Immune
FOUNDATIONS

PATIENT HANDBOOK

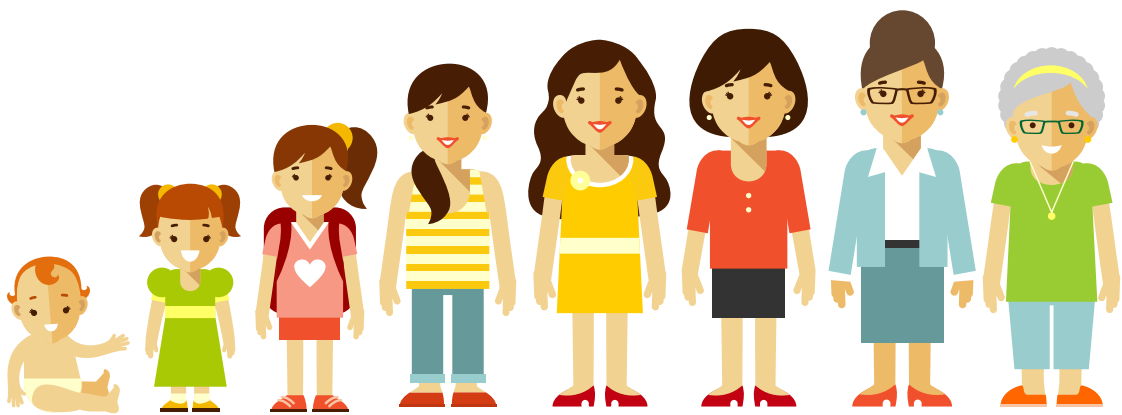
When was the last time you felt healthy?

Welcome to the Immune Foundations Patient Handbook. This guide was designed to help you better understand the factors affecting the health of your immune system, and in turn, your overall health and wellness. Chronic immune dysfunction affects a growing number of individuals each year; therefore, understanding the underlying factors these diseases share will reveal a manageable plan to improve symptoms and optimize your health.

The development of our immune system begins before we are born. The health of our mother, her diet and lifestyle habits, and infections during pregnancy can have dramatic effects on our immune system development. Starting the day we are born, the immune system must protect us from the myriad of viruses, bacteria and harmful substances in our environment. As we grow, the immune system becomes adept at identifying and responding to invasions by microbes or toxins.

However, the immune system can lose its swift and efficient abilities for a number of reasons. Poor diet, lack of exercise, poor digestion, chronic stress or impaired ability to detoxify harmful substances can all have significant consequences. Chronic immune dysfunction can show in a variety of ways, such as uncontrolled inflammation, increased susceptibility to colds and flus, allergies, and autoimmunity. Although these diseases and symptoms can vary dramatically, the major underlying factors of disease are surprisingly similar.

As the immune system adapts and changes over time, it is helpful to evaluate factors of diet, lifestyle, gastrointestinal health, stress and toxins to uncover the underlying causes for immune dysfunction. By understanding the factors contributing to immune dysfunction, the steps to recovering immune function and optimal health become clear. Working closely with your health care provider, you will develop a proactive plan to optimize immune defenses and build the reserves needed to support health.



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Supporting the Immune System with Lifestyle Medicine

Lifestyle medicine works to understand the specific causes of dysfunction in a given individual, then uses simple steps to recuperate and thrive. With your health care provider, you will work to uncover the underlying causes of your symptoms and develop a plan to address the major factors contributing to disease. Many people experience marked improvements in longstanding symptoms and disease with simple changes to diet and lifestyle, gastrointestinal health, stress management, and environmental exposures. Your health care provider will help you decide the areas that are most important for your unique situation. Remember, while making changes in one area will produce positive effects, intervening on multiple levels is the best way to reach your peak immune potential.

Diet & Lifestyle

Gastrointestinal Health

Toxins & Environment

Stress Management

Micronutrients and Immune Response

Consuming adequate micronutrients is critical to immune health. Micronutrients supply fuel to immune cells and help repair damage from adversarial encounters. Deficiencies in micronutrients can slow the body's healing capacity, infection fighting capabilities, and increase free radical activity that contributes to aging and inflammation. In addition to a nutrient-dense diet, taking a high-quality multivitamin is recommended to ensure adequate intake each day.

Micronutrients and Immune Function

Micronutrient	Possible Signs of Insufficiency	Role in Immune Enhancement	Food Sources
Vitamin C	• Bleeding gums • Slow wound healing • Fatigue • Easily bruised skin • Recurrent infections or colds	• Reduces the frequency and duration of a cold • Enhances white blood cell function • Increases interferon, a chemical that fights viral infections and cancer • Acts as natural anti-histamine	• Hibiscus tea • Cauliflower • Red and green peppers • Broccoli • Brussels sprouts • Mustard greens
Zinc	• Slow wound healing • Reduced appetite • Poor circulation (cold hands and feet) • Skin disorders (acne or psoriasis) • Recurrent infections	• Activates thymic hormones and white blood cells • Inhibits growth of viruses • Increases T-cells • Enhances cell-mediated immune responses • Promotes the destruction of foreign particles and microorganisms	• Oysters • Ginger root • Legumes • Nuts & seeds • Egg yolk • Sardines
Vitamin D	• Bone pain • Muscle weakness • Osteomalacia • Inflammatory Bowel Disease	• Helps in regulating the immune system through regulatory T- Cells (T-regs), which modulate autoimmune responses • Increases levels of the antioxidant glutathione, which prevents free radical damage	• Sardines • Salmon • Tuna • Shrimp • Eggs • Mushrooms
Vitamin A	• Fatigue • Poor night vision • Recurrent infections • Inability to fight off colds	• Antiviral activity • Maintains barrier surfaces such as the skin, GI and respiratory lining to protect from microorganisms • Enhances white blood cell and antibody response	• Liver • Eggs • Carrots • Spinach • Kale • Cantaloupe
Selenium	• Decreased resistance to infection • Tenderness and swelling in the joints • Cardiomyopathy	• Enhances white blood cell and natural killer cell function • Antiviral and antioxidant activity	• Brazil nuts • Halibut • Sardines • Shellfish • Beef • Legumes

Dirty Dozen™
Choose organic

- Strawberries
- Spinach
- Kale, collard and mustard greens
- Nectarines
- Apples
- Grapes
- Cherries
- Peaches
- Pears
- Bell and hot peppers
- Celery
- Tomatoes

Clean 15™

- Avocados
- Sweet corn
- Pineapple
- Onions
- Papaya
- Sweet peas (frozen)
- Eggplant
- Asparagus
- Broccoli
- Cabbage
- Kiwi
- Cauliflower
- Mushrooms
- Honeydew melon
- Cantaloupe

Diet, Lifestyle and the Immune System

How Carbohydrates Affect Immune Health

Studies have indicated that white blood cell activity is cut in half for more than five hours following the intake of 100 grams (g) of sugar. When the average American consumes over 65 g of added sugars each day[1], it is no wonder immune dysfunction has risen so dramatically. High sugar diets dramatically reduce the immune system's ability to fight infections.

No healthy diet is complete without carbohydrates. But, ideally, most of the sugar and carbohydrates you consume should come from fruits and vegetables. Plant foods contain fiber, antioxidants, vitamins and minerals; therefore, carbohydrates are delivered in the right context. Phytonutrients, the natural health-boosting compounds in plants, provide many of the antioxidant and anti-inflammatory benefits of fruits and vegetables. Choosing fruits and vegetables of different colors provides the broadest and most beneficial array of nutrients.

What foods are most important to eat organic?

The Environmental Working Group publishes a list each year of fruits and vegetables known to contain the highest and lowest amounts of pesticides called **The Dirty Dozen™** and **Clean 15™** to help consumers prioritize their organic food budget. Please refer to column on the left for the fruits and veggies most important to eat organic.

1. Centers for Disease Control and Prevention (CDC). National Center for Health Statistics (NCHS). National Health and Nutrition Examination Survey Data. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2007-2010.

