**User Guide**

Hello Clinicians!

These surely are unprecedented times. Our public has never been as interested in health as they are now. We have a responsibility to answer the call to provide sound advice for our clients and communities at large. Optimal nutrition is critical for immune and over-all health. Integrative and Functional Medical Nutrition Therapy (IFMNT) provides a deep framework in which to assess and support you clients. Comprehensive training in the specialty is vital to use it in practice most effectively and responsibly. While this resource in no way replaces a full training program, I am extremely excited to provide this useful guide to assist you in support of your clientele.

This is a research-based guide for you as the practitioner. It contains much detailed information and additional sources for further reading and in-depth understanding. This is a clinician’s guide, though you are welcome to modify and hone down to provide a patient friendly handout for your clients. You have my permission to brand as you see fit. We’ve left this as a word doc for easy edit, though we recommend you save as a PDF document before you distribute. I also encourage you to add a copyright designation, to protect your personal version of this document. Of course, if you do, my logo should not appear in your document.

I ask that you review this document carefully and be sure to exclude the clinician notes before distributing to patients/clients. Remember, you want to promote that recommendations are best made tailored to each individual, especially when they are for specific circumstances, like an acute immune assault. You always want your patients personally guided by you whenever possible. This document serves as general information only – be sure they know that. Likewise, be very careful NOT to make any specific Caronavirus treatment claims.

**Again, DO NOT distribute this guide to your patients intact – it MUST be amended.**

**And DO NOT make Coronavirus treatment claims!**

“More information” note sections have been added to provide additional tips and pearls of wisdom. If you decide to include these additional information sections in your patient handout, you may rename as you see fit. Bear in mind, this additional information is at a high level and may not be well understood by all patients. Only you know your clientele to decide.

In the text of the document anywhere is says “qualified healthcare practitioner” (including in the disclaimer), you can substitute the phrase with your name or dietitian/nutritionist. Keep in mind this is not an all-inclusive listing of immune support but covers common items. Feel free to add/subtract as you make this document your own resource.

Lastly, I am so grateful to the support of IFMNT certified practitioners, Bonita Davis RDN and Inessa Makdulina-Nyzio MS, RD, CDN. This document exists only with their generous support for its creation!

Stay safe and well,

A picture containing drawing

Description automatically generatedSusan

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**Founder, Next Level Functional Nutrition**

Maintaining a healthy immune system requires attention to a well-balanced life. With approximately 75% of our immune system located in our gut, a focus on gastrointestinal (GI) health is important. What we put into our body has a direct impact on our immune system. Nutritious food supports a healthy microbiome (healthy gut bacteria); therefore, having a direct influence on immune support. Processed food and other substances such as alcohol, smoking, and even medications can depress or weaken our immune system. While it is important to maintain prescribed dosing of your medication, it is equally important to keep the immune system supported.

**General Nutrition Strategies**

**Food first – Nature has created food with complex unique nutrient profiles, that is difficult if not impossible to replicate. Support for a healthy immune system begins with eating a variety of whole foods.**

* + Eat all colors of the rainbow with a focus on cruciferous vegetables – Cruciferous vegetables contain sulforaphane which has beneficial effects on the immune system. Strive for 8-12 servings of fruits/vegetables each day.
  + Maintain adequate protein – It plays an essential role in building and repairing body tissues.
  + Eat whole grains – They’re packed with protein, fiber, B [vitamins](https://www.webmd.com/vitamins-and-supplements/lifestyle-guide-11/default.htm), [antioxidants](https://www.webmd.com/food-recipes/how-antioxidants-work1), and minerals.
  + Balance healthy fats with a proper fatty acid ratio of omega 6: omega 3 (4:1 respectively) – The Standard American Diet (SAD), heavily laden with omega 6 fatty acids, is out of balance. Increasing omega 3 supports immune health.
  + Get your sweet treat from fruit – Reducing sugar, reduces inflammation; therefore, supporting a healthy gut and immune system. When looking for something sweet, reach for fruit with added vitamins, minerals, fiber, and phytonutrients.
  + Drink filtered water throughout the day – Water helps to flush toxins from your body.
  + Be mindful of dairy as it can increase mucus production leading to increased inflammation.

Sources:

1. Aune D, Giovannucci E, Boffetta P, et al. Fruit and vegetable intake and the risk of cardiovascular disease, total cancer and all-cause mortality—a systematic review and dose-response meta-analysis of prospective studies. International Journal of Epidemiology. 2017;46(3):1029-1056. doi:10.1093/ije/dyw319.
2. Wang X, Ouyang Y, Liu J, et al. Fruit and vegetable consumption and mortality from all causes, cardiovascular disease, and cancer: systematic review and dose-response meta-analysis of prospective cohort studies. Bmj. 2014;349(jul29 3). doi:10.1136/bmj.g4490.
3. Christ A, Günther P, Lauterbach MA, et al. Western Diet Triggers NLRP3-Dependent Innate Immune Reprogramming. Cell. 2018;172(1-2). doi:10.1016/j.cell.2017.12.013.
4. Gutiérrez S, Svahn SL, Johansson ME. Effects of Omega-3 Fatty Acids on Immune Cells. International Journal of Molecular Sciences. 2019;20(20):5028. doi:10.3390/ijms20205028.
5. Nutritionqed. Use the Power of Antioxidants to Take Down Free Radicals! Happy Living. <https://www.happyliving.com/2016/09/02/use-the-power-of-antioxidants-to-take-down-free-radicals/>. Published September 1, 2016. Accessed April 24, 2020.
6. Dr. Kharrazian's 3D Immune Tolerance Program. Dr. K. News. <https://drknews.com/3d-immune-tolerance/?oprid=11842&ref=31020>. Accessed April 24, 2020.
7. Harvard Health Publishing. How to boost your immune system. Harvard Health. <https://www.health.harvard.edu/staying-healthy/how-to-boost-your-immune-system>. Accessed April 24, 2020.

