal health. Scientific findings support the concept of quality foods distributed throughout the day. This food plan can enable you to reduce calories and still be satisfied with flavorful foods that provide a nutritious foundation for health.

What does a high-quality versus high-quantity diet look like? The goal is to spend less time and energy metabolizing food, while getting as many health-promoting nutrients as possible. In other words, the highest level of nutrition content for the lowest amount of calories is the goal. For example, if you typically eat about 1500 calories, you might try eating 1400 calories per day. This may seem very daunting at first, so picture a typical plate at dinner and eat about a quarter less. It is best not to limit vegetables; instead, limit all other foods. It may be necessary to start gradually and decrease calories slowly.

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Intermittent Fasting

Fasting is not recommended for everyone. Individuals with diabetes, metabolic syndrome, or recurring hypoglycemia may be "metabolically inflexible." It is strongly recommended that these individuals work with an experienced healthcare practitioner to transition towards being able to fast if this is a goal.

Intermittent fasting may have positive effects on brain function, longevity, and promote healthy aging. Intermittent fasting is a pattern that cycles between periods of eating and not eating. There are a number of variations, which include fasting every other day or every third day; modified fasting in which a person refrains from eating for a specific number of days; and time-restricted feeding in which a person eats in a shortened period of time to prolong the typical nightly fast.

Here are some general guidelines to follow when fasting:

- Prioritize whole, nutrient-dense foods, especially as you are limiting your intake on fasting days.
- Drink plenty of filtered water on fasting days. Your functional medicine practitioner may also recommend electrolytes or other supplements personalized for you.
- High-intensity exercise is not recommended while fasting. Walking, yoga, or other light activity is preferable.
- Be aware of your movement as you may feel dizzy or lightheaded, especially when first starting a fast.
- Stop fasting if you feel unwell and call your functional medicine provider.

The Gut-Brain Approach

The early part of the 21st century has highlighted the importance of beneficial bacteria as it relates to brain health. A diet of highly-processed foods is associated with a lack of diversity in microbiome. Changes in the microbiome have been observed in patients with Parkinson's disease, ALS, and Alzheimer's disease. These are compelling reasons to pay attention to the health of your microbiome.

Probiotic and fermented foods (e.g., sauerkraut, kimchi, yogurt, etc.), prebiotic foods (e.g., jicama, artichokes, asparagus, onions, etc.), and other vegetables, fruits, nuts, and legumes play a critical role in balancing the good bacteria in the gut. These good bacteria produce neurotransmitters that influence mood and brain function. Include fermented foods in your meals as often as possible.

Frequently Asked Questions

Can you explain more about mitochondria?

Mitochondria are like tiny power plants in every cell of the body. They convert food and oxygen into cellular energy. Molecules called "free radicals" are produced as a byproduct of energy production. An analogy for this would be the exhaust that comes from an engine. Free radicals need to be neutralized or they will create damage (often referred to as oxidative stress) in the body. Excess free radicals can damage the brain by initiating death of cells, leading to premature aging. Oxidative stress and deterioration of mitochondria in the brain are major contributors to neurological conditions such as Parkinson's disease and dementia.

Can you tell me more about high-antioxidant foods?

Many foods, particularly vegetables and fruits, contain an abundance of phytonutrients which decrease inflammation and neutralize oxidative stress. Some therapeutic foods on the Mito Food Plan are highlighted because they are high in antioxidants. For example, grapes, red wine, purple grape juice, peanut skins, and dark chocolate contain an antioxidant called resveratrol. Resveratrol can increase the production of detoxification enzymes and antioxidants and support mitochondrial function. Other phytonutrients found in the broccoli family help the body make glutathione, a very powerful antioxidant. Herbs and spices, green tea, and berries help to minimize oxidative stress.

How many carbohydrates are in the foods I eat?

The Mito Food Plan lists the approximate carbohydrates in a serving of fruits, vegetables, grains, legumes, and dairy foods. Serving size varies within each group. Food labels and some menus will also display the carbohydrates per serving, listed as "total carbohydrates." There are often multiple servings in a package, or restaurant meal, so look for the number of servings on the package or menu. If you are having more than one serving, you will need to multiply the total carbohydrate value (in grams) by the number of servings you're eating.

How will I know if I am in mild ketosis?

It can take up to 72 hours to enter ketosis, therefore you should start testing on day three of starting a ketogenic diet. Urinary testing strips for the presence of ketones is the most cost-effective and easiest approach, however, this type of testing may provide false negative results. Blood testing with a finger stick is the most accurate and preferred method. Regardless of method, testing should be performed daily, and the goal for most people is mild to moderate ketosis. For more information, and to ensure safety and effectiveness during this process, ask your functional medicine practitioner for guidance.

