

PROSPER THE IMMUNITY THROUGH DIET – A MUST IN UNEASE SITUATIONS

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ABSTRACT

As the world watches COVID -19, a disease caused by a novel corona virus, SARS – CoV-2, the focus has shifted to immunology. The immune response is critical for controlling and eliminating CoV infections. Hopefully, the profound understanding gained between the hosts innate immune system and corona viruses would lessen the lung inflammation induced by CoVs, which was identified by careful investigation of the immune system. The immune system's duty is to protect the host from viruses, germs, and other diseases. The immune system produces different cells to deal with infections caused by these pathogens, not only to destroy the current dwelling harmful agents, but also to guard the host from future attacks of the same kind. The immune system is always active, but when a person becomes infected, it becomes even more active. A number of vitamins, as well as other sources of vitamins and trace elements, have been shown to have an important role in strengthening the immune system and reducing infection risk. This review article discusses the numerous nutrients that can be used in antiviral and antibacterial defense. Dietary practices for acquiring a healthy microbiota can also benefit the immune system.

KEYWORDS: SARS-CoV-2, Corona virus, Covid-19, Immunity, Nutrition, Healthy diet, Lung inflammation

DURATION: Received- 16/05/2021, Reviewed- 29/05/2021, Revised/ Accepted- 20/06/2021

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INTRODUCTION

The network of biological processes is termed as immune system which protects an organism against various diseases. The immune system is responsible to detect various pathogens, bacteria, viruses, parasitic worms, cancer tumor cells, various objects as wood splinters and wounds, differentiating them from organisms own health issues.⁽¹⁾ Two major subsystems of immune system are present in many species.

Innate immune system

It provides a response which is preconfigured to wide variety of stimuli and situations.

Adaptive immune system

It provides a response which is tailored to catch stimulus produced by learning to identify molecules which are experienced earlier. Both the subsystems use cells and molecules to perform their respective functions.⁽²⁾

Unspecific immune system is present in all kinds of organisms. Bacteria have it in the form of enzymes which protects against various virus infections. Further fundamental mechanisms of immune system evolved in animals and ancient plants persist in their modern descendants. Mechanisms involved mainly are antimicrobial peptides called as defensins, phagocytosis and also the complement system. Jawed vertebrates which include humans, have more advanced defense mechanisms, which also includes the adaptability to recognize the pathogens and other objects more effectively and efficiently.

Immune Cell Development in Humans

During birth, the immune system of an infant is particularly characterized by a not fully developed non-specific immune system. Additional to this, a deleted activated T cells, a suppressed capacity of antigen-specific cells and also the presence of higher amounts regulatory T cells alters immune responsiveness. In the earlier months of life the antigen specific immune response developed will be in parallel to the immune tolerance maintenance against commonly found compounds in the environment of infant and mother.⁽³⁾ Immunological disorders such as autoimmunity and allergy are caused due to the impact on immune system function by the disturbances of these compounded changing processes.

Human milk contains a variety of immunologically active compounds, such as antibodies, that are individually adjusted to the mother's environment, as well as the newborn's environment, in order to protect the infant from infections. Human milk regulates the described developmental pathways in addition to providing immediate protection after birth. The importance of good nutrition during the first few months of life for overall immune system development is highlighted by the role of human milk. Human milk can pass on the infant's "mother immunological memory." Individual examination of human milk reveals compounds that act as key modulators. Immunologically active peptides, a variety of glycolipids, long-chain polyunsaturated fatty acids, and non-digestible oligosaccharides have all been identified as potential modulators. The interaction of different immune system

segments with these active components is extremely complex, allowing for a progressive and balanced immune system development. (4).

According to animal and human studies, still no biomarker exists that describes the entire development status of the immune system.