**Lifestyle Factors that Support the Immune System**

**Exercise**

Regular exercise, and reduction in sedentary lifestyle decreased inflammation, Supports healthy blood pressure and overall health. Avoid excess exercise that requires heavy respiration (mouth breathing) as it has been shown to increase upper respiratory infections in elite athletes.

Sources:

1. Gol M, Özkaya B, Yildirim C, Bal R. Regular exercise, overweight/obesity and sedentary lifestyle cause adaptive changes in thiol–disulfide homeostasis. Anais da Academia Brasileira de Ciências. 2019;91(2). doi:10.1590/0001-3765201920180547.
2. Nieman DC, Wentz LM. The compelling link between physical activity and the bodys defense system. Journal of Sport and Health Science. 2019;8(3):201-217. doi:10.1016/j.jshs.2018.09.009.

**Sleep**

Those who get too little or poor-quality sleep are more likely to get sick after being exposed to a virus, i.e. common cold. Lack of sleep can also affect how fast a person recovers.

According to Dr. Eric Olson of the Mayo clinic, “…your immune system releases proteins called cytokines [during sleep], some of which help promote sleep. Certain cytokines need to increase when you have an infection or inflammation, or when you're under stress. Sleep deprivation may decrease production of these protective cytokines. In addition, infection-fighting antibodies and cells are reduced during periods when you don't get enough sleep.” ¹

Research is showing that T cells are more effective with good quality sleep. ² T cells are a type of white blood cell. They have an important role in the [immune system](https://simple.wikipedia.org/wiki/Immune_system) as they attack [virus](https://simple.wikipedia.org/wiki/Virus)-infected cells, foreign cells, and [cancer](https://simple.wikipedia.org/wiki/Cancer) cells.

Sources:

1. Can lack of sleep make you sick? Mayo Clinic. <https://www.mayoclinic.org/diseases-conditions/insomnia/expert-answers/lack-of-sleep/faq-20057757>. Published November 28, 2018. Accessed April 11, 2020.
2. Dimitrov S, Lange T, Gouttefangeas C, et al. Gαs-coupled receptor signaling and sleep regulate integrin activation of human antigen-specific T cells. Journal of Experimental Medicine. 2019;216(3):517-526. doi:10.1084/jem.20181169.

**Stress Management**

Stress serves a purpose in our lives; it can be a motivator. However, when short term (acute) stress turns into chronic stress this weakens the immune system.

Sources:

1. Morey JN, Boggero IA, Scott AB, Segerstrom SC. Current directions in stress and human immune function. Current Opinion in Psychology. 2015;5:13-17. doi:10.1016/j.copsyc.2015.03.007.
2. Glaser R, Kiecolt-Glaser JK. Stress-induced immune dysfunction: implications for health. Nature Reviews Immunology. 2005;5(3):243-251. doi:10.1038/nri1571.

**Use Supplements to Complement Food Intake**

For most, a high quality multi vitamin/mineral supplement serves as a foundation and first step in any supplement plan. After that, additional supplements may be needed to support optimal health. That said, in some instances, taking too much of any one nutrient can cause imbalances and if an antioxidant, may create a pro-oxidant and promote disease.

Continue reading for information on the following nutrients that support immune health.

* Vitamin D, C, A and E
* N-Acetylcysteine (NAC)
* Zinc
* Quercetin
* Lipoic Acid
* Beta-Glucan
* Green Tea/EGCG
* Omega 3 EFA
* Probiotics
* Various herbs

Patient note: When taking supplements use high quality products from professional supplement lines. Proper dosing may be influenced by supplement quality, concentration of active ingredients, and other factors such as laboratory and other assessment methods determining need. For safety and highest benefit potential, it is always advisable to obtain a personalized assessment of supplement needs with a qualified clinician.

Sources:

1. Cooper EL, Ma MJ. Understanding nutrition and immunity in disease management. Journal of Traditional and Complementary Medicine. 2017;7(4):386-391. doi:10.1016/j.jtcme.2016.12.002.
2. Wald M. Corona-Nutrition [video webinar]. <https://www.youtube.com/watch?feature=youtu.be&v=eW7_NDcqz9E> Published March 11, 2020. Accessed April 26, 2020.

**Some of the most important Nutrients for Immune Function**

**Vitamin D**

Sunlight is the most abundant source of Vitamin D. Be smart about sun exposure. If you burn easily, seek the sun during non-peak hours; in general, avoid prolonged sun exposure between 10am-4pm. **Keep in mind** sunscreen blocks 90% of Vitamin D production. Time in the sun depends on the skin tone. 10-20 minutes unprotected exposure is usually sufficient to produce a base amount of D for several days. Production depends on age, hydration status, and genetics as well. Those needing additional Vitamin D support (low lab result) should not rely on sun as a sole source.

**Food Sources** - fatty fish, (tuna, mackerel, and salmon); beef liver, egg yolks, mushrooms; foods fortified with vitamin D, like some dairy products, orange juice, soy milk, and cereals. To get vitamin D from food, fish is a good option. Three ounces of cooked salmon has more than 450 international units (IU).

**Adult RDA:** 600 IU - 800 IU

**Supplementation –** Typical recommended dose800-2000 IU/day of Vitamin D3.¹ In some cases higher doses are needed to compensate for genomic variations which could require supplementation up to 5000 IU/day.

