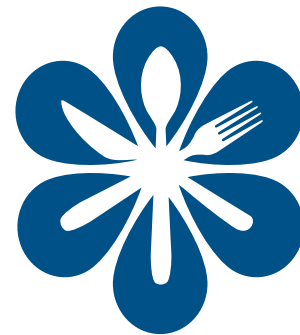


# MITO FOOD PLAN

Comprehensive Guide





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## Why the Mito Food Plan?

The Mito Food Plan may be described as an anti-inflammatory, low-glycemic, gluten-free, low-grain, high-quality-fats approach to eating. The plan focuses on supporting healthy mitochondria through the use of therapeutic foods that improve energy production. Mitochondria are structures in every cell that make energy by using oxygen and nutrients from food. The cells in the brain, heart, nerves, muscles, and organs all have higher concentrations of mitochondria. These parts of the body are more susceptible to a premature decline in function caused by a host of common affronts like poor nutrition, high stress, and toxin exposure.

The Mito Food Plan supports cellular energy production, overall vitality, and healthy aging. Insulin resistance and diabetes has been shown to increase the risk of dementia, including Alzheimer's disease. The mildly ketogenic, low-carb approach of the Mito Food Plan is helpful in producing ketones, an efficient alternative to glucose for the brain. Ketones are absorbed faster than glucose and produce less oxidative stress in the body. Oxidative stress has been implicated in many chronic and neurologic conditions. The Mito food list can assist in preventing the development of chronic and neurological diseases by helping people choose specific foods that enhance mitochondrial function.

Mitochondria are pivotal for cellular function, overall vitality, and graceful aging. Simply stated, the Mito Food Plan uses food for optimal energy while preventing accelerated aging in our most susceptible tissues. Research has shown that diet and lifestyle interventions can be helpful in providing support for healthy mitochondria. Eating certain foods can reduce the production of free radicals—molecules that create oxidative stress and damage tissues in the body. When mitochondria are working well, people are less likely to have symptoms of fatigue, pain, and cognitive problems commonly associated with mitochondrial dysfunction.

Cellular energy production is fueled when a person is eating nutrient-dense, high-quality foods. It is also important to consider how much to eat, how often to eat, and how to cook food. Calorie and carbohydrate restriction, along with eating lean, clean (pesticide and toxin-free) proteins, high-quality fats and oils, and more plant foods has been shown to help prevent or slow down neurological disease. Thus, the plan's focus is on eating the right quantity of proteins, fats, and carbohydrates to fuel cellular energy production, decrease oxidative stress, and support blood sugar balance.



## Why the Mito Food Plan?

Damage to mitochondria can result from eating foods that encourage generalized inflammation in the body. This damage increases the risk of developing 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). Brain-derived neurotrophic factor (BDNF) is a protein that protects and helps create nerve cells, or neurons, in the brain. Neurons transmit information in the brain and BDNF acts like a growth hormone for these neurons. BDNF is vital for thinking, learning, and a higher level of brain function. It turns out that levels of BDNF are lower in those with Alzheimer's disease and Parkinson's disease. Increasing one's levels of BDNF is a first line of defense against these neurological diseases. How can a person do this?

BDNF production is activated by several factors. These include exercise, calorie restriction, docosahexaenoic acid (DHA, an omega-3 fatty acid), intermittent fasting, intellectual stimulation, curcumin (a spice), sunlight exposure and meditation. Additionally, a state of ketosis, brought on by eating a diet lower in carbohydrates, moderate in protein, and high in fat, appears to provide the most efficient fuel for mitochondria and activation of BDNF. Conversely, the standard American diet (SAD), obesity, and elevated blood sugars lower levels of BDNF.

Dietary fat composition seems to be an important factor in blood-brain barrier function and cholesterol levels, both of which are involved in the development of Alzheimer's disease. Apolipoprotein E4 (ApoE4) is involved in cholesterol transport and has been suggested as the primary genetic risk factor for Alzheimer's disease. In some carriers of ApoE4 adverse genetic variants, metabolism of DHA – which is important for healthy neurons in the brain – may be disrupted. Some ApoE4 carriers who are overweight or obese may need higher amounts of dietary DHA than those who are non-carriers of the variant. In non-carriers of ApoE4, dietary supplementation of omega-3 fatty acids is associated with long-term protective effects on cognitive decline. ApoE4 has also been connected with cardiovascular disease and longevity. Research has shown an association between ApoE4, lifestyle risk factors, and dementia-related mortality.

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. These foods are highlighted in the list of Therapeutic Foods on the Mito food list.



## Features of the Mito Food Plan

This food plan was developed by a team of Functional Medicine physicians, leading experts, and nutrition professionals to help assist patients in learning how to eat to support mitochondrial function. Current research and clinical experience guided this team in the development of the Mito Food Plan.

- **Therapeutic Foods for Energy**—Creation of energy in the mitochondria is dependent on adequate supply of quality macronutrients (proteins, fats, 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 fruits and vegetables on a daily basis to provide nourishment on a cellular level. Adequate consumption of dietary fats and oils can influence the function and performance of the mitochondria; these fats impact the quality of the inner membrane of the mitochondria, which is where the final steps of cellular energy production involving the coenzyme adenosine triphosphate (ATP) occur. 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. A Functional Medicine practitioner will instruct patients on supplementing the dietary plan with additional targeted nutrients.

- **Protective Antioxidants**—The body needs oxygen to make ATP, however, metabolism and cellular energy production generate byproducts known as reactive oxygen species, or ROS. ROS cause oxidative stress in the body, which can damage tissues and have been implicated in many neurologic and chronic diseases. Smoking and high blood sugars have been shown to significantly increase oxidative stress in the body. Oxidative stress in excess of healthily managed levels can accelerate the development of chronic disease, pain, and fatigue. Damage from oxidation can be reduced by eating nutrient-dense foods containing protective antioxidants. Glutathione is one of the most important cellular antioxidants produced by the body. It is also involved in the process of detoxification. Certain vegetables, spices, and quality proteins in the diet enable the body to produce and utilize important antioxidants such as glutathione, vitamin C, and N-acetyl cysteine. A wide variety of spices and phytonutrients (nutrients from plants) in the diet enhance the production of glutathione and other antioxidants critical for protecting cells and neutralizing oxidative stress.

## Features of the Mito Food Plan

- **Anti-Inflammatory Nutrients**—Maximum phytonutrient density can be achieved by eating a diversity of anti-inflammatory fruits and vegetables. Eating 8–12 servings daily of colorful vegetables and fruits will guarantee a generous supply of anti-inflammatory phytonutrients, minerals, and vitamins, without added sugars. Vegetables should be the primary focus, especially the bitter foods in the cruciferous family (such as broccoli, cabbage and arugula) that have strong anti-inflammatory effects. Polyphenols in many of the therapeutic foods, especially blueberries,



strawberries, and walnuts, have been shown in both human and animal studies to increase cognitive function and decrease inflammation. They may even help to increase lifespan.

These foods have also been shown to help prevent Alzheimer's disease. The incidence of Parkinson's disease and Alzheimer's disease has been observed to be lower in populations where anti-inflammatory and antioxidant-rich foods are consumed on a regular basis. For example, the spice turmeric contains the powerful anti-inflammatory substance curcumin. People who eat curry, which contains turmeric, score better on cognitive tests.

- **High-Quality Dietary Fats**—A healthy brain thrives when quality fats such as DHA, found in seaweed, egg yolks, and cold-water fish such as salmon, mackerel, cod, and sardines, are eaten. Consuming adequate omega-3 fats, critical to the support of the brain's mitochondria, helps in utilizing fat for cellular energy production. DHA also assists with communication between neurons and decreases inflammation, both necessary for optimal brain health.

It is important to remember diversity when considering oils for cooking and dressing salads or vegetables. Coconut oil is a brain-healthy saturated fat that contains medium-chain triglycerides (MCTs), supports mitochondrial function, supplies fuel for ketosis, and may help to improve cognition and modulate inflammation. All organic and unprocessed coconut-based foods (oil, milk, water, grated coconut, flour) have benefits, but caution should be used with sweetened versions. Coconut oil, in particular, is a good source of MCTs.

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.

Extra-virgin olive oil (EVOO) is another 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.

- **Low Glycemic Impact**—Maintaining a lower and consistent insulin level is key to optimal mitochondrial health. A high-glycemic load diet of too many grains and added sugars can lead to elevated insulin, increased inflammation, and accelerated mitochondrial dysfunction. Minimizing grains, especially highly processed ones, and using low-glycemic vegetables and fruits as the main source of carbohydrates helps to stabilize blood sugar and protect mitochondria. This way of eating also minimizes fat accumulation.

Reducing glucose metabolism by limiting dietary carbohydrates may also have profound effects in preventing or slowing down the trajectory toward Alzheimer's disease. Recent research has suggested that even mild elevations of blood sugar may increase 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. This is one example of how sensitive mitochondria are to inflammation from excess sugars, processed foods, and environmental toxins.

