



Immunity booster nutrients to fight against novel COVID-19

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Nutrients play a vital role in aiding the immune system to function properly. Nowadays, everybody is fighting against novel coronavirus and accepted to live in a new normal environment. People are working on enhancing their immunity in several ways either by taking nutritious food or by doing exercise. Suddenly, people have become conscious eaters; food is being judged based on their nutritional standards and for their immunity-boosting potential. This short review looks at immunity, its types (innate and adaptive), function, and their respective work. Additionally, the role of macronutrients and micronutrients in building human immunity is also discussed.

Keywords: immunity, innate, adaptive, macronutrients, micronutrients

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Introduction

The lockdown, due to the recent Coronavirus outbreak, has disrupted our life cycle. We can say that it is the most challenging time of our lives and to overcome it, government authorities are working round the clock to keep people safe. The government is regularly issuing advisory about the protective measures like hand washing, sanitization, social distancing, etc. to spread awareness. We can also keep ourselves immune to viruses like these by following healthy eating habits. We all know food plays a pivotal role in keeping us healthy and productive. But how our nutrients potentially improve our immune system?

The immune system is defined as a combination of cells, chemicals and various processes which protect the skin and other regions (respiration, intestine) from foreign antigens [1]. It provides extraordinary defense against foreign attacks [2]. The immune function helps to safeguard our body from several diseases. In this regard, nutrients play an important role to enhance immunity in the human body [3, 4]. It provides energy to the body so that it can carry out different tasks of daily life. Insufficient intake of food nutrients can ultimately lead to various diseases, weakness and challenges [5]. Furthermore, cells need adequate nutrition for their proper functioning. Even a mild single-nutrient deficiency in our body can adversely affect the immune response. Deficiencies in trace elements such as iron (Fe), zinc (Zn), selenium (Se), and copper (Cu) and vitamin A, B6, B12, folic acid, C, D and E are associated with immune function disorders [6]. Thus, adequate use of these trace elements in the daily diet is vital for the immune system. Fig. 1 shows the various macro- and micronutrients our body needs to boost the immunity system.

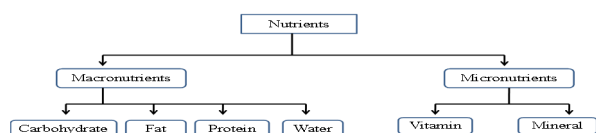


Fig.1 Flowchart showing different macronutrients and micronutrients

Immunity has been divided into two categories: Innate and Adaptive (also known as acquired) immunity [7]. Innate immunity is triggered first during infection. It requires only minutes to hours to activate fully, while adaptive immunity takes 1-2 weeks to establish [8]. The purpose of an innate immune system is to prevent pathogens from entering; to prevent the spread of infection; to eliminate pathogens by phagocytosis and cytotoxicity mechanisms and to activate the adaptive immune system by releasing cytokines [9]. The innate immune system plays a significant role in stimulating adaptive immunity [10]. Pathogenic invasion happens when viral or bacterial materials cross the innate defence (such as skin). Subsequently, pathogen manages to find the means to appropriate places for their continued living and multiplication. In this particular circumstance, foreign invasion triggers an adaptive immune response that prevents pathogen replication and migration in the body. The acquired immune system is extremely efficient in finding and 'remembering' a pathogen once re-exposed [2, 4, 6].

Macronutrients

Carbohydrate

40 to 80 per cent of total energy gets from macronutrient. According to the Recommended Dietary Allowance (RDA), adult and children aged ≥ 1 year should take 130g/d. Carbohydrates containing foods should be abundant in non-starch polysaccharides (dietary fibre), and low in the glycemic index as high glycemic can impair immune response. Cereals, vegetables, legumes, and fruits that are processed properly are especially impressive food choices. Grains, and vegetables, are high in starch, like corn and potatoes, while sweet potatoes contain mainly sucrose and not starch. Fig.2 shows various macronutrients rich food. Fruit and dark-green vegetables have little to no starch but contain sugar and dietary fibre [11].