**More Information**

Vitamin D plays a role in immune function. It has been suggested that relatively low vitamin D status during the winter months might explain the higher incidence of influenza in the winter than at other times. A study published in the *British Medical Journal* in 2017 showed how peoplewho had optimal vitamin D levels and whotook vitamin D during the winter had lower rates of flu than people who received fluvaccines.²

Vitamin D plays an important role in the immune system helping to regulate inflammation. “Several studies have associated lower vitamin D status with increased risk and unfavorable outcome of acute infections. Vitamin D supplementation bolsters clinical responses to acute infection. Moreover, chronic inflammatory diseases, such as atherosclerosis-related cardiovascular disease, asthma, inflammatory bowel disease, chronic kidney disease, nonalcoholic fatty liver disease, and others, tend to have lower vitamin D status…” ³

Sources:

1. Gaby A. Vitamin D. In: *Nutritional Medicine*. 2nd ed. Concord, NH: Fritz Perlberg Publishing; 2017:113-124.
2. Martineau AR, Jolliffe DA, Hooper RL, et al. Vitamin D supplementation to prevent acute respiratory tract infections: systematic review and meta-analysis of individual participant data. Bmj. 2017:i6583. doi:10.1136/bmj.i6583.
3. Agrawal D, Yin K. Vitamin D and inflammatory diseases. Journal of Inflammation Research. 2014:69. doi:10.2147/jir.s63898.
4. Nutrient Recommendations: Dietary Reference Intakes (DRI). NIH Office of Dietary Supplements. <https://ods.od.nih.gov/Health_Information/Dietary_Reference_Intakes.aspx>. Accessed April 26, 2020.

**Vitamin C**

As an antioxidant, protects from free radical damage and stimulates the immune system to help protect against infections and cancer. It prevents and combats cold and flu symptoms, and potentially reverses infections. Vitamin C also helps the body detoxify which protects against pollutants.

**Food Sources** - citrus fruit, kiwi, strawberries, papaya, cantaloupe, raspberries, pineapple, greens, parsley, bell pepper, cruciferous veggies (broccoli, brussels sprouts), squash, green beans, carrots

**Adult RDA:** 75mg - 90mg; is a little above what is needed to prevent scurvy (46mg/day).

**Supplementation –** typical recommended dose:

* Linus Pauling Institute recommends 400mg/day
* Vitamin C foundation recommends 3000 mg/day

Take with food to prevent stomach upset.

**More Information**

Vitamin C has reduced the incidence of colds, found beneficial for treating pneumonia. In animal studies it’s been shown to alleviate or prevent infections caused by diverse bacteria, viruses and protozoa. ⁶

**Vitamin C Infusion (IV)**

Sensitive people may experience GI upset (bloating, cramps, diarrhea) with higher doses of Vit C. Once oral tolerance is reached, IV-C is warranted for higher dosing. IV push (bolus) is an alternative to bypass gut. “…in a growing number of general practice and integrative medicine clinics, IV-C is being used effectively to treat a range of infections which are unresponsive to antibiotic therapy. ⁶

Sources:

1. Lobo V, Patil A, Phatak A, Chandra N. Free radicals, antioxidants and functional foods: Impact on human health. Pharmacognosy Reviews. 2010;4(8):118. doi:10.4103/0973-7847.70902.
2. Gaby A. Infectious Diseases. In: *Nutritional Medicine*. 2nd ed. Concord, NH: Fritz Perlberg Publishing; 2017:1248-1250.
3. Payne WG, Naidu DK, Wheeler CK, et al. Wound healing in patients with cancer. Eplasty. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2206003/>. Published January 11, 2008. Accessed April 26, 2020.
4. Ma Y, Chapman J, Levine M, Polireddy K, Drisko J, Chen Q. High-Dose Parenteral Ascorbate Enhanced Chemosensitivity of Ovarian Cancer and Reduced Toxicity of Chemotherapy. Science Translational Medicine. 2014;6(222). doi:10.1126/scitranslmed.3007154.
5. Carr A. Vitamin C Symposium 2019—“Vitamin C for Cancer and Infection: From Bench to Bedside.” Proceedings. 2019;5(1):3. doi:10.3390/proceedings2019005003.
6. Nutrient Recommendations: Dietary Reference Intakes (DRI). NIH Office of Dietary Supplements. <https://ods.od.nih.gov/Health_Information/Dietary_Reference_Intakes.aspx>. Accessed April 26, 2020.

**Vitamin A**

As an antioxidant, Vitamin A protects against oxidation and supports the immune system. A deficiency can lead to an impaired immune response, which can impact infection response and wound healing. ¹

**Food Sources**

**Animal – retinyl palmitate (vitamin A)**

liver, eggs, fatty fish, shrimp, dairy (yogurt, cheese, butter, milk)

**Plant – provitamin A (carotenoids, for example** β-**carotene, converts to vitamin A\*)**

apricots, broccoli, cantaloupe, carrots, dark green leafy vegetables, kale, mango, romaine lettuce, papaya, peas, spinach, sweet peppers, sweet potato, pumpkin, winter squash

**Adult RDA**: 700 – 900 mcg/day

**Supplementation –** typical recommended dosing information:

Found in multi-vitamins or individually. Vitamin A Palmitate may be the best form for immune support.

Take Vitamin A (fat soluble vitamin) with a fat containing meal (at least 10% fat).

Supplementing is generally safe: up to 10,000 IU (3,000 mcg RAE); do not exceed 5,000 IU during pregnancy. ²

**\*More Information**

“β-Carotene is an important dietary source of vitamin A for humans. However, the bioavailability and vitamin A equivalency of β-carotene are highly variable and can be affected by food and diet-related factors, including the food matrix, food-processing techniques, size of the dose of β-carotene, and the amounts of dietary fat, fiber, vitamin A, and other carotenoids in the diet as well as by characteristics of the target population, such as vitamin A status, nutrient deficiencies, gut integrity, and genetic polymorphisms associated with β-carotene metabolism.”³

It is important to know an individual’s genomics in order to make proper food and/or supplement recommendations. Genomics may influence the conversion of β-carotene to Vitamin A.

Sources:

1. Mandal A. Vitamin A Functions. News. <https://www.news-medical.net/health/Vitamin-A-Functions.aspx>. Published February 27, 2019. Accessed April 18, 2020.
2. Gaby A. *Nutritional Medicine*. Concord, NH: Fritz Perlberg Publishing; 2017.
3. Haskell MJ. The challenge to reach nutritional adequacy for vitamin A: β-carotene bioavailability and conversion—evidence in humans. The American Journal of Clinical Nutrition. 2012;96(5). doi:10.3945/ajcn.112.034850.
4. Nutrient Recommendations: Dietary Reference Intakes (DRI). NIH Office of Dietary Supplements. <https://ods.od.nih.gov/Health_Information/Dietary_Reference_Intakes.aspx>. Accessed April 26, 2020.
5. Huang Z, Liu Y, Qi G, Brand D, Zheng S. Role of Vitamin A in the Immune System. Journal of Clinical Medicine. 2018;7(9):258. doi:10.3390/jcm7090258.