- **Reduced Carbohydrates with Ketogenic Option**—A ketogenic diet is characterized by fewer carbohydrates, moderate amounts of protein, and higher amounts of fat. This shift in macronutrients causes the body to switch to utilizing ketones (produced by burning fats) instead of glucose as its primary source of fuel. Ketones (e.g., acetoacetate, beta hydroxybutyrate, and acetone) are produced in the liver when fat is burned instead of glucose. Called "ketosis," this state of burning ketones instead of carbohydrates is optimal for cognitive functioning and results in more sustained energy throughout the day. Ketones are efficiently used for the generation of ATP (energy) in mitochondria and may help protect vulnerable neurons from free radical damage while increasing the number of new mitochondria. Ketosis also facilitates a release of BDNF, the protein that helps build neural connections in the brain responsible for learning and memory. A ketogenic diet mimics the fasting state and has the same benefits for the brain. This option is especially helpful in reducing the risk of epilepsy, MS, ALS, and brain tumors. More recent research also suggests a reduction in the risk of Alzheimer's disease.
- **Intermittent Fasting and Caloric Restriction**—Research suggests that people can optimize brain function, longevity, and healthy aging by restricting calories and fasting for intermittent periods. Memory and cognition are thought to be enhanced by eating fewer calories overall. Fasting turns on genes that help cells survive by reducing inflammation. Calorie restriction may also be healthy for one's nerves and support memory and cognition. Eating fewer calories than required by the basal metabolic rate (BMR) allows the brain to make new neurons by decreasing free radicals, enhancing ATP production, and increasing the number of mitochondria present. Animal studies have shown a decreased incidence of both Alzheimer's disease and Parkinson's disease associated with calorie restriction.



## Features of the Mito Food Plan

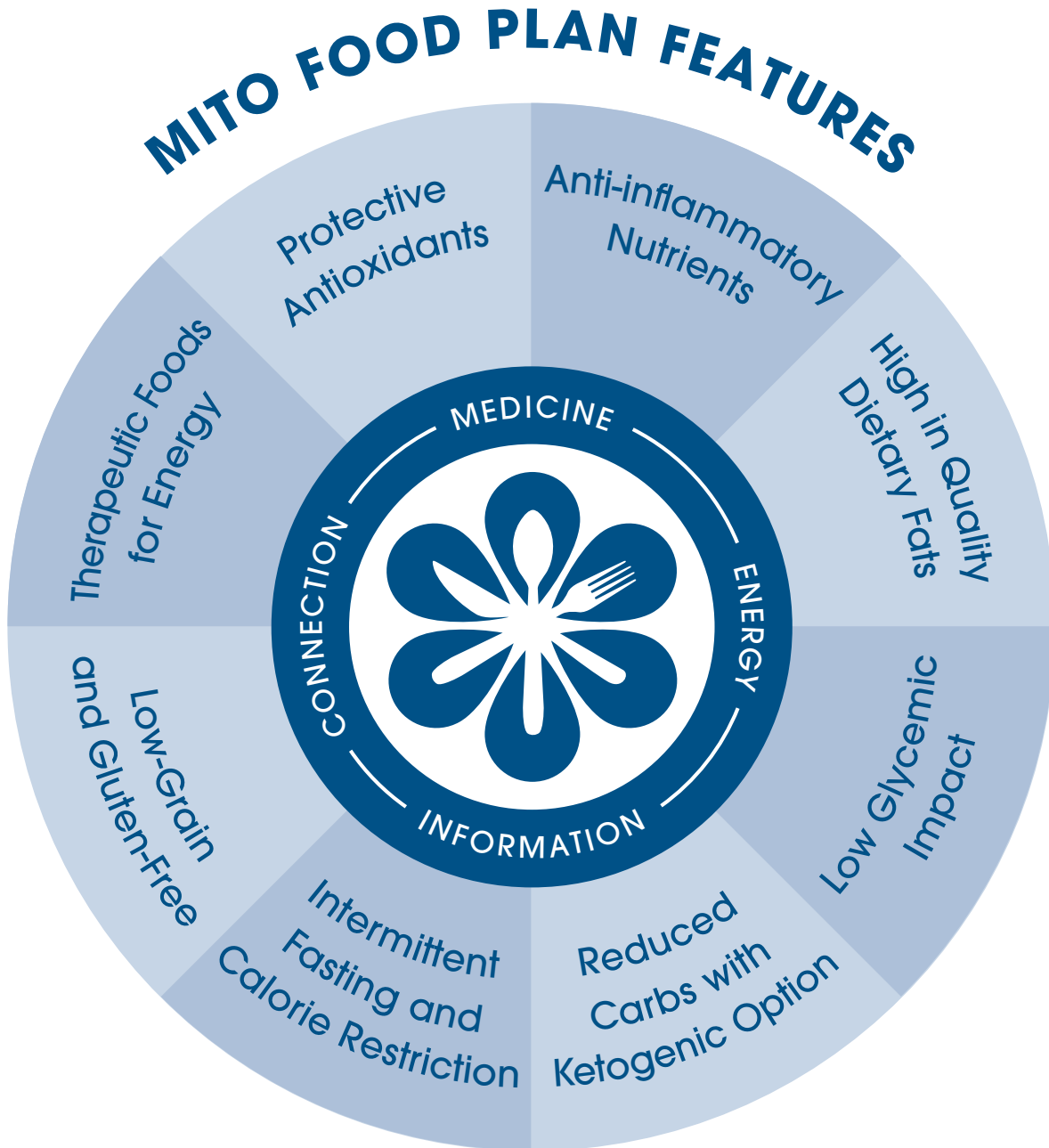
Instead of restricting calories every day, intermittent fasting is another way to trigger these changes. Intermittent fasting is a pattern that cycles between periods of restricting calories and periods of not restricting calories. There are a number of variations, which include fasting every other day or every third day; modified fasting in which a person restricts calories 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. Experts suggest following an intermittent fasting protocol for one day every 1–3 weeks, but patients should check with their Functional Medicine practitioners, who may have specific recommendations regarding a fast.

- **Low-Grain and Gluten-Free**— Gluten, a protein found in many different grains such as wheat, barley and rye, is not included in the Mito Food Plan as it is often related to sensitivities or allergies and associated with gut inflammation and other symptoms.

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 and fibrous vegetables. A Functional Medicine practitioner may emphasize the grain-free aspects of this food plan, especially if patients are experiencing inflammation, pain, fatigue, and cognitive decline.







# Touring through the Mito Food Plan

As mentioned earlier, the Mito Food Plan includes foods that are known to support healthy mitochondrial function while maintaining blood sugar and inflammatory balance. These foods are divided into common dietary categories that represent different macronutrients (proteins, fats, and carbohydrates). The food plan is designed to give patients a “snapshot” of the suggested foods from which to choose each day. Therapeutic Foods are called out in bold print in each category, and an orange dot indicates which foods may be limited or eliminated on a more ketogenic version of this plan. For recipes and shopping tips, refer to IFM’s Mito Food Plan-Weekly Menu and Recipes Guide, which contains a weekly meal plan and shopping guide.

Mito Food Plan

**PROTEINS** Proteins

Servings/day \_\_\_\_\_

**Free-range, grass-fed, organically grown animal protein, non-GMO, organic plant protein; and wild-caught, low-mercury fish preferred.**

**Animal Proteins:**

- Cheese (hard)  $\bullet$  1/2 oz
- Cheese (soft)  $\bullet$  1 oz
- Cottage cheese  $\bullet$  1/2 c
- Parmesan cheese  $\bullet$  2 T
- Ricotta cheese  $\bullet$  1/4 c
- Egg  $\bullet$  1 or 2 egg whites
- Fish, Omega-3 rich:**
- Alaskan salmon, cod, halibut, herring, Atlantic mackerel, sardines, striped tuna, etc.**  $\bullet$  1 oz
- Meat: Beef, buffalo, elk, lamb, venison, other wild game**  $\bullet$  1 oz

1 serving as listed = 35-75 calories, 5-7 g protein, 3-6 g fat, 0-4 g carbs  
Average protein serving is 3-4 oz (size of palm of hand).

**DAIRY & ALTERNATIVES** Proteins/Carbs

Servings/day \_\_\_\_\_

**Unsweetened, organic preferred**

**Dairy:**

- Butter  $\bullet$  1 T
- Kefir (plain)  $\bullet$  6 oz
- Milk: Almond, coconut, flaxseed, lactant, hemp, oat, soy (plain)  $\bullet$  8 oz
- Yogurt: Coconut, soy (plain, cultured)  $\bullet$  3 oz

1 dairy serving = 90-100 calories, 3-8 g protein, 1-2 g carbs  
1 dairy alternative serving = 12-40 calories, 1-5 g protein, 1-2 g carbs (nutritional values vary)

**FATS & OILS** Fats

Servings/day \_\_\_\_\_

**Minimally refined, cold-pressed, organic, non-GMO preferred**

- Avocado**  $\bullet$  2 T or 1/4 whole
- Butter  $\bullet$  1 T
- 2 T *nutseed*
- Chocolate, dark (70% or higher cocoa)  $\bullet$  1 oz
- Coconut milk, regular (canned)  $\bullet$  1 1/2 T
- Coconut milk, light (canned)  $\bullet$  1 T
- Mayonnaise (unsweetened)  $\bullet$  1 T
- Olive, **cooking: Avocado, coconut, ghee** (clarified butter, ghee), grass-fed, **grass fed butter** MCT, **olive (extra virgin)**, rice bran, sesame  $\bullet$  1 T

1 serving = 45 calories, 5 g fat

**Items in blue indicate preferred therapeutic foods**  
**Limit or eliminate these foods when following a more ketogenic version of the Mito Food Plan**

Note: Nutritional amounts are based on average values for the variety of foods within each food category.  
Dietary prescription is subject to the discretion of the health practitioner.

