Dynamic Chiropractic

VITAMINS / SUPPLEMENTS

Nutrition and Immunity: An Evidence-Based Review (Pt. 1)

James P. Meschino, DC, MS

Preventing viral-induced respiratory tract infections largely depends on the efficiency of the body's immune system. Should a patient develop a viral-induced respiratory tract infection, having an immune system that is working optimally has been shown to prevent the infection from becoming more virulent in many cases. All experts agree that a decline in immune function makes us more susceptible to respiratory tract infections, and allows these infections to become both more virulent and more life-threatening.[1-2]

There is a decline in immune system function as we age, which explains why the elderly and people with compromised immune systems are more susceptible to life-threatening respiratory tract infections.[3-4] However, there are a host of factors that can weaken the immune system at any age; and by the same token, some key nutritional and lifestyle factors that can help strengthen and optimize our immune function.

Factors Known to Weaken the Human Immune System

1. *Aging* (after 55-60 years of age). Why? Here are a few of the reasons:

- The thymus gland undergoes involution with aging, which results in T-cell lymphocyte dysfunction.
- Free-radical damage accumulates, which damages immune cells and leads to immunosuppression. (This can be slowed and/or reversed to some degree with the use of certain antioxidant supplements.)
- Decreased respiratory bursts (HOOH) within neutrophils by age 60 (higher amounts of vitamin C intake has been shown to help neutrophils recover some of this capability).[3-4]

2. *Drugs*: corticosteroids (prednisone), TNF-inhibitors for autoimmune disease (e.g., Humira, Remicade), anti-rejection drugs used by transplant patients (e.g., cyclosporin)[5]

3. *Compromised immune states*: HIV infection, overtraining with your workouts, diabetes, etc.[6]

4. *Depression and stress*: feeling hopeless, high cortisol levels, etc.[7]

5. *Nutritional deficiencies*.[8]

Important Ways to Maintain a Healthy Immune System

1. *Getting Sufficient Sleep*. Sleep and the circadian system exert a strong regulatory influence on immune function.[9]

2. *Avoiding Overtraining*. Light to moderate exercise strengthens immunity, but overexertion and overtraining weakens immunity, even in high-performance athletes (who report more upper respiratory tract infections than sedentary controls).[10]

Micronutrients and Immunity: Vitamin C and Other Antioxidants

Immune cells have a high requirement for antioxidants – especially vitamin C, vitamin E and beta-carotene. Many immune cells (i.e., neutrophils) use these antioxidants to generate reactive oxygen species (ROS) or free radicals (ROS) to kill viruses and other microbes. Immune cells also require antioxidants to protect themselves against the ROS they produce.

With suboptimal antioxidant status, immune cells cannot kill viruses as effectively and cannot protect themselves from the ROS they generate. The high ROS levels, in turn, damage immune cells and become less effective or immunosuppressed.

As an example, a 2017 study reviewed all the available studies looking at the role of vitamin C on the immune system. The researchers cited the body of evidence showing that ingestion of 250 mg per day of vitamin C in otherwise healthy people helps to enhance many important aspects of immune function.

The goal is to achieve a vitamin C blood level above 50 umol/L, which most healthy people can achieve with a daily intake of 100-250 mg of vitamin C.

This can be difficult to do from food alone and thus, vitamin C supplementation is an important consideration in achieving and maintaining optimal vitamin C status and immune function over our lifetime.

As we get older and immune function declines, some studies suggest the combination of 1,000 mg of vitamin C and 200 IU of vitamin E per day improves immune function in people over 60. Thus, higher doses are required as we age.

Studies also show that when fighting the common cold, supplementation with 200 mg per day of vitamin C can help reduce severity and duration, and actual incidence of the common cold if we are also exposed to physical stress. This level of vitamin C intake may also reduce common cold frequency in those who previously had lower vitamin C blood levels (below 45 umol/L).

Very importantly, higher levels of intake (1,000 mg vitamin C per day) have been shown to prevent the decline in vitamin C depletion within white blood cells during an infection. Here is a quote from the review paper itself regarding lung infections, pneumonia and vitamin C:

"Beneficial effects of vitamin C on recovery have been noted in pneumonia. In elderly people hospitalized because of pneumonia, who were determined to have very low vitamin C levels, administration of vitamin C reduced the respiratory symptom score in the more severe patients. In other pneumonia patients, low-dose vitamin C (250-800 mg/day) reduced the hospital stay by 19% compared with no vitamin C supplementation, whereas the higher-dose group (500-1600 mg/day) reduced the duration (hospital stay) by 36%. Vitamin C supplementation also showed a positive effect on the normalization of chest X-ray, temperature, and erythrocyte sedimentation rate (a marker of inflammation and infection). Since prophylactic vitamin C administration also appears to decrease the risk of developing more serious respiratory infections, such as pneumonia, it is likely that the low vitamin C levels observed during respiratory infections are both a cause and a consequence of the disease."

This means that during an infection, vitamin C turnover occurs more rapidly as immune cells draw down on their vitamin C stores to fight the infection. As vitamin C becomes more and more depleted within immune cells, they become less and less effective, allowing more serious infections such as pneumonia to take hold and progress.

