



Boosting your immune system

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The immune system is responsible for protecting the body against harmful microorganisms (called pathogens) which can cause illness and disease.¹ Good lifestyle and nutrition practices can help maintain and boost immune function. This is due to the influence that certain vitamins, minerals, proteins and fats have on immunity. The intake of a nutrient-rich diet is therefore associated with better overall health.^{2,3} Taking in sufficient nutrients is enough to boost your immune system. If a person is unable to meet their nutrient requirements through their diet, supplementation may be beneficial if taken at the correct dosage.^{3,4}

Immunity

The body makes use of two types of immunity, innate and adaptive. Innate immunity is also called natural immunity and acts as the body's first line of defence against infection. Innate immunity is always present in a healthy body and acts quickly on invading pathogens. Examples of innate immunity include the skin, tears, mucus and some white blood cells (e.g. natural killer T-cells).

Adaptive or acquired immunity refers to how cells in the body adapt to target specific pathogens. Lymphocytes and antibodies are examples of these cells.¹ The body's nutritional status can have a significant influence on the function of both innate and adaptive immunity. By consuming an energy-balanced diet that is rich in vitamins, minerals and protein, it is possible to boost the immune system.⁵ Nutrient supplementation is beneficial in cases of nutrient deficiency. However, if taken in extremely high dosages, supplementation can be harmful to the immune system and overall health.^{3,4}

Vitamins

Micronutrients play a crucial role in maintaining immune function. Deficiency of vitamins A, B-complex, C, D and E are associated with decreased immunity against viral and bacterial infections.⁵

Vitamin A

Vitamin A is a fat-soluble vitamin essential for promoting growth and development, as well as maintaining eyesight. Vitamin A supports natural immunity as it maintains epithelial tissue and promotes immune cell growth.⁴ The protective layers of the skin, lungs, stomach and intestines are maintained by vitamin A. This ensures that harmful microorganisms are unable to enter the body and cause illness. Immune cells such as natural killer T-cells and macrophages divide and mature as a result of vitamin A, enabling the body to effectively fight infection. Furthermore, carotenoids (precursors of vitamin A) act as antioxidants which protect cells from damage and help maintain overall health.⁶ The daily recommended intake (DRI) of vitamin A for women and men is 700 ug and 900 ug respectively. Vitamin A can be found in foods such as liver, fish, meat and fat-containing milk. Carotenoids, which can be converted to vitamin A in the body, are found in foods such as butternut, carrots, tomatoes and broccoli.^{2,4}

B vitamins

B vitamins are water-soluble and play a major role in both metabolism and cell division within the body. Although each B vitamin carries out its own unique function, almost all have a part to play in immunity. In cases of vitamin B deficiency, nerve and immune function falter and the body is unable to effectively use energy provided by carbohydrates, proteins and fats (macronutrients).^{4,7} Vitamin B1, also known as thiamine, activates important immune cells during periods of infection (e.g. natural killer T-cells and basophils). Vitamins B1, B2 and B3 elicit antioxidant and anti-inflammatory effects, thereby enhancing immune response. Vitamin B6 is one of the most prominent immune-boosting agents as it promotes both natural and specific immunity. Vitamin B12

and folate (vitamin B9), on the other hand, influence immunity in a different way. These two micronutrients are required for immune cell synthesis and red blood cell production. The daily recommended intake for each B vitamin is different. However, if one follows a diet rich in whole-grains, meat, leafy green vegetables (like broccoli), legumes (such as beans or lentils) and fruit, it is easy to meet these requirements.^{4,7}

Vitamin C

Vitamin C is probably the most famous immune-boosting vitamin, particularly with regards to treating the common cold. However, studies have shown that although vitamin C appears to decrease the number of 'sick days' experienced, it has little to no effect on preventing illness. Among other functions, this water-soluble vitamin acts as a powerful antioxidant which prevents cell damage in the body. Vitamin C is also needed to form the fibrous tissue, collagen, which is required for proper wound healing. The DRI for vitamin C is 75 mg and 90 mg for women and men respectively. Dark, leafy vegetables, tomatoes and citrus fruits are rich sources of vitamin C.⁴

Vitamin D

Vitamin D is a fat-soluble vitamin that maintains optimal bone health and brain function. Obtaining sufficient vitamin D is directly related to improved innate immunity. Vitamin D is involved in the production of peptides called defensins and cathelicidins. These peptides are strong antimicrobial agents that provide a natural defence against infection. When deficient in vitamin D, the risk of contracting upper respiratory tract infections is high. This is a further indication of its importance in maintaining immunity. In order to reach the DRI for vitamin D (15 ug per day), it must be obtained either through food intake or exposure to sunlight. Food sources of vitamin D include eggs, fatty fish (like tuna) and fortified cereals.^{4,8}

Vitamin E

Vitamin E is a fat-soluble vitamin that improves immunity primarily by acting as an antioxidant within the body. The DRI for vitamin E is 15 ug per day. Food sources of vitamin E include vegetable oils, seeds and nuts.⁴

Minerals

Like vitamins, an intake of essential minerals is required to promote optimal body function and immunity. Minerals are divided into major (needed in higher amounts) and minor minerals (needed in smaller amounts). Minerals that have a notable effect on immune function include iron, zinc, copper and selenium, which are all minor minerals.⁴

Iron

Adequate iron intake has been shown to promote natural T-cell function in innate immunity, making it essential for maintaining optimal health. Iron requirements range depending on gender and life-stage (children and females of reproductive age have much higher requirements). The DRI ranges between 8 and 18 mg/day. Iron is found in foods like meat, legumes, dark leafy vegetables and fortified cereals.^{4,9}

Zinc

Zinc is a trace mineral required for many chemical reactions in the body and has a positive effect on both innate and adaptive immunity. Zinc requirements for women and men are 8 mg and 11 mg respectively. In order to meet these requirements, a diet consisting of legumes, meats, sea-food and dairy is recommended.^{4,10}

Copper

Copper is a powerful antimicrobial agent, making it useful in innate immunity. Although copper is toxic in large doses, small amounts can be used by immune cells as a weapon against invading pathogens. Copper requirements are low at 900 ug per day and can be acquired through foods such as liver, mushrooms and dark leafy vegetables.^{4,11}

Selenium

Selenium is one of the most influential minerals in maintaining optimal immunity. Deficiency in selenium is linked to increased risk of infection and the development of cancerous cells. Selenium monitors immune cell development in both innate and adaptive immunity. It also acts as an antioxidant and anti-inflammatory. Selenium requirements are low at 55 ug per day and can be found in nuts, meat and seafood.^{4,12}

Conclusion

Nutrition plays a key role in maintaining optimal immune function. For this reason consuming a diet with sufficient energy, protein and micronutrients is essential. Nutrient supplements can be beneficial in cases of nutrient deficiency.

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