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**VEGETABLES Non-starchy** Carbs

Servings/day \_\_\_\_\_

- Artichoke
- Arugula
- Asparagus
- Bamboo shoots
- Beets (cubed)
- Bok choy
- Broccoli
- Broccoli sprouts
- Cabbage
- Brussels sprouts
- Carrots
- Cauliflower
- Celery root
- Celery
- Chard/Swiss chard
- Chives
- Cilantro
- Cucumber
- Spinach
- Sprouts, all
- Squash: Delicata, pumpkin, spaghetti, yellow, zucchini, etc.
- Eggplant
- Endive
- Fennel
- Fermented vegetables:
- Kimchi, pickles, sauerkraut, etc.
- Garlic
- Green beans
- Greens: Beet, collard, chicory, dandelion, escarole, kale, mustard, purslane, radicchio, turnip, etc.
- Watercress

1 serving = 15-11 c raw grams = 25 calories, 5 g carbs

**Organic, non-GMO fruits, vegetables, herbs and spices preferred**

**VEGETABLES Starchy** Carbs

Servings/day \_\_\_\_\_

- Acorn squash (cubed)  $\bullet$  1 c
- Butternut squash (cubed)  $\bullet$  1 c
- Plantain  $\bullet$  1/2 c or 1/3 whole
- Potato: Purple, red, sweet, yellow  $\bullet$  1/2 med
- Potatoes (mashed)  $\bullet$  1/2 c
- Root vegetables: Parsnip, rutabaga  $\bullet$  1/2 c
- Yam  $\bullet$  1/2 med

1 serving = 80 calories, 15 g carbs  
**Low Glycemic Impact Recommendations**  
Limit to 1-2 servings per day

**GLUTEN-FREE GRAINS** Carbs

Servings/day \_\_\_\_\_

**Unsweetened, sprouted, organic preferred**

- Amaranth  $\bullet$  1/2 c
- Buckwheat/kasha  $\bullet$  1/2 c
- Quinoa  $\bullet$  1/2 c
- Rice: Basmati, black, brown, purple, red, wild  $\bullet$  1/2 c
- Taro  $\bullet$  1/2 c

All grain servings are for cooked amounts.

1 serving = 35-110 calories, 15 g carbs  
**Low Glycemic Impact Recommendations**  
Short term: Consider removal  
Long term: Limit to 1-2 servings per day

**FRUITS** Carbs

Servings/day \_\_\_\_\_

**Unsweetened, no sugar added**

- Apple  $\bullet$  1 med
- Appleauce  $\bullet$  1/2 c
- Apricots  $\bullet$  4
- Banana  $\bullet$  1/2 med
- Blackberries  $\bullet$  1/2 c
- Blueberries  $\bullet$  1/2 c
- Cherries  $\bullet$  1/2 c
- Dates or figs  $\bullet$  3
- Dried fruit  $\bullet$  2 T
- Figs  $\bullet$  3
- Grapefruit  $\bullet$  1/2
- Grapes  $\bullet$  1/2 med
- Kiwi  $\bullet$  1 med
- Mango  $\bullet$  1/2 med
- Melon, all  $\bullet$  1 c
- Nectarine  $\bullet$  1 med
- Orange  $\bullet$  1 med
- Papaya  $\bullet$  1 c
- Peach  $\bullet$  1 med
- Pear  $\bullet$  1 med
- Persimmon  $\bullet$  1/2
- Pineapple  $\bullet$  1/2 c
- Plums  $\bullet$  2 med
- Pomegranate seeds  $\bullet$  1/2 c
- Prunes  $\bullet$  3 med
- Raspberries  $\bullet$  1/2 c
- Strawberries  $\bullet$  1 1/2 c
- Tangerines  $\bullet$  2 med

1 serving = 60 calories, 15 g carbs  
**Low Glycemic Impact Recommendations**  
Limit to 1-2 servings per day; **omit dried fruit and full juices**

**BEVERAGES, SPICES & CONDIMENTS**

**Unsweetened, no sugar added**

- Black tea
- Coffee
- Filtered water
- Fresh juiced vegetables
- Gingko biloba tea
- Green tea
- Sparkling/mineral water
- Unsweetened coconut water  $\bullet$
- Yerba mate
- Herbs and Spices: Cardamom, oregano, sage, etc.
- Condiments: Lemon/lime juice, miso, mustard, tamari, vinegars, etc.  $\bullet$  use sparingly, suggest 1 T or less per serving

**Items in blue indicate preferred therapeutic foods**  
**Limit or eliminate these foods when following a more ketogenic version of the Mito Food Plan**

Note: Nutritional amounts are based on average values for the variety of foods within each food category.  
Dietary prescription is subject to the discretion of the health practitioner.

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## 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. There are many sources of protein to choose from, whether a person is a vegan, vegetarian, or omnivore. Vegans can choose soy and legume proteins. Lacto-ovo vegetarians can have soy in addition to eggs and cheese. Omnivores can have all of these foods plus animal foods like poultry, beef, wild game, turkey, and fish. High-quality proteins are preferred, including grass-fed, organic, non-genetically modified organism (GMO) sources. For fish, remember to choose wild-caught sources, as farmed fish may contain hormones and toxic chemicals called polychlorinated biphenyls (PCBs). 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, which can be used as a condiment in a primarily plant-based meal.

**Therapeutic foods: Wild Alaskan salmon, mackerel (Atlantic), sardines, cod, elk, venison, and grass-fed lamb, beef, and buffalo (bison)**



### 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 may be eaten in the form of soup, cooked beans, dips, or hummus and will complement a non-starchy vegetable. However, legumes are downplayed in this food plan, as they are a concentrated source of carbohydrates. If legumes are preferred, eat no more than one serving a day and limit other carbohydrates like fruit and starchy vegetables.



### Dairy and Alternatives

Many people avoid dairy products because of allergies or sensitivities, or because they find them to be inflammatory. Most commercially available dairy products in the U.S. are made from the milk of the Holstein breed of cows, and this breed's milk is known to contain inflammatory A1 proteins. Consumption of dairy products can also contribute to or worsen certain health conditions. For example, research suggests that those who routinely consume dairy products may have an increased risk of developing Parkinson's disease. For these reasons and others, a Functional Medicine practitioner may advise patients to avoid dairy products.



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 these dairy alternative milks. It is recommended to purchase milks that say "unsweetened" on the front of the box. 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 its beneficial fats. Additionally, soy milk is the only dairy alternative with a similar protein content to cow's milk. When choosing soy milk, it is essential to select only organic to avoid GMOs.

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. Kefir is fermented for a longer time than yogurt, resulting in greater probiotic benefits and immune support. For patients following a more ketogenic approach, most dairy products are too high in carbohydrates to include on a daily basis. As such, dairy products are downplayed in the Mito Food Plan. Note that cheeses are not considered to be a dairy product because they have negligible carbohydrates. Cheeses are therefore included in the protein category.

**Therapeutic foods: Unsweetened cultured coconut milk yogurt**

### 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 and dried coconut for brain-healthy MCTs. Be sure to buy nuts that aren't heavily salted and roasted in oil. Eating a variety of nuts ensures getting a variety of phytonutrients.



Nut butters are easy to incorporate into snacks and meals; examples are tahini (sesame seed butter) drizzled over vegetables and pumpkin seed butter spread on an apple slice. For patients following a dairy-free version of this plan, a good alternative to dairy products like ricotta cheese is a “cheese” spread made from almonds, cashews, or other nuts. Many brands are widely available in health food stores or can be easily made at home. Another option is adding ground flaxseed meal, chia seed, or hemp seed to a smoothie, or sprinkling them on salad. Please note that 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. An average serving of chia or flax is higher in fiber and carbohydrates and lower in protein than the same amount of hemp seeds. While all three are similar in calories and fats, hemp seeds have less than half the omega-3 fats (1000 mg per tablespoon versus 2400 mg per tablespoon for flax).

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

### Fats & Oils

It is important to include good-quality fats every day to help keep inflammatory processes in balance. 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, phytonutrient-dense, unfiltered, extra-virgin olive oil should be used to dress salads and vegetables. MCT oil is another option. While butter and ghee (clarified butter) made from the milk of grass-fed cows is preferred, this may not be easily available; organic butter is a suitable alternative. A patient who has been advised to avoid dairy products may discuss the use of butter or ghee and other alternatives like coconut oil or coconut butter with a Functional Medicine practitioner. In general, for medium to high-heat cooking, coconut oil, MCT oil, and ghee are recommended because they are less likely to oxidize than other oils. Another advantage of coconut oil is that it is a precursor for beta-hydroxybutyrate, a super fuel for the brain and a critical component of the ketogenic diet approach. 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 imperative. 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, coconut butter, coconut oil (organic and virgin), coconut milk, ghee (clarified butter), and butter from the milk of grass-fed cows**

### Non-Starchy Vegetables

This category is of utmost importance for providing the necessary phytonutrients and antioxidants that nourish and protect the brain to support memory and cognition. There are more selections in this category than any other on the food plan, because non-starchy vegetables should account for the bulk of each meal. Patients are encouraged to try vegetables new to them and to aim for a minimum of 4–6 servings every day (ideally, 10–12 servings per 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/Swiss chard, spinach, sea vegetables, and the many green vegetables in the cruciferous family have been found to support mitochondria in the brain (see page 17 for a list of cruciferous vegetables). Fermented vegetables, such as sauerkraut and kimchi, are also recommended as they have been shown to support a healthy microbiome.