How Proteins Affect Immune Health

Your body relies on protein to provide important building blocks for the immune system. Important immune cells, antibodies, and enzymes all rely on an abundant supply of protein in order to function properly.

Protein consumption is also important to build and maintain muscle mass. Your muscles are a metabolically active tissue critical for energy generation. If your muscle mass is low or declining, your body's ability to generate energy will decline. Since strong immune function is dependent on access to energy, lower-than-normal muscle mass can affect your immune system's ability to function. Only by consuming an optimal amount of protein can your muscle mass and immune system be well supported. Legumes, such as beans and lentils, as well as nuts and seeds are high in fiber and good sources of plant proteins.

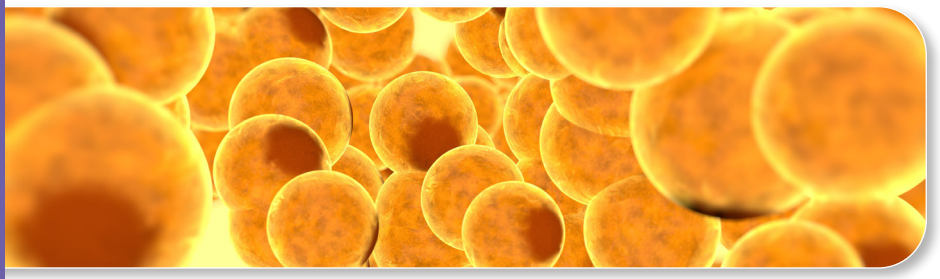
How Much Protein Should I Eat?
Protein needs vary based on gender, body size and physical activity level. Generally, 0.8-1.0 g of protein per kilogram of body weight is recommended.

120 lbs. = 44–55 g
150 lbs. = 55–68 g
180 lbs. = 65–82 g

Food	Calories	Protein (g)
Chicken breast *(4 oz., boneless, skinless)*	184	36
Salmon *(3 oz., wild caught)*	196	22
Shrimp *(3 oz.)*	84	18
Egg *(whole, boiled)*	77	6
Yogurt *(1 cup, plain, whole milk)*	149	9
Lentils *(1/4 cup)*	57	4.5
Almonds *(1/4 cup, dry roasted)*	206	7.5
Chia seeds *(2 Tbsp.)*	137	4

Tips for healthier fat intake

- Use extra virgin olive oil for lower heat cooking and salad dressings
- Sprinkle chia or ground flax seeds in oatmeal, smoothies and salads
- Eat more oily, low mercury fish (See chart on page 7)
- Use coconut or avocado oil for higher temperature cooking



How Fats Affect Immune Health

It was once recommended to avoid fats whenever possible, but in fact, certain fats are not only healthy, but critical to the body's ability to function. Omega-3 fats, such as those found in fish, avocado, and walnuts, are called **essential fatty acids** as the body cannot make them. Omega-3 fats have numerous health benefits, such as reducing inflammation throughout the body. Extensive scientific evidence shows that inflammation is a major factor in most, if not all, chronic diseases, and especially in immune disorders. For this reason, omega-3 fats are important for building a healthy, balanced immune system.

The typical American diet is characterized by overconsumption of refined vegetable oils, such as canola or soybean oils, commonly used in snack foods, cookies, crackers, and fast food. Refined oils are high in omega-6 fats and promote inflammation. The vast majority of Americans do not meet the recommended intake of omega-3 fats, but instead overload on refined oils. Instead of focusing on a low-fat diet, evaluating the types of fats you consume to balance omega-3 and omega-6 intake can have a significant impact on the immune response and tendency towards inflammation.

Healthy Fats

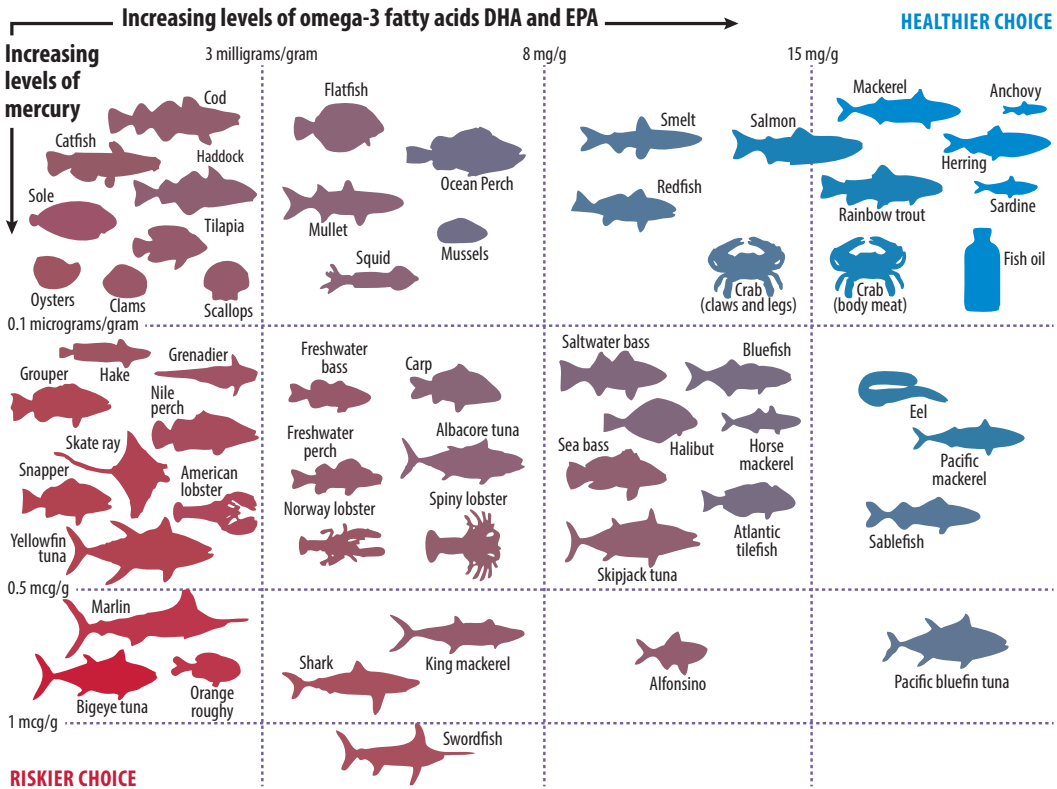
- cold-pressed extra-virgin olive oil
- flaxseeds & flaxseed oil
- wild-caught salmon
- chia & hemp seeds
- walnuts
- avocado
- avocado oil*
- coconut oil*
- macadamia nuts & nut oil*
- sardines & anchovies
- fish oil

Unhealthy Fats

- trans fat
- baked goods containing hydrogenated oil
- bacon
- canola oil
- corn oil
- soybean oil
- red meat (especially non-grassfed beef)
- sunflower oil
- safflower oil
- cotton seed oil
- palm oil
- margarine

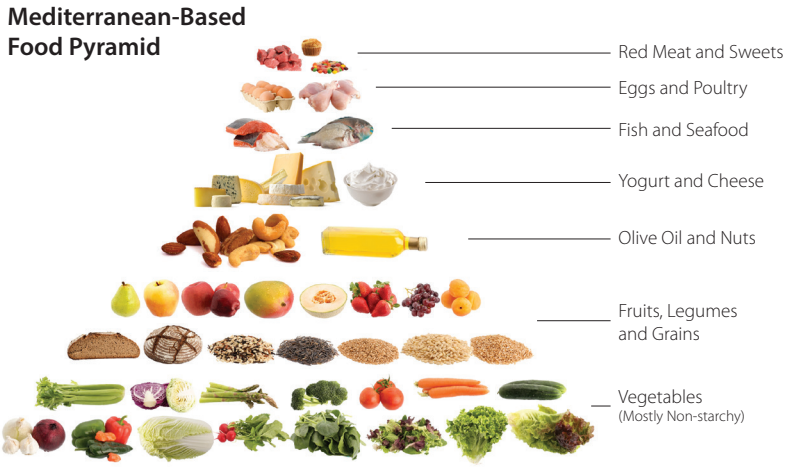
*Use oils with higher smoke points for high-temperature cooking.