As the researchers so aptly conclude, "Thus, it is apparent that vitamin C is necessary for the immune system to mount and sustain an adequate response against pathogens, whilst avoiding excessive damage to the host."[11]

Vitamin D

An excellent review of how vitamin D works to strengthen the immune system against acute respiratory tract infections was published in the *Journal of Infectious Diseases* in 2010. Researchers performed a placebo-controlled, double-blind study involving 164 young Finnish men (18-24 years of age) undergoing compulsory periodic military training. Men given 400 IU of vitamin D per day during the six-month training period had significantly fewer respiratory tract infections and related fewer days of absenteeism from training compared to the recruits who ingested the placebo.

There have been a number of vitamin D intervention trials like this, using vitamin D dosages as high as 4,000 IU per day. Some studies have shown a protective effect against respiratory tract infections and some have not. What seems to be a fairly consistent finding is that individuals who have a blood vitamin D level above 80 nmol/L show greater resistance to upper respiratory tract infections; and that those with low blood levels of vitamin D (especially below 25 nmol/L) appear to be at much higher risk.

The researchers explained a novel way in which vitamin D affects immunity with respect to the prevention of respiratory tract infections. They explain that immune cells which line the respiratory tract have vitamin D receptors, which allows vitamin D to enter these immune cells. Once inside the immune cell, vitamin D is converted to a more potent form of vitamin D, which is then transported into the nucleus of the cell.

Within the cell nucleus, vitamin D modulates specific genes involved in immunity. One of the gene effects is that vitamin D increases the secretion of a virus-killing molecule known as cathelicidin. As immune cells interact with various microbes, including viruses, in the respiratory tract, cathelicidin punctures a hole in the viral and/or bacterial cell membrane, destroying the invader and thus preventing infection. As such, lower vitamin D blood levels result in lower secretions of cathelicidin, with resulting reduced anti-viral fighting abilities of the immune cells that line the respiratory tract.

As such, it is always a good idea to know your vitamin D blood level and to put into place supplementation practices, if necessary, to get your vitamin D blood level above 80 nmol/L (without exceeding 150 nmol/L) (or achieving a vitamin D blood level between 32-60 ng/ml). Most people can achieve this blood level with 600-2,000 IU per day of vitamin D supplementation if necessary.

Some people need to be extra cautious with vitamin D supplements. These individuals include those with active tuberculosis, individuals with sarcoidosis (an autoimmune condition), lymphoma or primary hyperparathyroidism. In each of these cases, the body is often synthesizing very high amounts of vitamin D as a result of the disease. Taking additional vitamin D can easily cause vitamin D toxicity in these cases. (Toxicity occurs with a vitamin D blood level at or above 250 nmol/L or 100 ng/ml.)12

As such, first knowing the patient's blood vitamin D level is crucial. If it is below 80 nmol/L, then consider vitamin D supplementation to get it into the more ideal or optimal range (80-150 nmol/L or 32-60 ng/ml). This is something to strongly consider, in my view, for a host of reasons, as vitamin D in the optimal range also helps support bone density and cardiovascular health, and may

be important in the prevention of some cancers and type 1 diabetes.[13]

Editor's Note: Parts two and three of this three-part series discuss the science supporting other micronutrients; phytonutrients; probiotics; and additional evidence-based nutrients / supplements for optimizing the immune system.

References

1. Healthline: About Immunosuppressant Drugs. January 2018.
2. Hijano DR, Maron G, Hayden RT. Respiratory viral infections in patients with cancer or undergoing hematopoietic cell transplant. *Front Microbiol*, 2018 Dec 12;9:3097.
3. Weiskopf D, Weinberger B, Grubeck-Loebenstein B. The aging of the immune system. *Transpl Int*, 2009 Nov;22(11):1041-50.
4. Weyand CM, Goronzy JJ. Aging of the immune system. Mechanisms and therapeutic targets. *Ann Am Thoracic Soc*, Apri1 2016;13(Supplement 5).
5. Healthline, *Op Cit*.
6. John Hopkins Medicine: Disorders of the Immune System.
7. Leonard BE, Song C. Stress and the immune system in the etiology of anxiety and depression. *Pharmacol Biochem and Behav*, May 1996:299-303.
8. Magini S, Pierre A, Calder PC. Immune function and micronutrient requirements change over life course. *Nutrients*, October 2018;10(10).
9. Besedovsky L, lang T, Born J. Sleep and immune function. *Pflugers Arch -Eur J Physiol*, 2012;463:121-137.
10. Budgett R. Fatigue and underperformance in athletes: the overtraining syndrome *J Sports Med*, 1998;32:107-110.
11. Carr A, Maggin S. Vitamin C and immune function. *Nutrients*, 2017 Nov.9(11):1211.
12. Laaksi I, et al. Vitamin D supplementation for the prevention of acute respiratory tract infection: a randomized, double-blind trial among young Finnish Men. *J Infect Dis*, Sept. 2010;202(5).
13. Holick MF. Vitamin D: Importance in the prevention of cancers, type 1 diabetes, heart disease, and osteoporosis. *Am J Clin Nutr*, March 2004;79(3).