Frequently Asked Questions

If I wish a stricter ketogenic approach, how would I go about this?

A strict ketogenic diet needs to be directed by an experienced medical practitioner (doctor or nutritionist) who is familiar with supervising and monitoring those on a ketogenic diet. With that said, here are some basic considerations for a stricter ketogenic approach:

Eat healthy fats: These can make up as much as 80-90% of the diet. Focus on MCT oils, nuts, olives and olive oil, avocados and avocado oil, and full-fat organic dairy if suggested by your functional medicine practitioner.

Limiting carbohydrates: On a strict ketogenic diet, both carbohydrate and protein are kept low while fat intake is high. With 80-90% of calories coming from fat, this leaves approximately 10-20% available from both carbohydrate and protein sources. The actual level of carbohydrates and protein needed will vary from person to person. Carbohydrates should not fall below 20 grams per day.

Test for ketones often: Blood or urine testing should begin 3 days after starting a ketogenic diet. Daily testing is important, particularly for those who have epilepsy or ALS. The testing goal is for trace to moderate ketones. If ketones are not detected, talk to your functional medicine provider about adjusting your carbohydrate intake.

Be aware that: Occasionally the urine strips may not reflect ketosis even when compliance to the diet is high. This is fine if other markers are improving, such as glucose and insulin levels, triglycerides, or body composition.

Why is organic food so important?

Organic, pesticide- and toxin-free food from local, free-range, and grass-fed sources is very important for mitochondrial and overall health. Organic foods are grown without the use of pesticides and synthetic fertilizers. Organic meats, poultry, dairy, and eggs all come from animals that have not been raised on antibiotics or growth hormones. Free-range meats come from beef, buffalo, chicken, or lamb that have not been fed corn or other grains, but have been allowed to roam free and eat grasses that are naturally higher in healthy omega-3 fats. **See the Environmental Working Group website (www.ewg.org) for a list of produce containing the highest level of pesticides ("Dirty Dozen"), along with those containing the least amount of pesticides ("Clean 15").** Look for the USDA organic symbol or choose organically frown produce from your local farmer's market.

Frequently Asked Questions

How can I cook in a way that supports brain health?

When cooking, especially with high heat, substances called advanced-glycation end products (AGEs) form. AGEs inhibit mitochondrial function, increase inflammation, and increase oxidative stress. Typically, the higher the heat and the browner the food, the greater the amount of AGEs present.

A healthier option is to cook with moisture over low heat, such as using a slow cooker, poaching, steaming, and stewing. Food that is grilled, charred, broiled, seared, or crisped should be eaten with leafy greens (spinach, kale, chard, arugula, etc.) or a salad. Many common spices such as black pepper, cumin, chili pepper, curry, onion, and garlic can bind to damaging molecules, like AGEs. This food plan encourages liberal use of spices to enhance flavor and to reduce cellular damage from AGEs.

How will I know if I have an allergy or sensitivity to dairy?

If you or your functional medicine practitioner suspect that dairy may be causing negative reactions, it would be wise to completely avoid dairy and all products that contain any dairy for 2 to 3 weeks to see if symptoms improve. It is important to keep in mind that many food products have dairy components, such as lactose, casein, and whey.

Why are herbs and spices important in this food plan?

Spices and herbs can have anti-inflammatory and antioxidant effects in neurological disease. The Mito Food Plan encourages a generous use of various spices, such as basil, black pepper, cayenne, cilantro, cinnamon, cloves, curry, fennel seed, garlic, ginger, marjoram, oregano, paprika, parsley, rosemary, sage, and turmeric. All spices and herbs have the potential to limit the damage from oxidation. For example, glutathione is an important antioxidant. The curcumin in turmeric has the potential to activate genes that ramp up the production of glutathione. Dress up daily meals with a variety of spices, as they will make food taste more flavorful and increase health benefits.

What else can I drink on the Mito Food Plan besides green tea?

Some people have a genetic variant that makes their taste buds more sensitive to the bitterness of certain foods, including green tea. First, you can try some suggestions like using brewed green tea as the base for smoothies, or adding some lemon juice to your tea. If it is still bitter, you may try brewing tea at a lower temperature or switching to a higher quality brand. Herbal teas, black tea, and coffee also have some antioxidant benefits. Those who are sensitive to caffeine can purchase Swiss water decaf coffee to avoid the chemical solvents used in most decaffeinated brands. It is recommended to avoid anything with added sugars, including diet soda. As always, drinking plenty of pure, filtered water each day should be a priority.