Choosing Healthy Seafood



Building an Immune-Boosting Meal

One of the healthiest dietary patterns comes from the Mediterranean region. The Mediterranean diet consists of a high intake of olive oil, nuts, seeds, fish, plant proteins (legumes and lentils), fruits, vegetables, herbs and spices, moderate consumption of wine, and dairy (mostly in the form of yogurt and cheese). The Mediterranean diet does not emphasize meat consumption and is low in refined carbohydrates, sugars and processed foods. Following a Mediterranean dietary pattern is a simple way to make healthy choices and avoid harmful foods that can burden the immune system. This will also help ensure the foods you consume consist of the most beneficial macronutrients (fats, proteins, carbohydrates) and micronutrients (vitamins, minerals, antioxidants). Additional benefits of the Mediterranean lifestyle include eating meals in a relaxed, family-style atmosphere. Rather than rushing through meals or grabbing food on the go, mealtime is a time to slow down, laugh and reconnect.



Elimination Diets

Your health care provider may have you test your tolerance for certain foods through an **elimination diet**. Various foods are known to trigger reactions in susceptible individuals. Reactions can range from immediate emergence of hives to delayed onset of headaches and joint pains. These reactions can wreak havoc on the immune system by heightening the reactivity of the immune system and promoting inflammation. Some of the most common foods to trigger reactions include wheat, dairy, corn, soy, and eggs. An elimination diet will remove suspected reactive foods for three or more weeks, then carefully reintroduce foods and monitor for any adverse reactions.

Immune-Boosting Herbs and Spices

Since ancient times, spices and herbs have been considered priceless for their flavor-enhancing and health-promoting benefits. Many spices and herbs have been found to have anti-inflammatory, anti-microbial and immune-boosting properties. Incorporating fresh herbs and spices into salads, soups and other dishes is an easy way to support immune function and overall health. The table below outlines some of the health-promoting properties of various herbs and spices.

Garlic	• **Allicin** component has antibacterial benefits • Sulpher compounds support detoxification • Remedy for the common cold by reducing viral replication
Ginger	• Stimulates digestion • Reduces inflammation • Supports glutathione, the body's major antioxidant and detoxification molecule
Turmeric	• **Curcuminoids, tumerin protein, and volatile oils** have potent antioxidant and anti-inflammatory properties • Protects the liver from toxins • Improves digestion by increasing bile flow
Oregano	• Activates glutathione to support detoxification • Inhibits growth of microbes, such as *Staphylococcus*, *Giardia* and *Herpes*
Coriander	• Anti-diabetic properties • Antibacterial compounds have been found effective against *Salmonella*
Chilies	• Contain **capsaicin** which has potent anti-inflammatory effects • Helpful for pain relief and clearing congestion
Basil	• Antibacterial and anti-inflammatory • Supports white blood cell function

Immune-Boosting Broths

Bone and vegetable broths are easy to make and full of nutrients and beneficial amino acids. Some people choose to enjoy broth warm as a drink, and others use broths as a cooking liquid or base for soups.

Bone Broth

Ingredients:
2 lbs. beef, chicken, turkey or fish bones
1 medium onion
2 carrots
2 stalks of celery
2 Tbsp. apple cider vinegar
Sea salt
Filtered water
Optional: 1-3 tsp. each whole black peppercorns, ginger root, thyme, rosemary

Directions:

1. If using raw bones, roast bones on a cookie sheet for 30 minutes at 350 degrees F. If using leftover bones, there is no need for further roasting (freeze bones between food preparation and broth making).

2. Place bones in a large stock pot. Drizzle apple cider vinegar over bones and let sit for 5-10 minutes. Add filtered water to fill the pot three quarters full.

3. Roughly chop and add vegetables to the pot. Add a pinch of salt and spices. (Tip: Place spices in a tea bag or tied cheese cloth for easy removal).

4. Bring broth to a boil then reduce to simmer. (Carefully transfer to a crockpot at this point if desired). Simmer over low heat for 8-24 hours. Remove spices after 3-4 hours of simmering. Periodically skim any impurities from the surface with a large spoon.

5. Remove from heat and allow to cool. Strain through a fine metal strainer into a glass storage container. Refrigerate overnight; skim away fat or impurities from the broth after refrigeration.

6. Keep refrigerated and use within 5 days, or freeze for later use.

Vegetable Broth

Ingredients:
1 medium onion
3 carrots
2 stalks of celery
1 medium potato, peeled
2 bay leaves
2 tsp. whole black peppercorns
1 Tbsp. parsley or other herbs
Sea salt
1 gallon filtered water

Directions:
1. Roughly chop vegetables. Combine with spices and water in a large pot.

2. Bring to a boil. Reduce heat to simmer for 2 hours.

3. Strain through a fine metal strainer, then again through a mesh sieve or cheesecloth.

4. Refrigerate in a glass container for up to 3 days, or freeze for later use.

Tip for "Cheater Broth"
Buy organic stock in a carton, heat on the stove top, and add a couple Tbsp of gelatin to the stock.

Lifestyle Factors in Immune Health

Beyond diet, practicing healthy lifestyle behaviors is crucial to maintaining optimal immune function. Regular exercise and adequate sleep are key lifestyle factors for optimal health.

Sleep

Restful sleep is critical to a healthy immune system. Our bodies use sleep as a restorative time when tissues are repaired and digestion is active. Many people do not achieve the recommended six to eight hours of sleep per night. Healthy sleep patterns can be reinforced with the following steps:

1. Create a bedtime ritual: Consider a warm bath with Epsom salts before bed, or simply a regular pattern of washing your face to prepare for bed. The body begins to remember these habits. Going to sleep and waking up at the same time each day also has a significant impact on developing restful sleep patterns.
2. Avoid caffeine after 3 p.m. and alcohol after dinner.
3. Minimize use of electronic devices for two hours before bed.
4. Sleep worry-free by making a list of relevant tasks to tackle the next day.
5. Keep the bedroom dark, cool and quiet.
6. Calcium and magnesium used before bed can be helpful to relax the body and promote release of melatonin for deeper sleep.

Exercise

Regular physical activity is one of the most important steps you can take to improve health. Building aerobic capacity and muscle mass helps to maintain a healthy weight, improve bone health, detoxify the body and reduce stress.

Adults should aim for 150-300 minutes of moderate intensity exercise per week; this is equivalent to 30-60 minutes of exercise five to six days per week.[2] Those new to exercise can find building a regular routine to be a daunting task. However, it can be easy to build up to include exercise into your daily routine.

Begin with a 20-minute walk or jog, one day per week. The next week, walk/jog two days. The next week, three days and so on until you are exercising five days per week. At that point, add 10 minutes to one of your workouts for a total of 30 minutes of exercise. The following week, have two 30-minute workouts. Continue this pattern of progression to build a regular exercise routine and avoid injury.

2. 2008 Physical Activity Guidelines for Americans. U.S. Department of Health and Human Services; October 2008. Available from www.health.gov/paguidelines

Exercise Tips

- Include resistance exercise in your workout routine to build muscle and strengthen bones.
- Consistency is key. Schedule your exercise time and keep yourself motivated.
- Workout with a friend or join a gym for social interaction and to keep yourself accountable.
- Consider hiring a personal trainer to help you develop a routine that works best for you.