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. For example, try a red cabbage salad in the winter, when highly nutritious cabbage is abundant. Some other meal ideas include the following:

- Adding leftover broccoli, kale, or stir-fried vegetables to eggs in the morning
- Making a breakfast smoothie with berries, coconut milk, ice, and a large handful of spinach, kale, or other leafy greens
- Eating a salad with eggs, olive oil, avocado, or nuts for lunch
- Having a side salad with avocado or olive oil, cooked vegetables, and quality protein in the evening

Adding vegetables to breakfast is quite easy. Juices can also be made from a variety of vegetables. When selecting pre-made tomato or vegetable juices, patients should make sure to carefully read labels and choose only those that are low in sodium and free of added sugar.

In addition to the therapeutic vegetables listed, patients should try 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 [FAQs] 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, broccoli and all other cruciferous vegetables, seaweeds, asparagus, Swiss chard, daikon radish, beet greens, dandelion, okra, onion (garlic, scallion, leeks, shallot), fermented vegetables, sprouts***



### Starchy Vegetables

Starchy vegetables are included on this food plan in limited quantities, especially if a patient is leaning toward a more ketogenic approach. In general, it is preferred to limit starchy vegetables, as they tend to impact blood sugar (they are moderate to high on the glycemic index).

### Fruits

Fruits are packed with phytonutrients. Fruits with a 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, which have shown to increase levels of glutathione in the body. 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. Apples contain phytonutrients that suppress inflammation. They may be eaten raw or stewed with cinnamon for added benefit in lowering the blood sugar response. Fruit juices are not recommended, as they are dense sources of sugar and can increase blood sugar levels. Small amounts of dried fruit are acceptable occasionally, and dehydrated, non-sweetened fruit can be made at home. It's recommended to couple fruit with a little bit of protein, such as nuts or nut butter, to offset any blood sugar spikes. 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**

### Gluten-Free Grains

Gluten is a sticky, water-soluble family of proteins found in a few key grains (barley, rye, and wheat) and associated grain products (breads, cereals, crackers, pastas, etc.), which are omitted from the Mito Food Plan. Gluten is also commonly found in various sauces, dressings, seasonings, and many other foods. Proteins in gluten called gliadins can break down the microvilli (finger-like protrusions of intestinal cells) in the small intestine. This deterioration leads to a problem called leaky gut, which can cause (and also be caused by) food allergies, sensitivities, or intolerances, as well as other digestive disturbances or autoimmune conditions.

Gluten-free whole grains provide fiber and other phytonutrients that assist with blood sugar stability and are therefore generally considered healthy grain options. However, they are higher-glycemic foods, so servings of gluten-free grains are limited on this food plan. On ketogenic versions of this food plan, clients may omit fruit and starchy vegetables on days when they have gluten-free grains.

A Functional Medicine practitioner may advise patients to avoid this category entirely, consume only one serving (approximately 15 grams of carbohydrate) daily, or consume no more than 1–2 servings weekly.



### Beverages

Hydration helps rid the body of toxins, builds resilience to stress, enhances metabolism, and promotes satiety. It is important to drink plenty of clean, filtered water throughout the day. Individual recommendations for fluid intake will depend upon a number of factors, including body weight.

To determine an individual's hydration needs, divide their body weight (in pounds) in half. The resulting figure is the number of ounces of water to consume each day. For example, a person who weighs 128 pounds should consume at least 64 ounces (or eight, 8-ounce cups) of water each day ( $128 \div 2 = 64$ ).

In addition to filtered water, broths (vegetable, bone), meat stocks, and other beverages like fresh, raw, cold-pressed vegetable juices are also good liquid choices. Various teas are also allowed on the Mito Food Plan. Herbal teas like yerba mate, ginkgo biloba, black and white tea, as well as, coffee are other unsweetened beverages beneficial for brain health. 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.

The only therapeutic food in this category is green tea. Patients should consider adding at least two cups of green tea daily. For the best benefit from green tea, steep longer than regular tea, if possible.

#### **Therapeutic foods: Green tea**

### Spices and Condiments

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

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. However, total avoidance isn't always possible. Reading and understanding food labels can help you avoid unwanted additives. Additionally, additives can be avoided altogether when making healthier versions of condiments at home using common ingredients like herbs and spices.

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 are often medicinal as well.



## Therapeutic Foods for Healthy Mitochondrial Function

Now that the details of the Mito Food Plan are clear, it might be helpful to have more information on why certain foods are highlighted, as well as how to include them in food choices. Think of these therapeutic foods as fuel or “medicine” for the brain. While we have detailed 12 of the top choices below, there are many more therapeutic foods in each category highlighted on the food plan. Additionally, fermented foods such as sauerkraut and kimchi might also be considered therapeutic for the brain, as they provide fuel for a healthy microbiome.

### 1. Almonds

- Compelling data support eating a handful of nuts each day to reduce chronic disease risk. Research, such as the Nurses’ Health Study (a study of over 238,000 nurses that has been running since 1976), has revealed a link between consumption of almonds and a reduction in heart disease, important to a healthy brain. Almonds contain chemicals that are the building blocks of neurotransmitters, which are vital for memory and attention. They are a nutritious source of monounsaturated fats, calcium, magnesium, and potassium, and are high in phytonutrients and two important antioxidants, vitamin E and glutathione. Other nuts like walnuts are also brain-healthy because of their omega-3 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 almandine). 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.



### 2. 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 potent 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:** Fresh avocados do not begin to ripen until they are picked. Avoid purchasing avocados with bruises or soft spots. To ripen, place the avocado in a brown 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; mash on sprouted grain bread; or slice into a hummus/cherry tomato wrap. Additionally, avocado oil can be used for cooking or to dress salads or vegetables.





### 3. Buffalo/Beef, Grass-Fed

- Meat from grass-fed beef and buffalo is quite different from meat from conventionally raised animals. It contains more anti-inflammatory omega-3 fats, since the animals graze on grass and other wild plants. Meat from grass-fed beef and buffalo is also higher in vitamin E and antioxidants, and lower in saturated fat than meat from grain-fed animals. The ratio of omega-6 fats to omega-3 fats in the meat of grass-fed animals is lower than the ratio found in corn-fed beef. There is a prevalence of pro-inflammatory omega-6 fats in the standard American diet, with a typical ratio of more than 14:1 of omega-6 to omega-3. Remember to keep serving sizes of animal proteins small. Consider animal proteins to be a complement to a meal, rather than the main component.
- **Serving suggestions:** Ground, free-range buffalo and beef can be made into hamburgers or used in a favorite chili, meat loaf, or meat sauce recipe.



### 4. Blueberries (and all other 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. Strawberries have also been shown to provide similar improvements in memory and cognition. Berries are also beneficial brain food because they are relatively low in carbohydrates and have a low glycemic impact. Easily frozen without compromising their nutritional quality, organic berries also 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.



### 5. Broccoli (and all cruciferous vegetables)

- Cruciferous vegetables (also known as Brassicas) include broccoli, broccoli rabe, 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 confer health benefits, those in the broccoli family play a key role, as they are associated with reduced markers for degenerative damage in the nervous system, slowing and even reversing age-related declines in brain function and cognitive performance. Broccoli and other cruciferous vegetables contain sulforaphane, which helps protect the brain from excessive inflammation by helping ramp up the production of glutathione.



Broccoli contains a surprising amount of protein: 5 grams per 1 cup serving! Research has shown that cruciferous vegetables assist in detoxification, stimulate the immune system, slow down cognitive decline, and act as powerful antioxidants. They are also associated with a reduced risk of heart disease and many cancers. Long-term studies have correlated eating vegetables in the broccoli family with longevity.

- **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.

### 6. Coconut Oil (virgin, organic)

- Coconut oil and other coconut products have had a reputation as a “bad” saturated fat. But in tropical countries of the South Pacific, where rates of heart disease are very low, coconut oil has always been a primary source of fat. The medium-chain triglycerides (MCTs) in coconut oil can be helpful in raising “good” high-density lipoprotein (HDL) cholesterol while lowering the “bad” low-density lipoprotein (LDL) cholesterol. The antioxidants in coconut MCTs may also help to support the immune system. Additionally, coconuts are a rich source of a brain “superfuel” known as beta-hydroxybutyrate, one of the ketones that is beneficial on a ketogenic diet.

- **Serving suggestions:** Coconut oil should be both virgin (unrefined) and organic. Coconut oil can be used for cooking over higher heat, as it is very stable and doesn’t oxidize as most other fats and oils do. Use in stir-frying, add to steamed vegetables, stir into oatmeal, or use as a butter substitute to spread on sprouted grain bread or a baked sweet potato. Shredded coconut can be used to top salads and yogurt, and coconut water, which is high in electrolytes and minerals, can be used in smoothies and shakes. Coconut milk can be made at home by blending 1 cup of unsweetened, grated coconut with 4 cups of water in a high-speed blender.



### 7. Green Tea

- Green tea contains numerous phytochemicals that may help improve memory and cognition, powerful antioxidants that may decrease oxidative damage to the mitochondria in the brain. 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. The tannins and polyphenols of green tea help the body regulate insulin sensitivity while helping the brain maintain a steady supply of glucose, help to create a positive mood, and may prevent brain damage after strokes and other brain injuries by assisting the body’s DNA repair system.