Frequently Asked Questions

What about drinking alcohol?

Alcohol, especially in the context of neurological conditions and brain health, is a complex topic. Red wine in particular contains brain-friendly antioxidants and resveratrol, a phytonutrient that helps to relax blood vessels. However, alcohol is also a known toxin to the brain and often contains sugar, which may not be good for some people who want to improve brain health.

Your practitioner can help determine whether moderate or occasional use of alcohol would be appropriate given your health goals. For a generally healthy person, one glass of red wine may be perfectly acceptable at meals, even when leaning toward a more ketogenic diet. If you choose to avoid alcohol, choose foods high in resveratrol, such as red grapes, dark chocolate, peanuts, and small amounts of organic, purple grape juice.

What can I use on the plan as a sweetener?

Avoid all added sweeteners to the best of your ability when following this food plan. High-intensity sweeteners, such as high-fructose corn syrup, can lead to blood sugar imbalances, increased calories and weight gain, and continued cravings. When craving something sweet, choose from the fruits on the Mito Food List. While label reading is important to detect added sugars, the Mito Food Plan doesn't include processed foods. Fresh fruits and vegetables are great choices, as they contain no hidden sugars.

Artificial (synthetic) sweeteners should also be completely avoided; new research is finding that these high-intensity sweeteners may have negative effects on metabolism and could spur food cravings. Some of these may act as toxins in the brain and promote free radical formation. These types of sweeteners that should be avoided include NutraSweet® (aspartame), Splenda® (sucralose), acesulfame-K (Ace K, Sweet One®, Sunett®), and Sweet N' Low® (saccharin, sodium cyclamate).

Can I exercise while I'm on this food plan?

Exercise is an important part of any program designed to improve brain health. Aerobic exercise at a moderate intensity for at least 150 minutes a week, including weight training at least twice per week, is strongly recommended. Research has suggested that exercise helps to oxygenate the brain and helps learning and memory. Exercise also activates the gene that turns on BDNF, which protects our neurons and helps to create new ones. While fasting, high intensity exercise is not recommended.

Frequently Asked Questions

I started a ketogenic version of the Mito Food Plan and I feel terrible, what's going on?

A common term called the "keto flu" includes symptoms such as headaches, constipation, nausea, fatigue, brain fog, and insomnia that can begin shortly after starting a ketogenic diet. There are many possible causes of these symptoms including transitioning into full ketosis too quickly, withdrawal from sugars and processed foods, changes in the gut microbiome, and others. It is important to make sure that you transition slowly into ketosis under the guidance of your practitioner and keep track of how you're feeling. Make sure that you are drinking plenty of filtered water and eating as many colorful vegetables as you can. You may need extra rest during the first few days, but your energy level and symptoms should improve after this period of time. If you continue to feel poorly, talk to your functional medicine provider.

I have the genetics for Alzheimer's, will it make any difference if I follow the Mito food plan?

There are several genetic variants associated with a higher risk of developing Alzheimer's Disease. Depending on the genetic variant combination, a person may have a slightly increased to high likelihood of developing Alzheimer's Disease. It's important to talk to your doctor or a genetic counselor to make sure that you understand your actual risk. With that said, not all people with the highest genetic risk develop Alzheimer's Disease. Emerging research shows that diet and lifestyle, including the Mito Food Plan, can be powerful in reducing the overall risk of developing neurological diseases like Alzheimer's.

I have heard that sleep is especially important for brain health, can you explain why?

During sleep, a process called the "glymphatic flush" happens whereby the brain cleans out toxins and harmful proteins called tau and amyloid beta. This only happens while we are asleep. The buildup of tau and amyloid beta have been strongly associated with the development of dementia and Alzheimer's Disease. For most adults, 7-9 hours of sleep each night are needed for optimal brain function. If you have difficulty getting enough sleep, talk to your practitioner. There are many strategies that can increase the quantity and quality of your sleep.

Resources and Tools for Success

Changing food habits can be a complex and difficult process. To help both patients and practitioners, we have included recipes, menus, and other information to make this a "do-able" process. Look over this information carefully. If any questions about the food plan arise, please contact your functional medicine practitioner.

The following handouts are available to help patients and practitioners use the Mito Food Plan:

- **Mito Food Plan—Food List**
- **Mito Food Plan—Weekly Planner and Recipes**
- **Phytonutrient Spectrum Foods**
- **Phytonutrient Spectrum Comprehensive Guide**

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