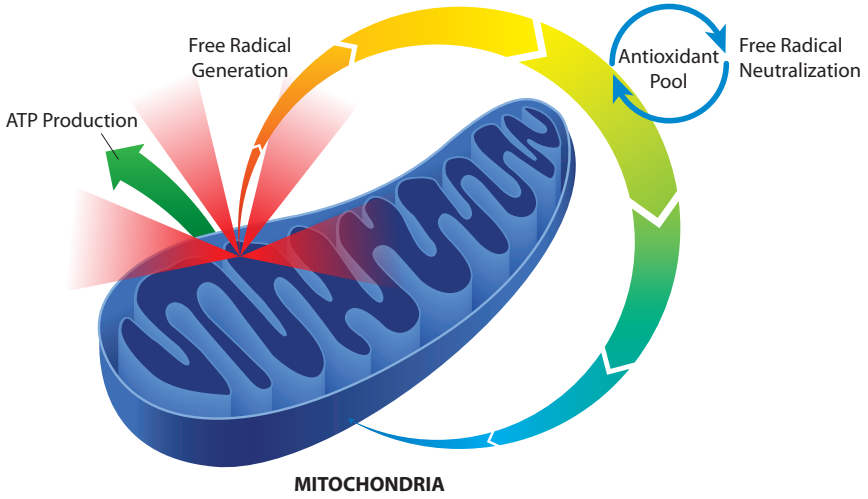
The Energy-Immune Connection

Every cell in your body needs an adequate amount of energy to perform the thousands of metabolic reactions needed to keep you healthy. Diseased cells simply don't have enough energy to perform optimally. Efficient immune function requires maximum immune cell energy.

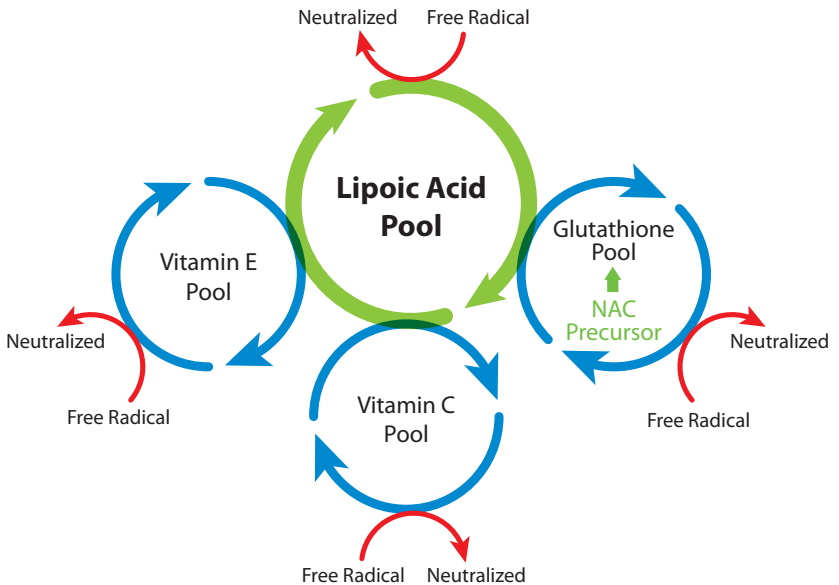
Of course, all cellular systems depend on an adequate supply of energy. Liver cells require adequate energy to detoxify unhealthy substances. Nerve cells require adequate energy production to send signals and process sensory data. Immune cells require an abundant supply of energy to protect us from foreign invaders.

Mitochondria live within cells and responsible for producing energy. The mitochondria are tiny biochemical power plants that convert the food we eat into cellular energy called adenosine triphosphate (ATP). This process also produces waste products including carbon dioxide and free radicals. Carbon dioxide diffuses into the bloodstream, is absorbed by red blood cells and then is expired by the lungs. Toxic free radicals are detoxified by chemical reactions that rely on an abundant supply of antioxidants such as vitamin C, vitamin E and glutathione.

Cycle of Cellular Energy Production



Cycle of Free Radical Neutralization



Gut Health Tips

1. Chew food thoroughly. While this seems intuitive, many people are in a rush and do not chew food completely. The process of chewing initiates production of acid in the stomach and enzymes that properly break down food for digestion. Try to slow down and enjoy each bite completely.
2. Remove offending foods. An elimination diet may be recommended to uncover reactions to foods.
3. Ensure proper amount and function of stomach acid and enzymes. If you currently use a antacid medications, speak with your health care provider about natural alternatives.
4. Protect the gut barrier by avoiding excess alcohol intake and sugar in the diet.
5. Keep microbial populations in balance with a broad-spectrum probiotic.
6. Keep detox systems moving. Be sure to take in plenty of water, fiber, fruits and vegetables to increase antioxidant reserves, bind and eliminate toxins and waste.

Gastrointestinal Health

The role of the gastrointestinal tract in immune health cannot be overstated. The GI tract encounters more microbes and potentially harmful molecules than any other part of the body through the foods we eat. For this reason, over 70% of the immune system exists within the highly trafficked GI tract. The GI tract is also where nutrients are absorbed and toxins are eliminated from the body. Balancing the GI tract is, therefore, often a first priority in recovering immune function.

Many people experience mild to moderate GI symptoms that, in fact, can have wide reaching effects on the health of the immune system.

Symptoms and factors that warrant a closer look into the gut include:

- Constipation
- Diarrhea
- Heartburn
- Frequent gas, bloating or belching
- Abdominal pain
- Antibiotic use within the past two years
- Frequent use of antacids or anti-inflammatory drugs

The two major areas to address in the gut are the health of the GI barrier and the microbiome, the balance of good and bad bacteria in the gut.

GI Barrier: The First Line of Defense

The intestinal barrier is an incredibly dynamic tissue in the body. The passage of nutrients into the body while excluding pathogens and other unwanted molecules is controlled by this barrier. The lining of the intestines has a vast surface area, but is only one cell layer thick. At times, this barrier can become disrupted and allows larger molecules and proteins to pass through, which triggers an immune response. This phenomenon, known as **leaky gut**, has been implicated as a major contributing factor to a number of chronic immune issues. When leaky gut occurs and an immune response is triggered, the body ignites inflammation in the gut and the immune system begins to react to molecules and foods it once tolerated without issue.

Factors that promote a healthy barrier	Damaging factors
Healthy diet with adequate fiber	Some medications (NSAIDS, corticosteroids, oral contraceptives)
Vitamins A & D	Alcohol in excess
Zinc	Chronic stress
Probiotics	Imbalanced intestinal bacteria

Microbiome

The GI tract is home to more bacteria than there are cells in our body. These bacteria live with us symbiotically, helping to protect us from pathogenic organisms, synthesize vitamins, and keep the immune system in balance. This imbalance is known as **dysbiosis**. When microbial populations fall out of balance, pathogenic bacteria, yeast and fungi can thrive, leading to damage and inflammation of the GI barrier. Dysbiosis can result from diets high in refined sugars and carbohydrates, constipation, chronic stress, poor digestion from low stomach acid (often secondary to use of antacid drugs), or use of antibiotics, which kill both good and bad bacteria. Healthy bacteria should primarily live in the large intestine, but at times can migrate to the small intestine. This **small intestinal bacterial overgrowth** (SIBO) can be another cause of unwanted gastrointestinal symptoms.

GI health starts with a balanced diet rich in plant foods, fiber, protein, healthy fats and water. Fiber helps to control blood sugar, bind and eliminate toxins, and also acts as a **prebiotic**, or food for the masses of healthy bacteria residing in the GI tract. Fermented foods, such as yogurt, sauerkraut, and kimchi, are natural sources of both prebiotics and probiotic bacteria. Broad-spectrum probiotics containing the species *Lactobacillus*, *Bifidobacteria*, and *Saccharomyces boulardii*, can greatly enhance microbial populations. Depending on the nature of GI complaints, 20-225 billion CFU (colony forming units) probiotic supplements may be recommended. It is important to note that probiotics in supplement form do not permanently colonize the gut; rather, as these microbes pass through, they provide positive benefits for up to two weeks.

Stress Management Tips

1. Identify stressors as well as steps you can take to change or eliminate these factors.

2. Keep a thought and gratitude journal. Reframe negative thoughts and focus on those things for which you are grateful.

3. Schedule adequate rest and down time.

4. Build relationships & avoid isolation when stress is high. Connecting with friends and family can offer emotional support.

5. Exercise regularly, ideally in nature. Aerobic exercise releases endorphins in the brain to improve mood. Getting exposure to fresh air and sunlight can also help elevate feelings of well-being.