- **Serving suggestions:** While green tea contains less caffeine than coffee, this may still be more caffeine than some can tolerate. If so, try disposing the first steeping of the tea and steep again using the same tea bag, or use decaffeinated green tea. If the taste of green tea is too bitter, try using cooled green tea as part of the liquid in a smoothie for breakfast. Brewed green tea can also be poured over cooked brown rice and topped with vegetables like seaweed or other greens. Try iced green tea in summer with some lemon juice topped with a mint leaf; substitute green tea for some of the liquid in soup near the end of its cooking; 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 (wheat-free soy sauce) for several days. Also try poaching cod or other fish in green tea (recipe provided in the Mito Food Plan - Weekly Planner and Recipes).

### 8. Olive oil (cold-pressed, unfiltered/cloudy, extra-virgin)

- Olive oil contains protective antioxidant phytonutrients called polyphenols that also confer anti-inflammatory benefits. Olive oil should be labeled “cold-pressed” and “extra-virgin.” It is green in color, has a stronger flavor, and is the result of the first crushing of the olives, the most nutrient-rich. Virgin olive oil comes from the second pressing, is lighter in color, and confers fewer benefits than extra-virgin olive oil (EVOO). When possible, purchase a less-processed, unfiltered (cloudy) olive oil. Store your olive oil in an airtight, dark glass container.
- **Serving suggestions:** Use EVOO only 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 veggie and salads.



### 9. 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. They are also a significant source of polyphenols that are important in brain health. 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.



### 10. Salmon (wild Alaskan)

- Wild Alaskan salmon is a significant source of DHA, the omega-3 fat that is one of the keys to a healthy brain. Studies have shown that those who eat more fish high in DHA exhibit better brain health. Wild salmon also contains a powerful carotenoid that gives salmon its distinctive color and acts as an antioxidant. The body's production of glutathione is dependent on the amino acid cysteine, which is supplied by salmon. Additionally, wild salmon is a good source of CoQ10, another potent antioxidant that participates in the production of cellular energy. Always avoid farm-raised salmon that are grown in pens and fed artificial coloring to create the orange color, as well as fishmeal containing chemicals associated with cancer and reproductive problems. Farm-raised salmon often contain PCBs, mercury, and other contaminants that may lead to chronic illness and inflammation.



Research studies support fish consumption for cardiovascular and brain health. Even a modest consumption of fish at 1–2 servings weekly, especially fish containing higher amounts of omega-3 fatty acids, may reduce the risk of coronary death. It is advisable to eat a variety of seafood and limit intake of mercury-containing fish (including larger fish such as tuna, halibut, and king mackerel) if a patient eats five or more servings a week. However, tuna should not be avoided altogether. Bonito, tuna, and sardines contain components that are protective for the heart, including certain proteins that help to reduce blood pressure. A healthy heart is consistent with a healthy brain.

- **Serving suggestions:** Wild Alaskan salmon can be added to stews and soups, or can be baked, slow-roasted, poached, and added to salads.

### 11. Seaweed

- Sea vegetables provide the raw materials for healthy mitochondrial function and nourishment for the nervous system. They have been found to have antibacterial, antioxidant, and immune system-supporting properties. Sea vegetables are an excellent source of minerals such as selenium and magnesium, containing more than 10 times the amount in other vegetables. They provide nourishment for the nervous system and its rejuvenation. 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. A longer soak renders the seaweed more digestible, and the soaking liquid can be used in soups. 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, making a nori roll stuffed with vegetables and sprouts, or using kelp instead of salt to season food.



## 12. Spinach

- Green leafy vegetables contain many antioxidants that help with improving memory and cognition. Spinach, in particular, is also high in carotenoids and flavonoids that provide anti-inflammatory and anti-cancer antioxidant protection.
- Serving suggestions:** Spinach should be washed well until no dirt remains in the water. It should not be soaked in water, as water-soluble nutrients will leach out of the greens. While boiling is not recommended for most vegetables, it is best to boil spinach uncovered for one minute to minimize loss of nutrients and flavor in order to reduce its oxalic acid content. Oxalic acid binds the calcium in spinach and reduces its availability to the body, and cooked spinach supplies more antioxidants than raw spinach. After boiling spinach for one minute, drain and press out the liquid in a strainer. Drizzle cooked spinach with garlic that has been sautéed in olive oil, add spinach to soups, or make a salad starring fresh baby spinach, pumpkin seeds, and strawberries.



The following table shows the healthful attributes of the different therapeutic foods.

### Attributes of the Therapeutic Foods

	Therapeutic Energy Foods	Protective Antioxidants	Anti-Inflammatory	Quality Dietary Fats	Fasting/Caloric Restriction	Reduced Carbs/Ketogenic	Low Glycemic	Low-Grain/Gluten-Free
Almonds	■	■	■	■		■	■	■
Avocado	■	■		■		■	■	■
Beef/buffalo, grass-fed	■			■		■	■	■
Blueberries	■	■			■	■		■
Broccoli	■	■	■		■	■	■	■
Coconut oil	■	■		■		■	■	■
Green tea	■	■			■	■	■	■
Olive oil, extra virgin	■	■	■	■		■	■	■
Pomegranate	■	■	■		■	■	■	■
Salmon, wild Alaskan	■	■	■	■		■	■	■
Seaweed	■	■	■		■	■	■	■
Spinach	■	■	■		■	■	■	■

A decline in mitochondrial function is associated with the normal aging process. This food plan can help patients optimize the functional integrity of mitochondria and prevent associated conditions such as cognitive decline. The first stage of a program for brain protection, pain reduction, and increased energy involves a general reduction of daily calories. The second stage is a further reduction of calories on occasion (intermittent fasting), or a 12–16 hour fast from dinner to breakfast. A Functional Medicine practitioner will work with patients to determine the type of practice, frequency, and duration that is most appropriate for specific health goals. Topping this all off is a focus on eating nutrient-dense food at all times to nourish aging mitochondria. This comprehensive guide is designed to help patients understand the importance of protecting the mitochondria in order to slow down the aging process and avoid neurodegenerative diseases.

**The Mito Food Plan can guide you to use food as medicine for these three areas of concern:**

### 1. Brain Protection

Brain aging is associated with an overload of inflammatory processes in the brain, resulting in higher levels of oxidative stress. Unless free radicals are deactivated by the antioxidants abundant in phytonutrient-rich colorful plant foods, the resulting oxidative stress accelerates brain aging. Oxidative stress may also turn on genes for insulin resistance and inflammation, further increasing your risk for diabetes, cardiovascular disease, and perhaps Alzheimer's disease (type 3 diabetes). Eating to support mitochondrial function is recommended for those who:

- Have a family history of neurological disease, such as Parkinson's disease, Alzheimer's disease, MS, and ALS (Lou Gehrig's disease)
- Are in the early stages of neurological disease
- Wish to use preventative measures to protect their brain as they age

In the past, scientists believed that loss of brain cells was a normal aspect of aging. That belief has now been challenged by new research showing that decreased exposure to inflammatory substances (including those in the environment or food) reduces brain cell death and improves cognitive function. For those with a family history and those who are in the early stages of neurological disease, a more therapeutic ketogenic protocol may be recommended. Those who are looking to take preventative measures to protect their brain as they age are encouraged to follow the traditional Mito Food Plan.

### 2. Pain Reduction

Mitochondrial dysfunction has been associated with chronic pain. The same oxidative stress that accelerates brain aging also results in skeletal fatigue, causing tissue demise. From a structural perspective, loss of muscle mass, also known as sarcopenia, is an indication of inflammation and metabolic disease. Sarcopenia is often the result of poor dietary habits. This is why inadequate mitochondrial function has been implicated in several neurological disorders that play a role in nerve pain. The pain that accompanies inflammation will in turn break down connective tissue.

Protecting and enhancing mitochondrial function by making specific food choices is one essential way to manage chronic pain. Clearly, food doesn't have the immediate benefit that pain medications may provide, but often it is



what a patient is not eating, such as phytonutrient-rich vegetables, that will reduce the triggers of inflammation. Sugar is a common triggering agent for inflammation and increased pain levels. Remember that added sugar is a hidden ingredient in many foods (soups, dressings, condiments, breads, crackers, etc.). Consistent healthy food choices can improve the overall status of foundational nutrition, leading to reduced pain. Anti-inflammatory foods and herbs that relieve pain also reduce the risk of dementia.

Typical cooking methods, such as frying, broiling, and grilling are another factor that needs to be considered. Cooking at high heat, which increases the formation of AGEs (see FAQ's on cooking below), combined with poor blood sugar control may lead to stiffening of the connective tissue and less flexibility, increasing the risk for degenerative joint disease and pain.

There are key suggestions that support mitochondrial health and reduce the experience of pain due to inflammation. Consuming the fatty acids EPA and DHA found in cold-water fish, using antioxidant spices, and avoiding gluten and dairy may have a powerful anti-inflammatory effect. People with low back pain also have low vitamin D levels. Effective musculoskeletal support is also provided by foods high in B vitamins, vitamin D, and other minerals such as calcium, magnesium, and zinc. Magnesium and potassium work together to regulate healthy vascular function and improve muscle pain. Quality proteins along with proper digestion complete the picture.

### 3. Feeling Drained and Fatigued

Mitochondria play an essential role in fatigue as they convert nutrients into energy. Relentless or overwhelming fatigue, i.e., feeling drained, is a direct result of inadequate or impaired mitochondrial function. This is often the consequence of poor glucose management and elevated insulin caused by eating mostly high-glycemic, processed foods. Foods that create a high glycemic impact result can stimulate inflammation, leading to lower cellular energy production. If a person has insulin resistance, those high-glycemic foods can also increase both insulin and glucose in the blood stream. This means more insulin-induced inflammation and less fuel available in the tissue, resulting in muscle loss and increased body fat. And vice versa: the more belly fat a person has, the more inflamed and insulin resistant they can become.