**Vitamin E**

Vitamin E is an important fat-soluble vitamin and antioxidant that helps combat inflammation and provides oxidative support. It also supports cell membrane integrity and helps protect against DNA damage.

**Food Sources -** spinach, swiss chard, turnip greens, asparagus, beet and mustard greens**;** nuts/seeds (sunflower, almonds, hazel nuts);oils (watch rancidity);fatty fish(sardines), shrimp;olives/avocados

**Adult RDA:** 15mg/day

**Supplementation –** For most effective support, choose natural Vitamin E as tocotrienols from Annatto (DeltaGold®).Typical recommended dose: 100 -300 mg.

Note: Vitamin E is very complimentary with Vitamin C as they work hand in hand in antioxidant defense and immune boosting. While dietary supplements in general work fine in their synthetic form, Vit E is different. It’s important to only use the natural version. Again, tocotrienols are the preferred form (especially delta and gamma isomers), though many multi-vitamins and stand-alone vitamin E supplements contain tocopherol sources. With tocopherol, natural is always listed as the "d-" form (d-alpha tocopherol for example) Synthetic vitamin E is listed as "dl-" forms. Never use the synthetic form! When using a supplement with natural tocopherols, it is best to have a mixed source containing alpha-, beta-, gamma-, and delta-tocopherols, instead of alpha-tocopherol alone. Some multivitamins have a mix of tocopherol and tocotrienols, though they do not provide as much benefit as tocotrienols alone. When taking a stand alone tocotrienol supplement, be sure to take it at a different time of day than any multivitamin containing tocopherols. Be sure to take Vitamin E with a fat food source, as is the case with all fat-soluble vitamins. Measurement of Vit E is found in IU and mg. Typically only alpha tocopherols are in International Units (IU), while other tocopherols and tocotrienols are listed in milligrams (mg). ¹

**More Information**

“[Vit E] has been shown to enhance immune responses in animal and human models and to confer protection against several infectious diseases. Suggested mechanisms involved with these changes are (1) the reduction of PGE2 production by the inhibition of COX2 activity mediated through decreasing NO production, (2) the improvement of effective immune synapse formation in naive T cells and the initiation of T cell activation signals, and (3) the modulation of Th1/Th2 balance.”²,3

The use of tocotrienols can function as a powerful proteasome modulator, while increasing the immune system’s ability to fight inflammation. alpha-, gamma and delta-tocotrienols strongly inhibited the inflammatory response using such markers as chymotrypsin, trypsin and tumor necrosis factor-α (TNF-α), with delta-tocotrienol being the most effective. 4

Tocotrienols (esp. γTE-gamma) tocotrienol function more efficiently than tocopherols in inhibiting key transcription factors such as NF-κB and STAT3 (Signal transducer and activator of transcription 3) from activation.5

Sources:

1. Office of Dietary Supplements - Vitamin E. NIH Office of Dietary Supplements. <https://ods.od.nih.gov/factsheets/VitaminE-HealthProfessional/>. Accessed April 26, 2020.
2. Lee G, Han S. The Role of Vitamin E in Immunity. Nutrients. 2018;10(11):1614. doi:10.3390/nu10111614.
3. Qureshi, A.A., et al., Tocotrienols inhibit lipopolysaccharide-induced pro-inflammatory cytokines in macrophages of female mice. Lipids Health Dis, 2011. 9(1): p. 143
4. Qureshi, A.A., et al., Impact of delta-tocotrienol on inflammatory biomarkers and oxidative stress in hypercholesterolemic subjects. Clin. Exp. Cardiology, 2015. 6(4): p. 1000367
5. Kannappan R, Yadav VR, Aggarwal BB. γ-Tocotrienol but Not γ-Tocopherol Blocks STAT3 Cell Signaling Pathway through Induction of Protein-tyrosine Phosphatase SHP-1 and Sensitizes Tumor Cells to Chemotherapeutic Agents. Journal of Biological Chemistry. 2010;285(43):33520-33528. doi:10.1074/jbc.m110.158378.

**N-Acetylcysteine** **(NAC)**

Cysteine is considered a semi-essential amino acid because your body can produce it from other amino acids, namely methionine and serine. It becomes essential only when the dietary intake of methionine and serine is low. NAC is essential for making glutathione, which is the most powerful antioxidant in your body.¹ NAC could be at risk for being low in those that consume a low protein diet, i.e. vegetarian, vegan; or with absorption issues such as those found in IBS, Crohn’s, Celiac diseases.

**Food Sources -** Cysteine is found in most high-protein foods, such as chicken, turkey, yogurt, cheese, eggs, sunflower seeds and legumes.

Serine is found in soybeans, nuts (especially peanuts, almonds, and walnuts), eggs, chickpeas, lentils, meat, and fish (especially shellfish).

**Supplementation** - NAC as a supplement form of cysteine. Typical recommended dose: 600-1200 mg per day.

**More information**

N-Acetylcysteine (NAC) is an antioxidant and a precursor to glutathione, which is one of the major antioxidants in lung tissue. There is evidence that oxidative stress contributes to the pulmonary damage that may result from influenza. Administration of NAC decreased mortality in mice infected with influenza virus as well as enhanced the efficacy of antiviral drugs in influenza-infected mice. ² In a double-blind trial, administration of NAC during the flu season reduced the frequency and severity of symptomatic influenza episodes. This improvement was not due to a reduction in the number of infections but, rather, to a decrease in the number of infections that caused symptoms. ³ Note – May consider Glutathione supplement proper - 100mg/once or twice a day (important: take away from food!)