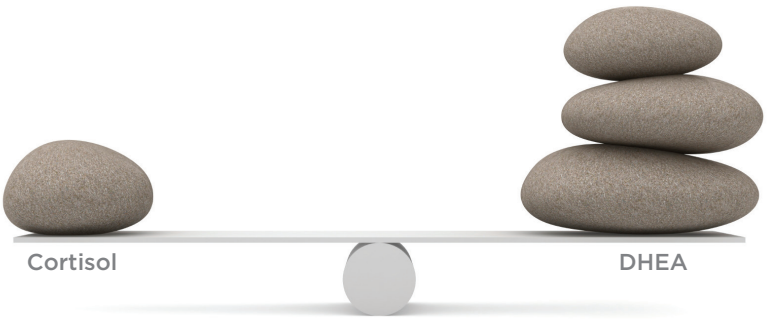
6. Consider supplementing with magnesium, fish oil, vitamin D or botanicals such as Eleuthero or ashwagandha, which have been shown to support chronic stress, reduce inflammation, and buffer feelings of anxiety.

7. Most importantly, seek professional counseling if your stress level has become overwhelming or unmanageable. ***Don't be afraid to ask for help.***

Stress and Immune Function

Stress, in its most basic form, is a force, pressure or weight. Although our bodies are equipped to handle short-term stressors, chronic stress over long periods of time taxes the brain, body and health to a great degree. Excessive stress can significantly impede the body's ability to heal and regenerate. Recurring infections, slow wound healing, or becoming more susceptible to a cold or the flu can be a result of high stress levels that deplete immune reserves.

Your body responds to stress through its stress-response system, the hypothalamic-pituitary-adrenal (HPA) axis. The HPA axis produces specific hormones that help counteract the effects of short-term stress. Under normal conditions, cortisol is released in response to stress for a quick burst of energy, and to mobilize blood sugar and reduce inflammation. DHEA acts to counter-balance cortisol and binds receptors in the brain to promote relaxation and decreased pain. Prolonged stress can create an imbalance of cortisol and DHEA, and the long-term effects of cortisol can wreak havoc on the body.



Stress Factors

Mental and Emotional Stress
- Anxiety
- Depression
- PTSD
- Fear, worry
- Restless mind

Blood Sugar Imbalances
- Elevated blood sugar
- Hypoglycemia
- Increased oxidative stress (decreased antioxidant reserve)
- Abdominal obesity
- Metabolic syndrome
- Hyperlipidemia
- Hypertension

Sleep Cycle Disturbances
- Not sleeping enough hours
- Unable to fall into a deep sleep
- Difficulty falling asleep
- Inconsistent sleep schedule
- Shift work issues

Inflammation Imbalances
- Musculoskeletal: back, joint pain
- GI: dysbiosis, Crohn's disease, diverticulitis
- Dermatological: eczema, psoriasis
- Autoimmune: MS, lupus, rheumatoid arthritis
- Immunological: food allergies, chronic infections

Chronic stress decreases the body's ability to fight off infections. Chronic stress can also significantly increase inflammation in the body, leading to cellular, tissue and joint damage.

Other indirect effects on the immune system are the unhealthy coping strategies people seek during periods of high stress. These include resorting to junk food, smoking or excessive drinking. Additionally, disruption of normal healthy habits such as exercise, sleep and healthy meal preparation can place even more burden on the body. While some stress cannot be avoided, reducing your stress level as much as possible can be an important step in improving your health.

If you need additional support for reducing stress and the impact that it has on your body, please speak to your health care provider about using the **SOS Stress Recovery Program**, a comprehensive program for personalized stress support.

SOS
STRESS RECOVERY PROGRAM

Toxins and Environment

Our interaction with our environment and exposure to toxins plays an essential role in the health and functioning of our immune system. Cigarette smoking, for example, increases the risk of rheumatoid arthritis and lupus.[3] Limiting toxic exposures whenever possible and maintaining adequate detoxification capacity are keys to a healthy immune system.

Environment

In modern years, our society has become increasingly sterile with regular use of antibiotics, hand sanitizers and disinfectants. At one point in time, children played in the dirt, where now we wipe them with antibacterial wipes at every opportunity. While these measures can protect against serious illnesses, experts have correlated the rise in allergies, asthma, and antibiotic-resistant bacteria with the increased use of daily sanitizing products.

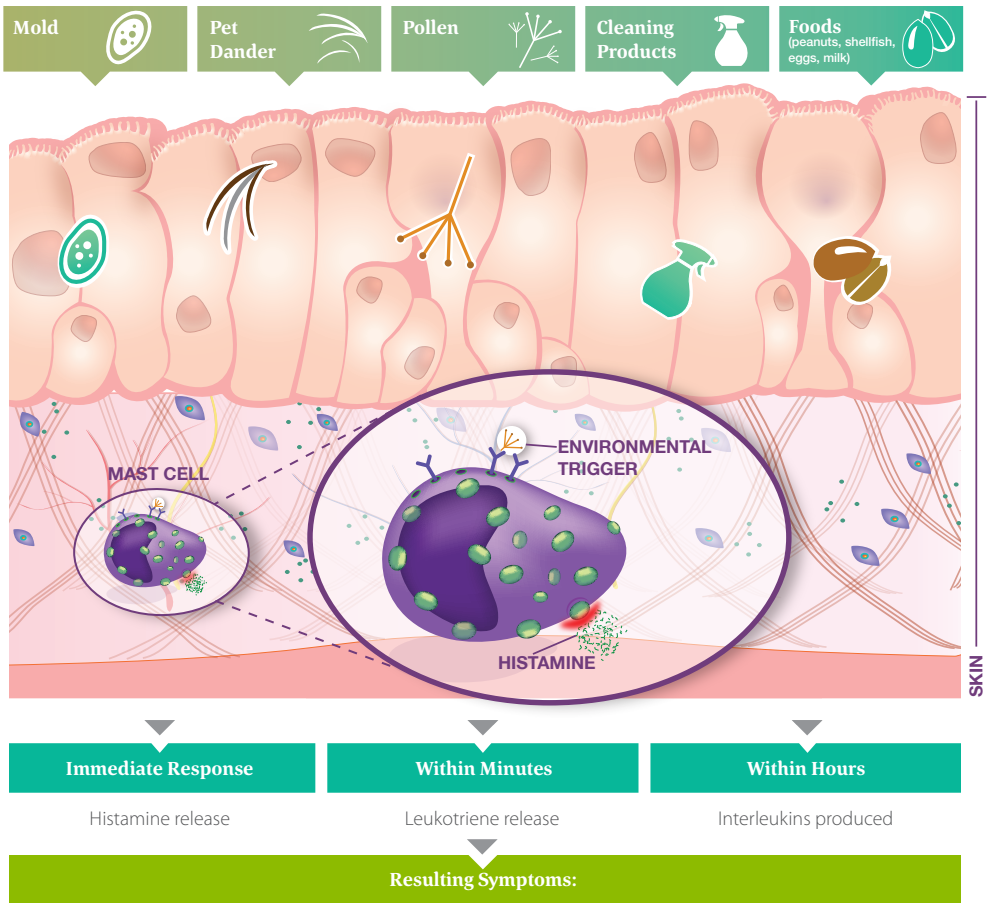
When we are children, our immune systems learn to recognize pathogens and develop appropriate responses. The Hygiene Hypothesis suggests that exposure to an array of microbes and allergens at a young age increases the immune system's tolerance and decreases the likelihood of over-reactions, as seen in allergies. Some of these microbes can have positive effects and act to teach the young immune system to recognize and respond. This is evidenced by lower rates of allergies and autoimmunity in children who grow up with pets and on farms.[4] Germ-free and dirt-free environments may not be our best bet; playing in the dirt may be a healthy behavior after all!

This is not to suggest abandoning standard hygiene practices—hand washing is of course one of the greatest tools for limiting the spread of colds and flus. However, we should be aware of the use of antibiotics in food sources, such as animal feed, and pervasive use of triclosan (an antibiotic found in sanitizers).