Hence, ongoing exposure to sugar or high-glycemic foods continues to drive the fatigue state forward. Chronic stress levels, causing release of adrenaline and cortisol over extended periods of time, eventually contribute to the death of your mitochondria. The aging body will have more difficulty disposing of these damaging stress hormones. Eating low-glycemic foods, following the Mito Food Plan, maintaining adequate sleeping patterns, being active, and reducing the negative impacts of stress allow for lower glucose and insulin levels, which in turn reduce dysregulated inflammation and tissue demise.



## Strategies for Optimizing Mitochondria

There are additional nutritional considerations in the case of fatigue and mitochondrial decline. Coenzyme Q10 is a mitochondrial biomarker: reduced levels have been found to have a strong correlation with fatigue. CoQ10 is essential to the energy cycle that occurs within the inner membrane of the mitochondria. The body makes some CoQ10, but for many suffering from fatigue syndromes, this isn't adequate enough to support tissue health. Functional Medicine practitioners may advise supplementation if food sources do not supply adequate amounts of this important nutrient. Low levels of vitamin B12 and folate also play a role in fatigue; dietary sources include wild sardines, tuna, salmon, clams, lentils, and leafy greens.

Anemia (low blood iron levels) is also often overlooked as a mitochondrial connection to fatigue. Mitochondria need iron for the chain reaction that creates energy in the form of ATP. Anemia is not unusual in those who are menstruating, those with celiac disease, and individuals following a vegetarian or vegan diet; feeling drained is a common complaint. Much of the iron in the body is found in the blood. When blood loss occurs, as happens during menstruation, it is important for iron intake and absorption to replace the iron lost during this process. Furthermore, the majority of iron absorption takes place in the small intestine, and when individuals with celiac disease eat gluten, the body's immune response causes inflammation and damage to the small intestine. This damage often results in reduced absorption ability. For individuals avoiding gluten, it is important to note that wheat flour is typically fortified with iron, whereas many gluten-free substitutes are iron-poor, high-glycemic grains. Additionally, animal food sources are some of the richest and more easily-absorbed sources of iron, therefore, those following vegan or vegetarian diets may need to pay special attention to ensure adequate intake.

### Other Lifestyle Factors for Optimizing Mitochondria

It is important to remember that dietary interventions are just one part of the overall picture of optimizing mitochondrial function. Other lifestyle considerations like exercise, movement, stress and sleep also play a role in mitochondrial health. Exercise and movement has been shown to improve cellular energy production. Both aerobic and anaerobic exercise should be performed on a regular basis. Exercise is critical for brain health in general and has been shown to reduce the risk for Alzheimer's disease. Exercise also helps to relieve stress, which contributes to inflammation and mitochondrial decline, by burning up excess stress hormones, while also improving your mood. Appropriate sleep is also important for mitochondrial health. Animal studies have shown that getting adequate sleep helps to reduce mitochondrial stress. Without sufficient sleep, there is an increased risk of neurodegenerative changes within the brain.





## Personalizing the Mito Food Plan for Success

This dietary approach allows for further personalization depending on a patient's therapeutic goals. A Functional Medicine practitioner can help a patient tailor this food plan to meet their individual healthcare needs. Some examples of modifications are:

- Avoiding, as much as possible, any foods that are known to trigger adverse food reactions, such as inflammation (e.g., dairy, grains, eggs, etc.)
- Avoiding certain high-carbohydrate foods like gluten-free grains, or limiting consumption to once or twice per week
- Setting caloric goals, which will help determine the appropriate number of food servings from each category (note that allowed carbohydrate servings should be spread throughout the day)
- Suggesting periodic intermittent fasting in the form of extended time gaps between the evening meal and morning breakfast, or by reducing intake to 600 calories for one or two days per week (See the FAQs for suggestions on calorie reduction)
- Modifying meal timing and the inclusion/exclusion of snacks
- Implementing a more ketogenic food plan, as described below, which can help improve mitochondrial and neurologic function
- Including or excluding additional foods based on an individual's needs, genetics, cultural eating preferences, or therapeutic goals

### Meal Timing and Ketogenic Diets

An important caveat must be given in regard to popular dietary programs for those with insulin resistance that suggest eating frequent small meals to keep blood sugar stable and burn more fat. Some people do well with four to five meals and snacks throughout the day, showing improvement in laboratory markers and symptoms.

However, those with higher risk markers for metabolic syndrome (increased waistlines and belly fat, elevated triglycerides, low HDL levels, increased blood pressure, and rising fasting blood sugar levels) may see more

improvement if they eat less frequently, especially if they eliminate snacks. Some feel better overall if they consume only two meals per day, about 12 hours apart, resulting in insulin being released less often during the course of the day. Meal frequency becomes less important when blood sugar is stable, and hunger occurs less often.



## Personalizing the Mito Food Plan for Success

Eating foods that do not cause peaks and valleys in blood sugar and insulin levels helps the body feel fuller for a longer period of time. This also keeps inflammation and cravings down while protecting important tissues. A ketogenic approach uses fewer carbohydrates in general, with less blood sugar spikes that lead to hunger. The resulting lack of hunger and cravings makes it easier to go for longer periods without even thinking about food. It is critical, however, to be sure to ingest high-quality vegetables, fruits, and proteins.

### **How many carbohydrates should be consumed while following a ketogenic food plan?**

There are various opinions regarding this. The most rigid approach that seems to guarantee ketosis allows no more than 20 grams of total carbohydrate per day. This is often prescribed for patients who are experiencing seizure disorders or suggested for those initiating a weight loss program using a strict ketogenic diet. Other ketogenic approaches allow up to 40 or 50 grams per day, supporting a milder ketogenic state.

If the therapeutic goal includes body fat loss, improved energy levels, enhanced muscle strength, or enhanced neurological function or brain protection, a ketogenic focus may be clinically indicated. A Functional Medicine practitioner may choose a ketogenic approach for a patient, depending on how rigidly compliant the patient might need to be. For example, a practitioner may choose a less restrictive approach for a healthy person who desires to live long and stay healthy into old age while maintaining good memory and cognition. The patient's recommended carbohydrate intake may be as much as 60–80 grams per day. But, when there are signs of compromised brain function, a strict approach of ingesting fewer carbohydrates (about 40 grams per day) might be indicated. A Functional Medicine practitioner can guide patients in making these decisions.

One pitfall of a more restrictive ketogenic diet is the impossibility of ingesting the recommended 8–12 servings of phytonutrient-rich vegetables and fruits needed for a brain-healthy diet. One approach, somewhat less restrictive, allows no grains and limited amounts of the following higher-carbohydrate foods: dairy foods (milk and kefir from cows and goats, as well as unsweetened yogurts made from cow's milk, coconut and soy), legumes, fruit, and starchy vegetables. Some Functional Medicine practitioners might suggest completely eliminating dairy from the diet because of the potential for formation of antibodies that may cause inflammation. Overall carbohydrate amounts are limited to 20–30 grams for males and 15–20 grams for females. Ketosis can still be achieved, although perhaps to a milder degree; this approach still shows increased mitochondrial efficiency and improved brain function (See FAQs for more on testing for ketosis). Such a mild ketogenic approach with a focus on healthy fats, adequate protein, and a colorful amount of phytonutrient-rich foods is the foundation of the Mito Food Plan.



### Calorie Reduction and Enhanced Health

We know today that tracking “calories in and calories burned” doesn’t necessarily equate to a healthy body type or optimal health. Scientific findings support the concept of *quality* foods distributed throughout the day. Therefore, the Mito Food Plan offers two options to control carbohydrates while providing adequate protein and plenty of healthy fats. This food plan can enable a person to reduce calories as the scientific literature recommends and still be satisfied with flavorful foods that provide dietary fiber from colorful plant sources, moderate protein, and healthy fats that provide adequate fuel for the mitochondria and healthy brain function.



While fiber provides no additional calories, high-fiber foods have enormous health-enhancing effects on the microbiome (also called gut flora). The early part of the 21st century has brought to light information regarding the importance of beneficial bacteria as it relates to the neural communication pathways in the brain. Probiotic/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, which produce neurotransmitters responsible for mood and neurological function. The habitual consumption of highly-processed foods is associated with a lack of diversity in microbiome, which is implicated in the risk for Parkinson’s disease, ALS, and Alzheimer’s disease. Imbalances in the microbiome may also be related to the inflammation correlated with the development of Alzheimer’s disease. These are compelling reasons to pay attention to the health of the microbiome.

Research also suggests that calorie restriction will slow the aging process. As a result, some practitioners have begun urging their patients to lower caloric intake to 20–30% below what their basal metabolic rate requires to maintain a steady weight. Calorie restriction also activates an important metabolic process called the Nrf2 pathway. This process increases production of antioxidants and detoxification enzymes and decreases the formation of toxic free radicals. For example, stimulating the Nrf2 pathway enhances the body’s ability to make the important antioxidant called glutathione, which reduces damage to tissue and slows down the aging process.