Sources:

1. Top 9 Benefits of NAC (N-Acetyl Cysteine) - Healthline. <https://www.healthline.com/nutrition/nac-benefits>. Accessed April 11, 2020.
2. Gaby A. Infectious Diseases. In: *Nutritional Medicine*. 2nd ed. Concord, NH: Fritz Perlberg Publishing; 2017:1248-1250.
3. Garozzo A, Tempera G, Ungheri D, Timpanaro R, Castro A. N-Acetylcysteine Synergizes with Oseltamivir in Protecting Mice from Lethal Influenza Infection. International Journal of Immunopathology and Pharmacology. 2007;20(2):349-354. doi:10.1177/039463200702000215.

**Zinc**

Zinc serves many roles including the support of a strong immune system. Zinc deficiency can lead to poor wound healing and lower disease resistance.

**Food Sources -** Excellent sources of zinc include seafood (cooked oysters), beef, lamb, spinach, cocoa powder, pork, chicken, oatmeal, tofu, cashews, pumpkin seeds, squash seeds, sunflower seeds, peanuts, lentils, chickpeas, mushrooms.

**Adult RDA:** 8 -11mg/day

**Supplementation** – Typical recommended dose: Zinc (15-30mg); Note: Chelated forms may be best absorbed (picolinate as an example). Zinc gluconate may be best for children – lozenges is an option.

**More information**

Zinc is an antiviral on two different levels. It is an essential mineral, is indispensable for cell division, growth and development. It also helps to produce hormones, break down carbohydrates from foods, and maintain the immune system.

A strong anti-inflammatory agent, zinc is also antioxidant – meaning that it has the power to scavenge and neutralize disease-causing free radicals. Research has shown that zinc fights viruses in two ways, by not only being a direct antiviral, but it also stimulates antiviral activity.

**The following are potential Zinc nutrient interactions:**

**Copper -** Taking large quantities of zinc (50 mg/day or more) over a period of weeks can interfere with copper bioavailability. Since copper supports the immune response, taking a balanced formula with both zinc and copper may be advisable. Then again, there are those with excess copper status who may not require additional copper. It may be best to assess copper status to best know if extra copper is needed.

**Iron -** Supplemental (38-65 mg/day of elemental iron) but not dietary levels (from food) of iron may decrease zinc absorption.

**Folic Acid** - The bioavailability of dietary folate is increased by the action of a zinc-dependent enzyme, suggesting a possible interaction between zinc and folic acid.

Sources:

1. Gaby A. *Nutritional Medicine*. Concord, NH: Fritz Perlberg Publishing; 2017.
2. Nutrient Recommendations: Dietary Reference Intakes (DRI). NIH Office of Dietary Supplements. <https://ods.od.nih.gov/Health_Information/Dietary_Reference_Intakes.aspx>. Accessed April 26, 2020.

**Quercetin**

The polyphenol, Quercetin, is a powerful antioxidant, anti-histamine and anti-inflammatory, and is the most prominent of over 5,000 flavonoid compounds found in food. Flavanoids in general can have an immunimodulating effect and Quercetin has a potential role in modulating immune system responses.1 As such, quercetin may be a key player in an immune support regimen.

**Food Sources -** apples, onions, blueberries, kale, tea, and broccoli

**Supplementation –**

**More information**

In animal studies, quercetin modulated the expression of Th2 cytokines including IL-4 and IL-5. These cytokines play a role in switching IgE class and suppressing the degranulation/secretion of different chemical mediators from activated mast cells thereby reducing airway allergic inflammation. In addition, Quercetin supported inhibition of nuclear transcription factor kappa B (NF-kappa B) and the inhibition of mucus production in the lung.2,3

Sources:

1. Hosseinzade A. et al. Immunomodulatory Effects of Flavonoids: Possible Induction of T CD4+ Regulatory Cells Through Suppression of mTOR Pathway Signaling Activity. Front. Immunol., 31 January 2019 | <https://doi.org/10.3389/fimmu.2019.00051>
2. Rogerio AP, et al. Anti-inflammatory effect of quercetin-loaded microemulsion in the airways allergic inflammatory model in mice. Pharmacol Res. (2010) 61:288–97. doi: 10.1016/j.phrs.2009.10.005
3. Gupta K, et al. Reversion of asthmatic complications and mast cell signalling pathways in BALB/c mice model using quercetin nanocrystals. J Biomed Nanotechnol. (2016) 12:717–31. doi: 10.1166/jbn.2016.2197

**Alpha lipoic acid (ALA)**

ALA has sulfur-containing compounds that support a strong immune system. ALA helps regenerate other antioxidants, and specifically stimulates glutathione production. Glutathione is the master antioxidant.

ALA can help with diabetic neuropathy, blood sugar control, and enhanced insulin signaling.

**Food Sources -** organ meats, spinach, broccoli, tomatoes, peas

**Supplementation -** Typical recommended dose: 100-600mg per day. Take 30 minutes prior to a meal for best absorption. May be taken with a meal to reduce possible GI disturbance.

**More information**

According to the Linus Pauling Institute, “…. lipoic acid in [supplements](https://lpi.oregonstate.edu/mic/glossary#supplement) is not bound to [protein](https://lpi.oregonstate.edu/mic/glossary#protein) [as it is in food sources]. Moreover, the amounts of lipoic acid available in dietary supplements (50-600 mg) are likely as much as 1,000 times greater than the amounts that could be obtained from the diet.

Sources:

1. Nutritionqed. Use the Power of Antioxidants to Take Down Free Radicals! Happy Living. https://www.happyliving.com/2016/09/02/use-the-power-of-antioxidants-to-take-down-free-radicals/. Published September 1, 2016. Accessed April 24, 2020.
2. Lipoic Acid. Linus Pauling Institute. https://lpi.oregonstate.edu/mic/dietary-factors/lipoic-acid#food-sources. Published January 1, 2020. Accessed April 7, 2020.