3. The Health Consequences of Smoking—50 Years of Progress. A Report of the Surgeon General. U.S. Department of Health and Human Services; 2014.
4. Okada H, Kuhn C, Feillet H, Bach JF. The 'hygiene hypothesis' for autoimmune and allergic disease: an update. Clin Exp Immunol. 2010 Apr; 160(1):1-9.

Allergens and Toxins

Seasonal allergy sufferers are all too familiar with natural substances, such as pollen and pet dander, causing an overreaction of the immune system. In susceptible individuals, pollen, dust and dander trigger an alarm response in mast cells, which leads to the release of histamine and triggers an inflammatory reaction to produce the common symptoms of sneezing, itchy eyes, and nasal congestion. Allergies often correlate with asthma, an overreaction of inflammation in the lungs. Allergies and asthma respond well to increased antioxidant intake and anti-inflammatory measures. Interestingly, improving gut barrier function can also have dramatic effects on seasonal allergy symptoms.



Allergens and Toxins

Toxins exists in a number of forms. In fact, some are natural substances, but create deleterious effects in the human body. Others are manmade toxins, such as synthetic commercial chemicals and cigarette smoke, and these toxins are a relatively new phenomenon to the human body. These chemicals can mimic hormones, cause inflammatory reactions, and have direct suppressant effects on immune function.

Unlike natural substances and organisms that trigger immune reactions in the body, toxins and pollutants are unwanted exposures in our environment that have become more pervasive than ever. With toxins present in food, water, and air, our exposure to toxins is, in many ways, inevitable. This discussion is not intended to make you fearful of your environment, rather, make you aware of the exposures you can control and steps to live a clean lifestyle.

Toxin	Sources of Exposure
Heavy metals (aluminum, arsenic, cadmium, lead, mercury)	Antacid medications, antiperspirants, cans, household detergents, fertilizers, fungicides, tobacco products, paint, automobile exhaust, large fish such as shark and swordfish
Volatile compounds and solvents	Harsh cleaners, paint, dry cleaning chemicals, gasoline, cigarette smoke
Dioxins	Petroleum-derived chemicals, pesticides, herbicides
Phthalates and parabens	Lotions, soaps, toothpastes, deodorants, fragrances

Toxins that are made by living biological systems are called "biotoxins." These are the toxins causing health struggles around many complex conditions, but we will focus on two major ones: **mold toxicity** and **Lyme disease**.

Biotoxin illness is differentiated from illness caused from synthetic toxins or heavy metals because the latter is not made by living systems. Biotoxin illness is complex because it requires us to look not only at infectious agents, but also the environment we spend time in to correct the issues. Many patients experience frustration while trying to uncover the root of their mysterious symptoms such as fatigue, joint pain, brain fog, neurological pain, and headaches because biotoxin illness is not the first diagnosis that typically presents in a doctor's appointment.

Therefore, it is often years of constantly checking off different potential diagnoses without improvement that end up in biotoxin consideration.

Most distinguishable symptoms of **mold toxicity** to help differentiate it from other chronic diseases:	Most distinguishable symptoms of **Lyme disease** to help differentiate it from other chronic diseases:
Electric shock sensations	Migrating pain
Ice pick-like pains	
Vibrating or pulsing sensations in the spinal cord	

Mold Toxicity

For mold toxicity, the most important part of any treatment strategy is to remove yourself from exposure. This means locating the source of exposure and optimizing your relationship with that environment. Since many people find that their mold exposure comes primarily from their home, work, school, or car, there are some simple things you can do to create a space that isn't hospitable for mold to grow.

Consult with a **local remediation company** if mold is detected and requires clean-up.

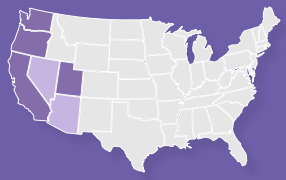
An **ERMI test** can be run in the comfort of your own space in order to identify the molds that may be populating your space. A quick internet search will result in labs that deal with ERMI tests.

Run your bathroom fan while showering to prevent condensation build up.

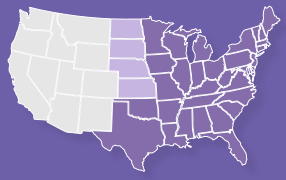
Check your space for signs of **water damage or condensation** such as around pipes, in front-loading washing machines, windowsills, etc.

Know Your Ticks

Western Blacklegged Tick
(*Ixodes pacificus*)



Eastern Blacklegged Tick
(*Ixodes scapularis*)



Severe Illnesses

- Lyme disease
- Anaplasmosis
- Babesiosis
- Ehrlichiosis
- Powassan
- Rickettsiosis
- Tick-Borne Relapsing Fever (TBRF)

Just like mold, prevention and avoidance of exposure are the first lines of defense. There are some simple guidelines to follow to avoid a tick-borne infection, and these may be some of your most effective tools.

Consider a home **HEPA air filter**.

Minimize indoor plants if mold is a concern because the soil can be a source of exposure.

Keep humidity low.
Set your humidity indoors to 50%, if possible. Consider a dehumidifier.

Keep a journal of symptoms and where you are when they are the most intense; you may find patterns of reactivity within specific spaces to help you identify where potential issues may be lurking. For example, if you travel, you may notice your systems change while in hotels, when you get home from work, or maybe they resolve after a few hours into your workday outside the home.

If mold toxicity is identified as a problem and symptoms persist past removal of exposure, you can also run tests to determine your personal level of biotoxin burden. Your doctor may choose to run these panels to identify the best treatment approach which could potentially include binders, liver support, nasal sprays, sauna use, dietary adjustments.

Lyme Disease

Lyme disease is just one example of tick-borne disease, but it is one of the fastest growing infections in many areas of the US. One of the complicating factors of Lyme disease is that ticks often carry more than one infectious agent, and therefore, once infected, most patients have Lyme disease and co-infections. It is estimated that approximately 24% of ticks carry two or more pathogens, and the most common co-infections are Babesia, tick-borne relapsing fever (TBRF), Bartonella, Ehrlichia, Rickettsia, and Anaplasma.

Tips to avoid tick-borne illness

1. **Wear long pants** and **long sleeves** when hiking.
2. Be sure to **wear insect repellant**.
3. **Avoid** walking through **tall grasses** where ticks like to live.
4. **Check your pets** for ticks before allowing them back into the home.
5. Upon entering the home, **remove clothing** and **place** in the **washer or dryer**. From there, **take a shower** to prevent tick latching.
6. Be sure to **check your body** for ticks, being sure to look in crevices often missed like body folds, between toes, and around waistbands.
7. If a tick is located but not attached, **flush down the toilet**.
8. If a tick is located and latched, **remove tick safely by**:
    - **Use tweezers close to the skin** and gently pull straight back.
    - **Wash the area** with soap and water, and optionally, dab area with essential oils such as oregano/thyme/tea tree or colloidal silver.
    - **Place tick in a baggie** to be sent out for testing.
    - **Call your doctor** right away to start treatment until confirmation is made that the tick was non-infectious. At that point, you can stop interventions.

While prevention and early intervention are key in Lyme disease, you may find yourself in the growing segment of patients dealing with a chronic Lyme infection. If that is you, talk to your physician about the treatment options available to you, as they range from prescriptive antibiotics to natural antimicrobial agents specific to your infections. It is also common for patients to go through multiple treatment protocols before finding the strategy that works best for them.

However, there will be similarities in the goals:

1. Fight infection
2. Address inflammation
3. Optimize cell signaling with membrane support
4. Support mitochondrial function
5. Address hormone imbalances resulting from infection
6. Optimize microbiome diversity and detoxification pathways

Remember that this may take some time, so be patient. Many patients require one to five years before they reach full resolution, so be sure to focus on the progress, no matter how small, and set realistic expectations for your healing journey. Give yourself empathy during the process, and be a true partner with your practitioner.

Cleaning Up Toxins and Allergens

Those suffering from allergies, asthma, autoimmunity or other chronic immune dysfunction should be diligent in avoiding toxins whenever possible.