So what does a high-quality versus high-quantity diet look like? If calories are a measurement of financial currency, a person should strive to get a bigger bang for their buck through dietary choices. The goal is to spend less time and energy metabolizing food, while getting a more protective and beneficial response from the foods eaten. In other words, the highest level of nutrition content for the lowest amount of calories is desired. For example, if a person typically eats about 1500 calories, they might try eating 1000–1200 calories per day, occasionally reducing calories even more for a modified fast. This may seem very daunting at first, so picture a typical plate at dinner and eat about a quarter less, focusing on eliminating the higher-calorie foods. It is best not to limit vegetables; instead, limit all other foods. It may be necessary to start gradually and decrease calories slowly. This is easiest to do when

## Personalizing the Mito Food Plan for Success

not socializing. This approach may be most successful if attempted alone or with family first. Patients will notice how pleasant it is to not feel bloated or full long after dinner. Reducing calories to 600 a day once or twice a week is an alternative way to ‘fast’ or reduce calories intermittently (See the FAQs for more suggestions on calorie reduction).

To support the concept of reducing calories by 20–30%, it may be helpful to understand the following and to use calories as a general guide in choosing quality food portions from the Mito Food Plan list:

- Assuming moderate activity, males generally consume 2000 to 2400 calories per day, so a 20–30% reduction of calories would result in a range of approximately 1400–1800 calories per day.
- Assuming moderate activity, females generally consume 1400–1800 calories per day, so a 20–30% reduction of calories would result in a range of approximately 1000–1400 calories per day.
- These generalities are only intended to be a place to start in the journey of choosing healthy foods. Please note that calorie and macronutrient needs are dependent on an individual’s size, activity level, and gender, so working with a qualified Functional Medicine practitioner is highly recommended for optimal results.

A Functional Medicine practitioner will help patients determine how many servings of food from each category to eat each day to promote healthy aging through a mildly ketogenic distribution of calories.



## Frequently Asked Questions

### How much of each food category should I be eating?

The Mito Food Plan is often implemented with a macronutrient distribution of 20% protein, 60% fat, and 20% carbohydrates. The food plan may also be recommended with a 30% protein, 30% fat, and 40% carbohydrate distribution for highly active or metabolically inflexible individuals. Functional Medicine practitioners may also adjust the macronutrient distribution (e.g., 15% protein, 80% fat, 5% carbohydrates) when a fully ketogenic approach is warranted. It is important that clients following more ketogenic versions of this plan work with a trained Functional Medicine practitioner (doctor or nutritionist) to determine how best to customize the macronutrient and food group distributions to meet specific health goals.

### 20P/60F/20C Macronutrient Distribution by Caloric Ranges (For Use with the Mito Food Plan)

Calories	600*	1000–1200	1200–1400	1400–1800	1800–2200	2200–2500
Calorie Guidelines for Females	Fasting	Reduced	Mildly Reduced	Standard	Active	
Calorie Guidelines for Males	Fasting	Reduced	Reduced	Mildly Reduced	Standard	Active
<b>Proteins</b>	6	6	6	6-9	9-10	10
<b>Legumes<sup>^</sup></b> <b>Grains<sup>^</sup></b>	0	0	0	1	1	1-2
<b>Dairy/Alternatives<sup>†</sup></b>	0	0	1	1	1	1-2
<b>Nuts &amp; Seeds</b>	0	3-4	4-5	5-6	6-8	8-12
<b>Fats &amp; Oils</b>	4	8-10	10-11	11-13	13-16	16-18
<b>Vegetables, non-starchy</b>	4	6-7	7-8	8-9	9-10	10-12
<b>Vegetables, starchy</b> <b>Fruit</b>	0	1	1	1	1-2	2

\* The 600 calorie distribution is 32P/55F/13C. This very low-calorie level is recommended only for occasional intermittent fasting days.

† When consuming dairy alternatives in the place of dairy products, substitute 2 dairy alternative servings for every 1 serving of dairy.

^ When following a lower-carbohydrate or more ketogenic version, no more than 1-2 servings of grains should be consumed per week, at all calorie ranges. On days when a grain is consumed, servings of legumes should be omitted.

### Can you explain more about mitochondria?

Mitochondria are tiny power plants in every cell of the body. They convert food and oxygen into cellular energy called adenosine triphosphate, or ATP. 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.

The body tries to defend itself against free radicals by producing antioxidants to neutralize their effects. In addition to the antioxidants like glutathione, which the body is able to produce, a plethora of antioxidants comes from phytonutrients in colorful vegetables and fruits.

### Can you summarize the high-antioxidant foods?

Many foods, particularly vegetables and fruits, contain an abundance of phytonutrients which act as antioxidants to 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. These foods 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.



### Can you explain more about the benefits of intermittent fasting and calorie restriction?

Eating fewer calories increases the protein BDNF, which 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.

A 12-16 hour fast from dinner to breakfast (or lunch) is another way to increase the BDNF and Nrf2 pathway. The trick for success is to be sure to eat enough protein and veggies at dinner, to avoid hunger later in the evening and decrease the desire to snack. Other methods of fasting include reducing calories to 600 per day once or twice a week, or consuming 20–30% fewer calories than an individual’s baseline metabolic rate, or skipping snacks, or spreading out meals from 5 to 12 hours. Some experts even suggest fasting for 24-hours one to two times a month, drinking only water. Any type of fasting or caloric restriction should only be done under the guidance of an experienced medical practitioner.

Fasting is not advised for some, particularly those with metabolic conditions (e.g. metabolic syndrome, diabetes). It is always wise to talk with a Functional Medicine practitioner before attempting a fast.

### How do I calculate a 600-calorie meal plan?

One easy way to keep calories to 600 calories per day is to use one of the quality vegetarian-based protein powders or medical foods available today. Choose unsweetened protein powders made from quality pea proteins, rice proteins, or combinations of pea, rice, chia, and hemp. Most provide a total of 130 to 160 calories and 15 to 25 grams of protein per two-scoop serving when added to unsweetened almond or coconut milk. This can provide a sustaining and balanced food replacement throughout the day. Another way is to use modest amounts of food as follows:

- 600-calorie “day at a glance” focusing on a protein powder: use a cold milk alternative and shake well with powder in a shaker cup. Aim for four servings approximately 4 to 5 hours apart for satiety.
  - **Example:** Two scoops unsweetened protein powder added to 1 cup unsweetened almond or coconut milk (40 to 50 calories) = 130 to 160 total calories. Repeat this three more times throughout the day. If desired, you may use a blender and add ice and a handful of greens to each smoothie.
- 600-calorie “day at a glance” focusing on a modest amount of quality protein, small amounts of healthy fats, and three to four servings of non-starchy vegetables:
  - **Breakfast:** One egg scrambled with ½ cup spinach sautéed in a small amount of chicken broth, topped with ¼ of whole avocado, pinch of sea salt, and pepper.
  - **Lunch:** About 2 ounces of cooked turkey or chicken over 2 cups of mixed baby greens, juice of ½ lemon, and 1 tsp olive oil drizzled over greens and chicken, with pinch of sea salt and cracked pepper.
  - **Dinner:** About 3 ounces poached or broiled salmon and ½ cup steamed broccoli drizzled with ½ tsp olive oil, juice of ½ lemon or lime, pinch of sea salt, and fresh herbs of choice.



### How else can I reduce calories by 20-30% as suggested?

There are some simple ways to implement calorie reduction into your regular eating pattern. First, try to slow down and notice the sensation of fullness in your body. Many people eat so quickly that their brain doesn't have time to register a sense of fullness and many calories are already eaten. Here are some other strategies:

- Instead of making four, 4-ounce burgers with one pound of ground meat, try making five, 3 ounce burgers. The difference will be hardly noticeable, but calories will be reduced by 25%.
- For breakfast, instead of having three eggs and two slices of toast, try having two eggs and no toast, or just one slice for starters. Add a side of veggies and assess your hunger.
- Instead of having a sandwich at lunch, try half a sandwich and fill up the rest of the plate with veggies, which are the healthiest brain food. Better yet, avoid the bread altogether and have a large salad with greens, brightly-colored veggies, protein, lemon and a healthy oil for dressing. This meal will be much more satisfying than the sandwich, resulting in feeling fuller for a longer period of time.
- Another idea is to reduce a 6-ounce portion of protein at lunch or dinner to 4 ounces.

## Frequently Asked Questions

Generally, if you wait about 20 minutes after eating, you will no longer feel hungry. In general, eating fewer calories, no matter how it is done, will benefit the brain and its mitochondria.

### 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.

### What would a typical day’s meals look like if I limit carbohydrates to 60 grams per day?

The Weekly Planner and Recipes guide will illustrate this, but here is a sample menu for a day. It is not as hard as one might think. Just focus on brain-healthy proteins and veggies!

- **Breakfast:** Two-egg omelet with 1 cup spinach cooked in coconut oil, plus a small handful of pumpkin seeds or walnuts and ½ cup blueberries
- **Lunch:** Organic, grass-fed beef, buffalo, or turkey burger with 2 cups of salad greens (or a mixture of kale and greens) plus 2 cups of raw veggies, tossed with olive oil and vinegar, and a roasted seaweed snack
- **Dinner:** Wild salmon with 1 cup steamed broccoli and salad of 1½ cups greens, ½ cup cherry tomatoes, ½ cup thinly sliced red cabbage, handful of almonds, and ½ avocado, tossed with olive oil and balsamic vinegar

### How will I know if I am in mild ketosis?

It typically takes at least 72 hours to enter ketosis, therefore testing should be started after day three of following a ketogenic diet. Urinary testing strips for the presence of ketones is the most cost-effective and easiest approach, however, this type of testing is influenced by hydration and 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.