**Beta-Glucan**

A fiber in the cell walls of cereals (oats, barley), certain types of mushrooms, yeasts, seaweed, algae. A lesser amount is found in wheat, rye, and sorghum. ¹ Beta-Glucans are thought to regulate the immune system as they pass through the intestinal tract. ² Immune regulation is thought to be from mushroom sources. ³

**Food Sources –** barley, oats, mushrooms (reishi, shiitake, maitake), yeasts, seaweed, algae, wheat, rye, sorghum

* 1.5 cups of cooked oatmeal contain 3 g of beta-glucans
* 1 cup of cooked pearl barley contains approximately 2.5 g of beta-glucans

**Supplementation** – Typical recommended dose: 250-500mg/day. Take first thing in the morning or last thing at night (before or well after a meal), with a full 8 oz glass of water. ⁴

**More Information**

Especially the *Coriolus versicolor* mushroom (known as yun zhi in China) “β-Glucans have been shown to enhance immune responses for centuries, which contributes to their anti-tumor property. However, their mechanisms of action are still elusive. Dectin-1, the C-type lectin receptor for β-glucan, is expressed abundantly on dendritic cells (DCs). Activation of DCs via Dectin-1 can lead to the maturation of DC, inducing both innate and adaptive immune responses against tumor development and microbial infection. In this study, we found that particulate yeast-derived β-glucans could induce the maturation of murine dendritic cell line D2SC/1 cells and increase the expression of mGITRL on D2SC/1 cells via Dectin-1/Syk pathway in a dose dependent manner. Furthermore, we demonstrated that the increased mGITRL on D2SC/1 cells could impair the suppressive activity of CD4(+)CD25(+) regulatory T cells (Tregs) and enhance the proliferation of CD4(+)CD25(-) effector T cells (Teffs). These findings suggest that particulate β-glucan can be used as immunomodulator to stimulate potent T cell-mediated adaptive immunity while down-regulate immune suppressive activity, leading to a more efficient defense mechanism against tumor development or infectious diseases.” ⁸

Sources:

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**Green Tea/EGCG**

There is accumulating evidence of immune benefits from consuming green tea or its active ingredient EGCG.¹ The [anti-inflammatory](https://www.healthline.com/nutrition/13-anti-inflammatory-foods) and antioxidant effects of EGCG are thought to be one of the main reasons for its role in disease-prevention.²

**Food Source**s – EGCG is primarily found in green tea. Additional food sources include:

**Teas** (white, oolong, black)

**Fruits:** cranberries, strawberries, blackberries, kiwis, cherries, pears, peaches, apples, and [avocados](https://www.healthline.com/nutrition/12-proven-benefits-of-avocado)

**Nuts:** pecans, pistachios, and hazelnuts

**Supplementation** – Typical recommended dose: Eight ounces of brewed green tea typically contains about 50–100 mg of EGCG. ³

One group of researchers suggested a safe intake level of 338 mg of EGCG per day when ingested in solid supplemental form, and 704 mg EGCG/day in beverage form.⁴

**More Information**

In case reports and a clinical trial, administration of green tea extracts containing epigallocatechin gallate (EGCG; one of the major green tea polyphenols) appeared to induce partial remission in some patients with early stage chronic lymphocytic leukemia or other low-grade B cell malignancies. Administration of green tea catechins also reduced the incidence of prostate cancer in men with high-grade prostatic intraepithelial neoplasia (the main premalignant lesion that leads to prostate cancer). In addition, treatment with a green tea extract prevented the development of new colorectal adenomas in patients with a history of colorectal adenomas, suggesting that green tea might help prevent colorectal cancer.

After a report was published indicating that EGCG induced apoptotic cell death in leukemic B cells from patients with chronic lymphocytic leukemia (CLL), many patients with CLL and other low-grade lymphomas began using products containing tea polyphenols. The authors of this report are aware of 4 patients with low-grade B cell malignancies (3 with chronic lymphocytic leukemia and 1 with B cell lymphoma) seen in their clinical practice who began oral self-treatment with EGCG-containing products and appeared to have an objective clinical response shortly thereafter. Three of these patients met standard criteria for a partial response. Some of the patients had steady clinical, laboratory, and/or radiographic evidence of disease progression prior to taking green tea products. Spontaneous remission/regression is rare in patients with low-grade B cell malignancies.

Green tea extract inhibited the growth of influenza virus *in vitro*. The inhibitory effect appeared to be due at least in part to (-)epigallocatechin, one of the major catechin molecules in green tea. In a study of elderly nursing home residents, gargling with an aqueous solution of green tea catechins 3 times per day reduced the incidence of influenza.

One hundred twenty-four elderly residents of a nursing home in Japan (mean age, 83 years) gargled 3 times per day with an aqueous solution of green tea catechins (polyphenon E; 200 μg/ml) or with a control solution for 3 months during the winter. The concentration of catechins in the gargles of the active-treatment group was half that of commercial green tea beverages. It was not stated whether the study was randomized or blinded. All study participants received an influenza vaccine. The incidence of influenza during the study was significantly lower in the active-treatment group than in the control group (1.3% vs. 10.4%; p < 0.03). No adverse effects were reported.

In a double-blind study, administration of a proprietary green tea extract (1 capsule twice a day for 3 months) reduced the number of days with cold or flu symptoms by 35.6%, compared with placebo (p < 0.002), in healthy volunteers (mean age, 30 years). However, it was not stated how many of the illnesses were colds and how many were influenza. In another double-blind trial, the combination of green tea catechins and theanine (a compound present in green and black tea) decreased the incidence of influenza in healthcare workers.

One hundred ninety-seven healthcare workers in Japan were randomly assigned to receive, in double-blind fashion, capsules providing daily 378 mg of green tea catechins and 210 mg of theanine or placebo for 5 months, from November to April. The proportion of participants who developed influenza (diagnosed clinically) was significantly lower by 69% in the active-treatment group than in the placebo group (4.1% vs. 13.1%; p = 0.022).

Sources:

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**Fish Oil – Omega 3s**

Omega 3 fatty acids are long known for their anti-inflammatory support. Both the innate and adaptive immunity can be regulated by the levels we have of Prostaglandin E, an inflammatory compound produced in the presence of an imbalance of essential fatty acids. It is therefore prudent to prevent deficiency and strive for a balance of omega 3s.