1. **Clean Your Food.** Choose organic whenever possible. Refer to the Dirty Dozen™ on page 4 to prioritize fruits and vegetables to buy organic, but always wash fruits and vegetables thoroughly to remove pesticide residues (soaking produce in a bowl of water with ½ cup vinegar helps cleanse the skins). Rely on organic, wild or pastured meats, poultry, eggs, and fish as well.

2. **Clean Your Air.** Use a HEPA air filter, especially in the bedroom, to filter air of dust, dander, and allergens. Avoid using synthetic fragrances such as those in spray air fresheners and candles as these can act as respiratory irritants. Natural fragrances, such as essential oils, can be diffused for a pleasant fresh scent.

3. **Clean Your Home**. Avoid harsh household cleaners and detergents. Those with severe allergies may consider limiting use of carpet and upholstery in the home, as dander, dust and dust mites can settle in cloth. If your house has a history of water damage, be sure to have the house fully inspected for mold.

4. **Clean Your Skin.** Skin and personal care products are often laden with undesirable chemicals and synthetic fragrances. Especially in those with sensitive skin, avoid synthetic fragrances in laundry products, shampoos, body washes and lotions.

5. **Clean Your Body.** Since we all must live, breathe, work and play in our environment, maintaining the ability to detoxify and remove harmful substances is essential. A nutrient dense diet, ample water intake, and regular exercise are vital steps in detoxing. Infrared sauna may also be considered to amplify detox capacity.

Nutritional Supplements for Immune Enhancement

Although it's best to eat a healthy diet, nutritional supplementation is imperative for a number of reasons. First, many people do not consume the recommended five to nine servings of fruits and vegetables each day, nor do they eat a balanced diet that offers a variety of vitamins and minerals. Second, the high demands of modern life wear down even healthy bodies. Third, hundreds of chemical toxins are released into the environment every year, which contaminate the food, water and air supply. These factors combined can lead to the breakdown of the immune system. Supplementing your diet with vitamins, minerals and antioxidants can help support important liver enzymes that are responsible for detoxification and healthy immune function.

The goal of your nutritional supplement program should be to ensure your body is supplied with an abundance of key nutrients necessary for optimal health and immune function. Some people assume that by following the U.S. government's vitamin and mineral guidelines (recommended dietary allowance or RDAs), levels will be adequate for maintaining good health—and some people believe RDA levels should never be exceeded. In reality, most RDAs were derived by establishing the lowest nutrient level needed to prevent severe vitamin deficiency diseases, such as scurvy, rather than by establishing an optimum level of vitamin and mineral nutrition for healthy function.

Supplementing Key Vitamins, Minerals and Antioxidants

Vitamins and minerals are sensitive compounds that break down easily when food is cooked, exposed to light, or transported for long periods of time. Few of the foods we eat regularly are grown locally. Soil can be depleted in nutrients as well, especially in commercial farms. These factors can impact the nutrient density of our foods.

Additionally, achieving an optimal intake of each important vitamin, mineral and phytonutrient is difficult without consuming excess calories. For these reasons, supplementing key nutrients and antioxidants can correct nutritional deficiencies and build resilience to changes in our environment.

Phytonutrients/Concentrated Greens

Supplementing concentrated fruits and vegetables in capsule or powder form provides a broad range of "phyto" or plant nutrients on a daily basis. Phytonutrients enable other antioxidants like vitamins A, C and E and selenium to work more effectively. Supplementing these nutrients help to improve antioxidant status and metabolic reserve for the immune system.

Antioxidants and Immune Function

Ingredient	Method of Action	Dosing
Zinc	Zinc is one of the most important micronutrients used by the body to enhance antioxidant defenses. It is in high demand during infections and may become deficient during conditions that stress the immune system (cancer, chronic infections, etc.).	15-50 mg/day
Selenium	Selenium is a powerful antioxidant used to protect the body from oxidative stress. Inflammatory conditions and chronic stress may deplete selenium levels.	75-200 mcg/day
Lipoic Acid	Lipoic acid (sometimes called alpha-lipoic acid) is a key cofactor in energy production and is also necessary for the liver to function properly. Lipoic acid is one of the most powerful antioxidants cells use to protect themselves from oxidative stress. Lipoic acid also helps maintain optimal levels of other important antioxidants and can be a powerful tool in immune function support.	200-600 mg/day
Acetyl L-Carnitine	Acetyl L-carnitine is involved in cellular metabolism and helps cells produce abundant energy. This nutrient is normally found in high concentrations in the heart, muscle tissue, and in cells that have a high need for energy production, such as immune cells.	500-1,000 mg/day
N-Acetyl Cysteine (NAC)	NAC is a component of glutathione, the body's most powerful antioxidant. Studies have shown that intracellular glutathione levels can rapidly decrease during infections, leading to a reduced ability of immune cells to fight infection.	500-1,500 mg/day
Glutathione	Glutathione is the body's master antioxidant, which protects cells from damage, helps immune cells fight infection, and enhances detoxification.	250 mg-1 g/day
Quercetin	Quercetin helps balance cytokine levels and improve T-lymphocyte balance. When combined with vitamin C, it provides powerful immune support.	250-750 mg/day

Other Natural Agents that Support Immune Function

Probiotics

As discussed earlier, the GI tract contains many species of beneficial bacteria and yeast. Supplemented forms of these healthy microbes are generally referred to as "probiotics." *Bifidobacterium* and *Lactobacillus* are two of the most well-recognized and researched groups of probiotic bacteria, as well as the yeast *Saccharomyces boulardii*. Probiotics have proven their efficacy in numerous conditions such as antibiotic-associated diarrhea, irritable bowel syndrome and general gut health.

There are a number of ways in which probiotics enhance the immune system. One well-researched probiotic mechanism is the support of gut wall barriers, thereby decreasing gut permeability. Probiotics also support the immune system by increasing immune cell activity and antibody response, which may be especially helpful for those with allergies or allergies. Lastly, probiotic bacteria have been found to enhance the cellular immune response by increasing the T-helper cell response, which is critical for immune system specificity.

Vitamin D

Vitamin D is a hormone-like nutrient that plays a critical role in immune health. Vitamin D is produced in humans when skin is exposed to direct sunlight, and it can be found in oily fish such as sardines, mackerel, and salmon. While in the past vitamin D was recognized primarily for its role in bone health, recent research has uncovered a relationship between low levels of vitamin D and increased risk of infection, cancer, muscle pain, weakness, autoimmune diseases, cardiovascular disease, and diabetes. Seasonal climates and working indoors can limit exposure to sunlight; therefore, supplementing with vitamin D is often essential to maintain adequate levels. Research suggests that vitamin D3 is the preferred form when taken as a dietary supplement.

Immunoglobulins

Immunoglobulins, aka antibodies, can lend passive immunity with a wide array of capability of binding microbial components. The most common example of passive immunity is through mother's milk, but you can also receive similar benefit from colostrum or serum-derived immunoglobulins. Colostrum is the milk produced in the first days after birth. This specialized milk is rich in growth factors, nutrients, anti-inflammatory and antimicrobial compounds, as well as immunoglobulins. Immunoglobulins, otherwise known as antibodies, bind to microbes and harmful substances to facilitate removal from the body.

Purified bovine colostrum concentrate is standardized to a high level of immunoglobulins to protect and repair gut tissues. Bovine colostrum concentrate is a powerful tool to help reduce gut inflammation, stimulate healing of gut barriers, and assist in balancing the microbial population. However, there is a large portion of chronically ill patients that cannot tolerate dairy sources due to inflammation, indigestion, or hormone-driven concerns. For that reason, serum-derived bovine immunoglobulins (SBI) have been a source of passive immunity for many.

Echinacea

Products containing various forms of echinacea are among the top-selling herbal preparations every year in the United States. Echinacea is best known for a general ability to enhance the overall function of the immune system. Echinacea has been shown to stimulate phagocytosis (certain white cells engulfing bacteria/viruses) and increase the activity of white blood cells. Both the roots and whole plant of echinacea are used in tinctures, fluid extracts, powdered extracts and standardized extracts.