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

The Mito Food Plan can be used for guidance, but needs to be directed by a trained Functional Medicine 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:

- **Keep carbohydrates low:** This is very individualized and based on each person and their activity level. The range for adults can be from 20 grams for a less active person to 80 grams per day for an athlete.
- **Eat healthy fats:** These can make up as much as 60–80% of the diet. Focus on butter from grass-fed cows, coconut oil, MCT oil, nuts, olives and olive oil, avocados and avocado oil, and full-fat organic dairy if suggested by the Functional Medicine practitioner.
- **Moderate amounts of protein from pesticide- and toxin-free sources:** Depending on a person's size and activity level, average ranges can be from 70 to 80 grams per day on days that don't involve exercise, and up to 120 grams on days that resistance exercise is performed.
- **Test for ketones often:** As it takes 3 days on a ketogenic diet to achieve ketosis, blood or urine testing should be started after 3 days. 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, adjust carbohydrates by increasing exercise or decreasing starchy vegetables or fruits by 7–15 grams (½ to 1 serving).
- **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?

The importance of pesticide- and toxin-free food from local, free-range, grass-fed, and organic sources cannot be stressed enough. Such foods are extremely important for brain 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. Research has shown that organically grown fruits and vegetables retain greater nutritional value than foods grown with pesticides and other chemicals. The food plan also stresses avoiding highly processed and junk foods and refined sugars. **See the Environmental Working Group website ([www.ewg.org](http://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”).** Be aware when purchasing foods from foreign countries, such as Mexico or China; these countries have different laws regarding organic foods. To avoid confusion, buy locally grown food as much as possible.



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

During cooking, tasty aromatic compounds form, but so do inflammatory substances called advanced-glycation end products (AGEs) that can actually inhibit mitochondrial function, increasing oxidative stress. Typically, the higher the heat and the browner the food, the greater the amount of potential inflammation from the meal. AGEs are primarily found in meats cooked at high temperatures, highly processed foods, and full-fat cheeses. A healthier option is to cook with moisture over low heat, such as cooking in a crockpot or slow cooker, poaching, steaming, and stewing. Food that is grilled, charred, broiled, seared, or crisped should be eaten with fresh cooked greens (spinach, kale, chard, arugula, etc.) or a salad. Pairing the browned foods with fresh vegetables will help decrease the inflammation that may result. Adding certain spices (see next page for more information) to food cooked over high heat may reduce the formation of other damaging molecules, such as heterocyclic amines (HCAs), as the chlorophyll in greens binds with HCAs. While it is not possible to totally avoid AGEs, reducing your exposure whenever feasible will help reduce the total load. Try some of the recipes in the Mito Food Plan Weekly Planner and Recipes guide using healthier cooking methods to reduce formation of 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.

Casein, a protein in cow's milk has cross-reactivity to gluten, a protein in wheat. If a person is sensitive to gluten, they may need to also avoid dairy to prevent negative symptoms and potential inflammation. Talk to your Functional Medicine practitioner if you have questions or concerns.

### Why are herbs and spices important in this food plan?

Spices are medicinal, concentrated herbs that 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 is vital to brain health, as it has the potential to activate genes that produce detoxification enzymes and thus ramp up the production of glutathione. Turmeric has been shown to reduce buildup of the beta-amyloid protein that is found in high amounts in the brains of those with dementia.

Using a variety of herbs and spices will help individuals develop and experience new tastes. It is recommended that daily meals be dressed up with a spectrum of spices, as they will make food taste more interesting and increase the medicinal impact. Some studies even suggest that spices can reduce some of the oxidative damage and formation of cancer-causing substances that occur with cooking. Try incorporating rosemary into hamburger meat before grilling, or adding turmeric to a vegetable stir-fry. Combining black pepper with turmeric increases its availability in cooked dishes.



## Frequently Asked Questions

This combination can also be sprinkled on eggs. Experiment with its flavor on different foods and sauces. Also, try sprinkling cinnamon on warmed almond or coconut milk drinks to help the body better respond to high insulin levels, which can damage the brain over time.

Here's good news for the chocolate lovers: cocoa, actually considered a spice, may also enhance healthy brain function by increasing cerebral blood flow to gray matter in the brain and improving memory and cognition! Cocoa's high antioxidant levels may also help protect DNA and support healthy cardiovascular function. Dark chocolate with a 70% or higher percentage of cocoa is recommended in order to avoid added sugar and milk.

### Suggestions for buying herbs and spices?

- When buying spices in bulk, store them in airtight glass or tin containers. Buy only what will be used within 6 to 12 months. Whole spices will keep for a longer time, up to 2 to 3 years.
- Purchase herbs and spices in all forms: fresh, dried, whole, cracked, coarsely ground, and finely ground.
- Store herbs and spices in a cool, dark place. Heat, light, and moisture will accelerate the loss of flavor. High temperatures can cause spices to cake or harden and change or lose color.
- Keep spice containers closed and away from the stove.
- To test for freshness, rub between fingers and sniff to check for aroma.

### I dislike the taste of green tea. What else can I drink on the Mito Food Plan?

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. If these don't work, then try ginkgo biloba tea, which provides similar benefits as green tea. Herbal teas, black tea, and coffee also have some antioxidant benefits. Those who are sensitive to caffeine should 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.

### What about drinking alcohol?

Alcohol, especially in the context of neurological conditions and brain health is a complex topic. Alcohol can improve blood flow to the brain by lowering blood pressure. Red wine in particular contains brain-friendly antioxidants and resveratrol, a phytonutrient that helps to relax blood vessels. However, alcohol is also a known neurotoxin and often contains sugar, which may not be good for some individuals wanting to improve brain health.



## Frequently Asked Questions

There is no consensus regarding the impact of alcohol on the health of the aging brain, particularly as it relates to Alzheimer's disease. Out of 19 studies on alcohol and Alzheimer's disease, 7 reported a decreased risk of the disease; 3 found an increased risk of the disease; and 9 reported no impact. One study suggested that light to moderate wine intake is associated with a larger brain and may have potential benefits for brain aging. For a generally healthy person, one glass of red wine may be perfectly acceptable at meals, even when leaning toward a more ketogenic diet. Alternatively, one who wishes to avoid alcohol may incorporate foods that are high in resveratrol, such as red grapes, dark chocolate, peanuts, and small amounts of organic, purple grape juice. A Functional Medicine practitioner who knows a client's health history can make a determination as to whether moderate or occasional use of alcohol would be appropriate and consistent with health goals.

### **I don't see any sweeteners on the Mito Food Plan. What can I use on the plan as a sweetener?**

It is essential to refrain from all added sweeteners to the best of one's ability when following this food plan. The damaging effects from inflammation that sugar can have on the blood vessels and brain are long-lasting. In addition, high-intensity sweeteners can lead to blood sugar imbalances, increased calories and subsequent 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 encourage eating processed foods. Fresh fruits and vegetables are safe foods, 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 actually act as excitotoxins in the brain and promote free radical formation. These types of sweeteners include NutraSweet® (aspartame), Splenda® (sucralose), acesulfame-K (Ace K, Sweet One®, Sunett®), and Sweet N' Low® (saccharin, sodium cyclamate).

### **What condiments are acceptable?**

Many condiments like teriyaki sauce, ketchup, barbecue sauce, and glazes almost always contain added sugar. It is recommended to avoid them entirely or make healthy, homemade versions. Adding more spices and fresh herbs in food preparation will create less need for unhealthy condiments. Gluten-free tamari or soy sauce, coconut aminos, Tabasco sauce, fish sauce, and most mustards are acceptable. Remember to check labels, as some brands have added sugars.

## Frequently Asked Questions

### 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 level for at least 150 minutes (2½ hours) a week, including weight training at least twice per week, is strongly recommended. Compelling research has indicated that exercise helps to oxygenate the brain and particularly affects 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.



### 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 plausible causes of these symptoms including transitioning into full ketosis too quickly, withdraw 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 critical 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 you Functional Medicine practitioner. There are lots of strategies that can increase the quantity or improve the quality of your sleep.

## In Summary

In this comprehensive guide, we have presented the most up-to-date information and research about mitochondrial health. Food IS medicine; it is important to appreciate what food does for us besides fill our stomachs. Food has the potential to support and heal the body, primarily when it is fresh, whole food. Maintaining the integrity of the mitochondria is pivotal to healthy aging. The importance of antioxidants and anti-inflammatory foods and the strategic position of fresh fruits and vegetables in this food plan cannot be overstated. By caring for the mitochondria, you also have the power to take care of your brain. The importance of keeping blood sugar stable to avoid the development of Alzheimer's disease, otherwise known as type 3 diabetes, should be a focus. The therapeutic use of herbs and spices is another important concept. Eating healthy foods that are not "low fat" may be a new concept. Avoiding gluten-containing grains may be difficult, but also critically important for many. Lastly, avoiding cooking over high heat whenever possible may be more important than previously realized. These concepts, put all together in one program, will start patients on the road to aging gracefully and more slowly.

***"...plan your foods like your pension, feel good about eating for the future and never skimp even when other pressures are brought to bear. The health of your mitochondria and the future you, will thank yourself for it!"***

*—Dr. Michael Ash*



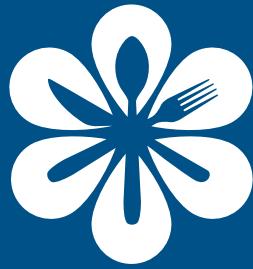
Changing food habits can be a complex and difficult process. To help both patients and practitioners, we have included recipes, menus, and other information to make this a “do-able” process. Look over this information carefully. If any questions about the food plan arise, please contact a Functional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