**Food Sources –** Fatty fish such as salmon and sardine. Wild caught is recommended over farm raised.

**Supplementation** – Typical recommended dose: 1-3.5 g per day taken with a meal containing fat.

**More Information**

Studies with healthy human volunteers - decreased production of PGE2 and 4 series‐LTs by inflammatory cells following use of fish oil supplements for a period of weeks to months. Similar effects of fish oil are seen in patients with chronic inflammatory diseases such as RA and IBD. Further, Animal studies give evidence that the interplay between gut microbiota, omega-3 fatty acids, and immunity helps to maintain intestinal wall integrity and interacts with host immune cells

Additionally, studies in humans showing that oral marine n‐3 PUFAs decreases arachidonic acid‐derived eicosanoids have usually used high intakes of EPA + DHA, often several grams per day.

Dose–response indicated EPA intake of 1.35 g day–1 for 3 months was not sufficient to influence ex vivo PGE2 production, whereas an EPA intake of 2.7 g day–1 did significantly decrease PGE2 production

Omega 3 metabolites more recently discovered, called Pro-resolving mediators (PRMs) and their specialized Mediators metabolites (SPMs) have been found to be of significant importance in supporting proper immune defense and response to inflammation. Several professional line supplement manufacturers are now producing special SPM supplements that may be more targeted than standard fish oil supplements in supporting immune.

Sources:

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**Probiotics**

Probiotics cause the mucosal immune system in the intestinal tract to secrete protective immunoglobulins such as secretory IgA and a host of protective defensives against bacteria. Alter the function of the mucosal immune system to make it more anti-inflammatory and less pro-inflammatory; specifically, can stimulate dendritic cells to make them slightly less responsive and less reactive to bacteria within the lumen. ¹

Examples of immune supporting Probiotic strains:

* *Lactobacillus rhamnosus* GG.
* Combination of *L. rhamnosus* GG and *Bifidobacterium animalis* ssp. *lactis* BB-12.
* Combination of *L. acidophilus* DDS-1 (NCIMB 30333) and *B. lactis* UABLA-12 (NCIMB 30334).
* *L. casei* Shirota.
* *Bacillus Subtilis*
* *Lactobacillus acidophilus NCFM.*
* *Lactobacillus fermentum.*

Source:

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**Herbs to Support the Immune Support**

It is suggested that those with a strong immune system are best prepared to prevent the cold/flu. Any remedy is most effective when beginning at the first sign of symptoms. Always consider drug/nutrient/herbal interactions and the potential for allergy to herbs.

**Echinacea**

Stimulates the immune system, supports respiratory health, and aids in the prevention of upper respiratory tract infections.

Used topically to enhance wound healing and treat eczema, psoriasis and other skin conditions.

**Supplementation** - Dosing varies by conditions:

* For treatment of colds, 5 mL twice daily for 10 days is recommended.
* For influenza, 200 mg daily for 15 days, then 100 mg daily for 15 days, followed by 100 mg every other day for 60 days.
* Use caution for use with autoimmune patients.

**Elderberry (Sambucus nigra L.)** May be prudent to discontinue during an active COVID infection. Controversial if it stimulates a cytokine storm, an increased and harmful inflammatory response.

Elderberry is an anti-inflammatory herb.

* Severity of influenza symptoms
* Winter tonic Elderberry (Sambucus nigra L.) is traditionally used for respiratory infections, and clinical trials have confirmed its efficacy in the treatment of influenza. Elderberry is also used to treat sinusitis, bronchitis, and cough.

Administration of an elderberry extract decreased the number of colds by 29% , the number of days with cold symptoms by 52%, and mean symptom severity by 58%.

**Supplementation**

600–900 mg/day of an extract standardized to contain 22% polyphenols and 15% anthocyanins.

May not be appropriate for people with elder pollen allergies.

**Garlic**

Garlic has a wide variety of health benefits. It contains compounds that help to support the immune system. Whole garlic can be crushed or chewed in order to produce allicin, which quickly converts to other sulphur-containing compounds that provide health benefits. Before cooking with crushed garlic, let it stand for 10 minutes. This may help maximize the health benefits of garlic. Studies also show benefits from taking aged garlic extract.

**Supplementation**

2-3 cloves (about 8g) of garlic/day can provide immune health benefits.

As a supplement – most studies use a dosage of 600-1200mg/day.

While moderate dietary intake of garlic does not reduce platelet aggregation or adversely interact with Warfarin, higher doses (2,400-7,200mg of aged garlic extract) may do so.

Sources:

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Nantz M.P. Supplementation with aged garlic extract improves both NK and γδ-T cell function and reduces the severity of cold and flu symptoms: a randomized, double-blind, placebo-controlled nutrition intervention. Clin Nutr. 2012;31(3):337–344. doi: 10.1016/j.clnu.2011.11.019

**A General Immune “Tonic”**

* Put the following in a blender:
  + Juice of 1 fresh lemon
  + 1 cup apple cider vinegar (with the mother)
  + 1 cup raw honey
  + 8 cloves garlic
* Mix on high speed for 60 seconds. Pour mixture into a glass container. Seal and leave in the refrigerator for five days. (discard after)
* If not blended, be sure to crush garlic
* Normal dosage is two tsp. in a glass of water or small amount of fruit juice daily
* Optional additional ingredients: ginger, cayenne pepper, curcumin/turmeric, fresh lemon