Berberine-Containing Plants

Plants containing berberine alkaloids (goldenseal, oregon grape root, barberry) or their purified constituents, berberine and hydrastine, are often used for immune, gastrointestinal and cardiovascular support. These compounds have antiseptic and powerful antimicrobial activities. These plants and their extracts have been historically used for a number of infectious conditions, in addition to blood sugar support.

Andrographis

Andrographis paniculata has been used in Eastern traditional medicine for many years. In Europe, andographis is utilized for the treatment and prevention of upper respiratory tract infections and sinusitis. Considered a key "bitter" herb, clinical trials using andrographis alone or in combination with eleuthero extracts have shown great benefits for relieving upper respiratory conditions.

Astragalus

Astragalus membranaceus has been used for centuries in traditional Chinese medicine. Astragalus has been shown to have immune-supporting, anti-inflammatory and stress-relieving properties. Astragalus extracts and constituents have been shown to enhance the activity of key immune cells. Astragalus is often used in combination with other Chinese herbs to enhance its function.

Cat's Claw

Cat's Claw *(uncaria tomentosa)* is a woody vine whose bark has been used as medicine for ages, but recently, it has been used more frequently in the treatment of Lyme. It has a potent immune modulating effect through inflammation pathways.

Cryptolepis

Cryptolepis sanguinolenta is a potent herb primarily found in Ghana, Africa. It has been used traditionally for the treatment of malaria but has recently been adopted as a solution for spirochete infections, such as Lyme disease.

Arabinogalactan

Arabinogalactan is branched carbohydrate that acts as a soluble fiber, prebiotic, and primer of the immune system. It is known to be one of the active compounds of immune enhancing plants including echinacea and several mushroom species. Commercially available sources are typically derived from larch trees. A number of studies have shown that arabinogalactan supports immune function by increasing natural killer cell activity. As a fiber, arabinogalactan also indirectly supports immune function through its prebiotic properties. Prebiotics provide fuel for probiotics in the GI tract and support the growth of healthy bacteria.

Beta-Glucans

Beta-glucans are derivatives of yeast cell walls and purified to be free of any remaining yeast components. Beta-glucans are used to naturally prime immune cells to elicit and quicker immune responses. Beta-glucans have been shown to reduce the occurrence and duration of upper respiratory tract infections.

Mushrooms

Several mushroom species have been used in traditional systems to improve immune function. The mushrooms most commonly used as a dietary supplement in the U.S. are shiitake (*Lentinus edodes*), reishi (*Ganoderma lucida*), maitake (*Grifola frondosa*) and *Agaricus blazei*. While many of the mechanisms are not completely clear, specific components within these mushrooms are thought to activate immune cell function (primarily neutrophils, macrophages and natural killer cells). Mushrooms such as reishi, maitake, cordyceps and coriolus are now commonly found in functional foods and nutritional supplements intended for immune health promotion.

Black Elderberry Extract

Black elderberry has a long history of use for symptoms associated with cold and flu among European herbalists. Studies suggest that the flavonoids in elderberry inhibit human influenza A (H1N1) infection in vitro by binding to the virus, and blocking the virus' ability to infect host cells.[5] Elderberry preparations for medicinal use range from expressed juice to syrup, tea decoction, and powdered extract in the form of lozenges or capsules.

5. Roschek B Jr, Fink RC, McMichael MD, Li D, Alberte RS. Elderberry flavonoids bind to and prevent H1N1 infection in vitro. Phytochemistry. 2009 Jul; 70(10):1255-61.

Botanicals and Herbs to Address Acute and Chronic Immune Challenges

Chronic Sinus Infections **Flu/Viral Infections** **Upper Respiratory Tract Infections (Acute)**	**Andrographis:** anti-inflammatory, antipyretic, antiviral, immune modulating
	Thyme: antifungal, antibacterial, antiseptic
	Berberine: antibacterial and anti-Inflammatory
	Echinacea: antiviral, antibacterial
	Black Elderberry Extract: antiviral
Upper Respiratory Tract Infection (Prevention)	**Beta-glucans:** immune primer, white blood cell activation
	Arabinogalactan: increased natural killer cell activity
Seasonal Allergies **Asthma**	**Quercetin:** anti-inflammatory, antioxidant, stabilizes mast cells from releasing histamine
	Stinging Nettles: anti-inflammatory
	N-Acetyl Cysteine: antioxidant activity, breaks down the viscosity of mucus
Urinary Tract Infection (Acute)	**Uva Ursi:** antibacterial with confirmed activity against *E. coli* and *Helicobacter pylori (H. pylori)*
	Marshmallow Root: demulcent herb used to soothe the tissue of the urinary tract
	Celery Seed Extract: soothing, cleansing, diuretic, antibacterial properties
Urinary Tract Infection (Prevention)	**Cranberry:** inhibits the binding of *E. coli* to urinary tract tissue to prevent active infection
	Hibiscus: antibacterial activity against *E. coli*, diuretic

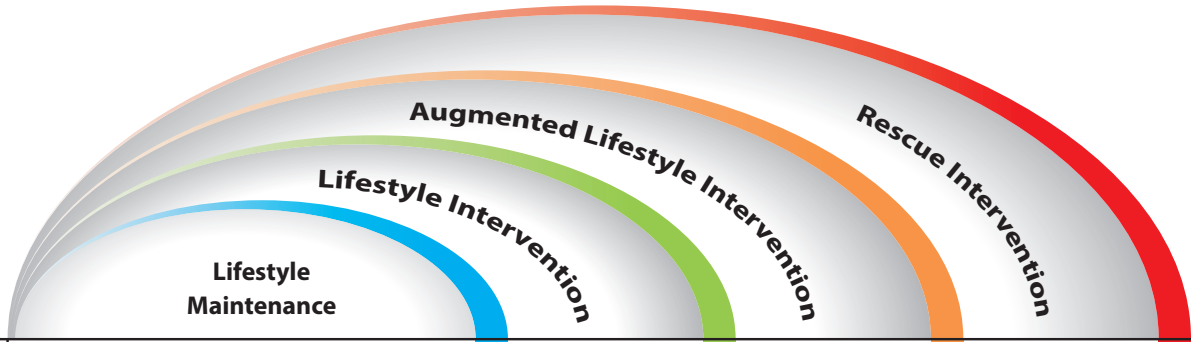



Conclusion

Chronic immune dysfunction can have a significant effect on quality of life. However, as you have seen, many of the underlying factors of disease can be addressed to improve immune function. Immune issues are often blamed on "bad genes," but in fact, it is the interaction of our genes with our environment that determines their expression and function. Our choices in diet and lifestyle, the health of our GI tract, how we manage stress, and our toxic exposures all play pivotal roles in the function of our immune system.

As discussed throughout this handbook, the body has a remarkable resilience and a metabolic reserve that acts as a buffer against disease. It is up to you to provide your body with the right conditions and engage in lifestyle patterns for optimal health and immune system function.

The Prevention to Intervention Hierarchy



	Lifestyle Maintenance	Lifestyle Intervention	Augmented Lifestyle Intervention	Rescue Intervention
Vitamin D Status, Bone & Joint Health	Sun exposure, regular exercise, balanced diet	Sun or light therapy, therapeutic diet, exercise training	Vitamin D supplementation, chiropractic care, physical therapy	Osteoporosis drugs, surgical intervention, pain medications
Stress Management	Adequate sleep, healthy relationships, scheduling downtime	Gratitude journal, Tai Chi, yoga	Targeted supplements, acupuncture, talk therapy	Anti-depressant or anti-anxiety drugs, sleep aids
GI Health	Whole foods diet	Increased fiber & water intake, fermented foods	Probiotic supplements	Antibiotic, antacid or anti-inflammatory drugs
Detoxification	Plant-based diet, adequate hydration	Exercise, infrared sauna, avoiding known toxins	Antioxidant and nutrient supplements to increase detoxification	Heavy metal chelation therapy, drugs to combat toxic symptoms

Adapted from Guilliams, T. Supporting Immune Function: A Lifestyle and Nutrient Approach. Stevens Point (WI): Point Institute; 2014. 12 p.

Recommendations:

Notes:

Lifestyle Matrix

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