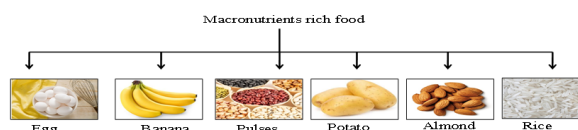


Fig. 2 Various macronutrients rich food

Fats

Fatty acids (FAs) are important indispensable sources of energy and also constitute the basic cell structural components. Effector and regulatory roles of innate and adaptive immune cells are affected by saturated and unsaturated FAs as they modify membrane structure and fluidity and by working through specific receptors. FAs possess almost endless possibilities to attenuate the cell's immune functions by manipulating its structure, metabolism, and function. Imbalance of saturated and unsaturated FAs affect the immune system, which results in the development of many allergic, autoimmune and metabolic diseases. Source of FAs are dairy products, palm, coconut oil, meat, nuts, fish and vegetable oil [12].

Protein

Of the twenty amino acids, in particular, twelve can be synthesized by our body and are classified as non-essential amino acids. On the other hand, our body cannot synthesize the remaining eight amino acids, so they are known as essential amino acids. The absence of any of these amino acids can suppress the tissue's ability to develop, repair or maintain. Lack of essential amino acid can also trigger immune system repression. Eggs, meat, fish, poultry and milk are the complete source of protein. Other sources are soya bean, pea, barley, canola, corn (germ), and chickpea. These are also body defense mechanisms framework, body function regulation enzymes, and certain hormones. Several immune mechanisms rely on the development or cell replication of active protein compounds. Studies show that the metabolism of proteins plays an important role in establishing natural and acquired immunity against infections [13].

Micronutrients

Vitamins

Vitamin A, C, D, E and B6 are the effective nutritional element of the immune system. Deficiency of vitamin A can affect the functioning of various immune system cells. Vitamin A sources include sweet potatoes, spinach, cabbage, cantaloupe and squash.

Fig. 3 shows various micronutrients, rich food. Supplementation with vitamin C strengthens white blood cell production as well as immunity. A very excellent source of vitamin C is citrus fruit, green leafy vegetables such as spinach, kale, bell peppers, Brussels sprouts, strawberries, and papaya. Vitamin D can modulate both innate and adaptive immune responses. The human body can get this vitamin by exposure to sunlight. Other sources are egg yolk, fish and fortified food. Vitamin E is a strong antioxidant and an essential nutrient for immune system maintenance. It is known that vitamin E supplementation has several advantageous effects on the immune system of host [13, 14]. Vitamin E-rich foods include almonds, peanuts, hazelnuts, and sunflower seeds. RDA for vitamin D and E is 10 µg and 7.5-10 mg α-tocopherol, respectively. Sources of vitamin B6 include lean chicken breast, cold-water fish (i.e., tuna), boiled potatoes, chickpeas and bananas [15].

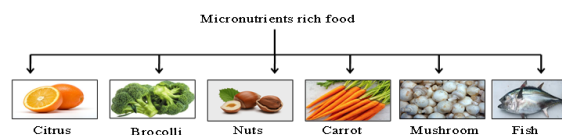


Fig. 3 Various micronutrients rich food

Minerals

Se, Zn, Cu, and Fe are important minerals that affect the immunity of the human body [16]. Se is an important element that is required for the development of the innate and acquired immune system. RDA for Se is 40 µg/d. Source of Se are button mushrooms, broccoli, onions, sardines, tuna, brazil nuts and barley. Zn is a mineral that inhibits viruses and has been considered to be essential for highly proliferating cells, particularly in the immune system. Source of this mineral is oysters, wheat germ, crab, lean meats and poultry, boiled beans, yogurt and chickpeas. Cu plays a crucial role in the growth and continued development of the immune system [17]. Intake of 1.7 mg/d is recommended by RDA. The human body can get Cu from legumes, nuts, beef and seeds. The role of iron is both in the proliferation of immune cells as well as in the maturation that fights infection. Lean poultry (i.e., chicken and turkey), seafood, beans, broccoli, and kale, are the sources of Fe.

In these times, it is imperative that we all follow a healthy regimen and take all the precautionary measures to tackle with coronavirus pandemic.

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