**Additional Considerations:**

**(Clinicians, feel free to share with your patients as you see fit)**

* Meditate daily (see life-force energy, green light, and immune strength pouring into your body from all angles). Your mantra "I am the master of my reality (immune system). I radiate health. Fear has no power over me. My body and immune system support me perfectly, and all is well."
* Immune altering effects of 5G wireless technology is in question. Until we know more, anyone questioning their sensitivity should avoid expose to 5G as much as possible. Consider turning off your internet in the home at night. Likewise, some patients have an increased electrical sensitivity and may benefit from turning off fuses or electoral current in the room they sleep in.
* Social isolation during a pandemic is important but so also is love and human touch! I do not recommend avoiding contact with loved ones at this time (unless they need to be in complete isolation) - in fact, share all the touching/massage (light if you’re ill) that you can!
* Consider Grounding (also called Earthing). Weather allowing, walk barefoot on sand or dirt/grass (no pesticides) daily if possible. Grounding can neutralize fee radical, generated through infection, inflammation, cell damage, trauma/stress, and our toxic environment. It may also improve sleep, reduce inflammation and support immunity. More here: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3265077/>
* Epsom salt baths: increase magnesium absorption through the skin (allows to compensate for the magnesium that’s depleted through the stress response), additionally the sulfur permits the body to detoxify adequately. Assists with body aches associated with infections and excess lactic acid production post exercise.
* A Holistic Pediatrician’s Guide to the Pandemic - Healthy Kids Happy Kids: <https://healthykidshappykids.com/pandemic-masterclass-replay-2/>
* Useful overview resources of nutritional support for Coronavirus can be found here:

1. <https://onlinelibrary.wiley.com/doi/full/10.1002/jmv.25707>

2. <https://theana.org/COVID-19>

**Special notes – The remainder of this document is FOR CLINICIANS ONLY:**

Under extreme immune assault, the following are examples of protocol suggestions used by some functional medicine practitioners. Consider making these recommendations ONLY if you feel comfortable doing so. If you have any hesitation, do NOT make high dose supplement recommendation. Please refer to another practitioner well trained in high-dose supplement intake and monitoring.

1. Vit D - bolus 25,000-50,000 IU, for one day; then for the next day or two, 20,000, then back to 5,000 after that. Take with food containing fat.  Be sure to balance with magnesium - if deficient, heart palpitations may be a risk factor.
2. Vitamin A (real, not beta carotene) - bolus 50,000 IU for one day, then 20,000 for the next 2 days, then 10,000 after that (account for any amount already in a multi vitamin). Take with meal containing fat.
3. Zinc chelate - bolus 50mg (separate from the vit A), for one-two days, then back to 20-25mg for the duration of illness. No less than 15mg during an acute assault. Take with food (though doesn't have to be fat containing). Remember, long term higher dose zinc may also require copper to balance. Check copper and ceruloplasmin status to know for sure.
4. (Buffered) Vitamin C - 500mg-1g every hour - or to bowel tolerance. Consider 1000mg, 4-5 times a day during acute symptoms. Continue to take no less than 2000 mg per day - Use this and magnesium to keep bowels open in general, and as needed. Higher doses can be done for 1-3 days in acute situations. Liposomal C can offer additional benefits as it crosses into the bloodstream more effectively. Has benefits for viral infections and allergies by stabilizing mast cells, possibly reducing the risk of a cytokine storm. NOTE: Higher dose C (above bowel tolerance) should be administered through IV. In general, IV administered nutrients offer a bypass to gastrointestinal issues that can interfere with absorption of orally administered supplements.
5. Iodine - Lugol's liquid 2% - one drop in 8 oz water 3 days straight (this is a conservative amount by many standards). After that, maybe once a week, unless you are eating a ton of fish/sea veggies. Be sure to have adequate selenium when supplementing iodine. (max selenium supplementation from all sources 400mcg/day.). Note: Under supervision of a doctor, this may be included in a special nebulizer protocol, along with saline solution and food grade hydrogen peroxide. More information here: <https://stopthethyroidmadness.com/iodine12345/>
6. Melatonin twice a day can be useful to prevent cytokine storm. Even doses as high as 10 mg twice a day may be considered. Some recommend a liposomal version.
7. The polyphenol, Resveratrol, found in red wine, grapes, and berries is a potent antioxidant (reducing oxidative stress) and stimulator of Sirt1 (supporting longevity). It can also reduce nucleocapsid production, which is what most coronaviruses need to survive and spread. Resveratrol also has anti-inflammatory properties (reducing cytokine expression), and may help modulate ACE2 expression, which may provide further support against the damaging effects of the virus. While not direct research exists on Covid19 specifically, the addition of resveratrol supplementation in an immune support regimen may be considered. A specific form, trans-resveratrol may be more bioavailable. More here on resveratrol: <https://www.ncbi.nlm.nih.gov/pubmed/32338224> and here: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5307780/>
8. Hypertension - or high blood pressure - is the largest comorbidity to COVID-19. If you have hypertension, your risk of death due to Coronavirus increases dramatically! NOS3 is important because it produces nitric oxide, which dilates the blood vessels and decreases blood pressure. If for any reason (gene SNPs, diet, oral microbiome, low HCl) one has low NOS function, it increases vulnerability. COVID-19 blocks NOS3 (which means even less nitric oxide) **and**converts it into radicals that harm the body even more. it’s especially important for you to learn about and implement lifestyle, diet, and supplement strategies to support NOS3, especially if you have the negative gene variants.
9. Additional herbs to consider: 1) Lobelia tincture to support respiratory 2) Yin Chiao. as a general immune support. Follow Label instructions.  One can always be allergic/sensitive to herbs - always start low dose.
10. Homeopathics to consider: 1) V-Clear EPs 7630 - an upper respiratory homeopathic. 2) Oscilloccinum for flu symptoms. In general, homeopathics should be started at first sign of symptoms. Take as directed on label. As with all homeopathics, no food, alcohol, tea, mint for 15 mins on either side of administration.
11. Additional immune support to consider: Immunoglobulin G (IgG) or colostrum. IP-6 and inositol. Mitake Mushroom extract, and the herb Cat’s claw. You may find these 3 in combination. Quercetin works as a natural histamine and also have high antioxidant value.
12. Similar to Mitake, Reishi and Shitake mushrooms can also help modulate the immune response. Shiitake mushrooms may be particularly helpful for those who have negative genetic variants for the mannose-binding lectin (MBL2) gene, which may increase risk for inflammation and a weakened immune system.
13. Genetic/genomic influences may affect one’s vulnerability to immune assault. Consider learning more in this area or referring to a health professional well trained in this specialty for further assessment.

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