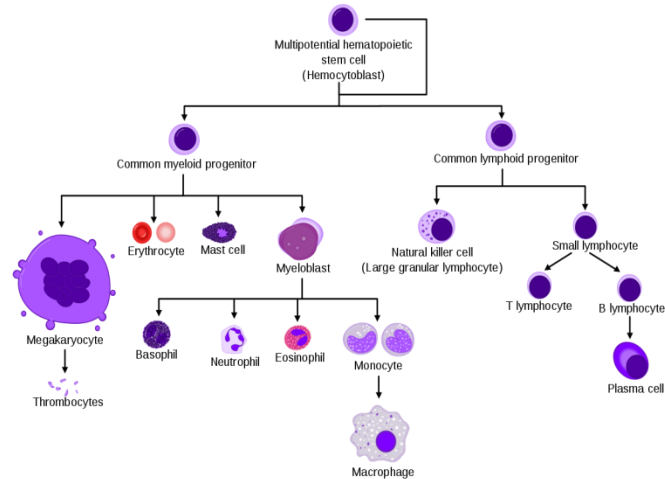


Figure 1: immune cell development

Autoimmune diseases, cancer, and inflammatory diseases are all caused by immune system dysfunction. Immunodeficiency develops when the human immune system is less active than usual, resulting in recurrent and life-threatening infections. (5) Human immunodeficiency can be caused by genetic diseases like severe combined immunodeficiency, acquired conditions like HIV/AIDS, or the use of immunosuppressive medications. Autoimmunity occurs when normal tissues are assaulted by overactive immune cells that mistake them for foreign invaders. Rheumatoid arthritis, diabetes mellitus type 1, Hashimoto's thyroiditis, and systemic lupus erythematosus are all examples of autoimmune disorders. Immunology is the scientific study of all aspects of the immune system.

Layered defense

The immune system protects its host from infection by layering defenses that get more specific as time goes on. Physical barriers prevent diseases such as bacteria and viruses from entering an organism's body. The innate immune system provides a nonspecific but immediate reaction whenever any pathogen violates the protective mechanism. In vertebrates, a second layer of protection, the adaptive immune response, is activated by the innate immune response if the pathogen successfully eludes the innate response, as all animals have an innate immune system. (6) During an infection, the immune system modifies the response in order to better pathogen detection. After the pathogen has been eliminated, the adaptive immune system stores the increased reaction as an immunological memory, allowing it to attack more forcefully and move faster the next time the responsible pathogen is encountered.

Components of the immune system

INNATE IMMUNE SYSTEM	ADAPYTIVE IMMUNE SYSTEM
Response is more specific	Antigen and pathogen specific response
Immediate maximal response when exposed	Time lag between maximal response and exposure
Cell-mediated and humoral components	Cell-mediated and humoral components
No immunological memory	Immunological memory when exposed
Nearly found in all forms of life	Only found in jawed vertebrates

The adaptive and innate immune systems function based on the ability to distinguish between self and non-self-molecules. Non-self-molecules are those that are recognized as foreign molecules, one of which is antigens, which are described as compounds that bind to certain immune receptors and induce an immunological response.

DISORDERS OF HUMAN IMMUNE SYSTEM

Host defense failures occur and divided into three categories

Immuno deficiencies

Immuno deficiencies occur when more than one component of the immune system is inactive. Due to immuno senescence, the immune response begins to deteriorate about the age of 50. (7) In both elderly and young people, the immune system's ability to recognize infections will be decreased. Obesity, alcoholism, and drug use are significant causes of deteriorated immune systems in developed countries, while malnutrition is the most common cause in developing countries. The protein deficiency diet is linked to impaired cell-mediated immunity, phagocyte function, complement activity, IgA antibody concentrations, and cytokine production. Due to enucleating removal of the thymus and genetic changes, severe immunodeficiency and highly sensitized infection can occur at a young age. Severe combined immunodeficiency is a rare genetic disorder in which the generation of efficient B cells and T cells is disrupted due to a number of genetic abnormalities. Chronic granulomatous disease, for example, is a hereditary or congenital immunodeficiency in which phagocytes have a reduced ability to eliminate infections. Acquired immunodeficiency is caused by certain forms of cancer and AIDS. (8)

Auto-immunity

Auto immune disorders are caused by excessive immune reaction, which leads to immune system dysfunction. The immune system's failure causes it to be unable to distinguish between own and alien chemicals, resulting in the attack of own body parts. In normal circumstances, many T cells and antibodies react to self-peptides. The function of specialized cells produced by the bone marrow and thymus is to eliminate cells identified as self-antigens in order to prevent autoimmunity, as well as to store juvenile lymphocytes and self-antigens produced throughout the body. (9) Hashimoto's thyroiditis, rheumatoid arthritis, type 1 diabetes, and systemic lupus erythematosus are all examples of autoimmune disorders.

Hypersensitivity

Is an immunological response that kills the body's own tissues. Divided into four classes based on the hypersensitive reaction

time course and related processes. Type 1 hypersensitivity is an allergic reaction that occurs immediately after exposure to an allergen. Symptoms involve mild discomfort to death. IgE triggers degranulation of basophils and mast cells when they are cross-linked by antigen.⁽¹⁰⁾ Type 2 hypersensitivity, also known as anti-body dependent hypersensitivity, occurs when antibodies attach to antigens on particular cells, causing them to be destroyed. It is controlled by IgG and IgM antibodies. Type 3 hypersensitivity reactions occur when immune complexes settled in numerous tissues triggered. Type 4 hypersensitivity, also known as cell-mediated or delayed type hypersensitivity, develops over two to three days and is associated with a variety of autoimmune and infectious illnesses, including contact dermatitis. This reaction is mediated by T cells, monocytes, and macrophages.

Table 1: Most commonly seen diseases, disorders of the immune system and their symptoms

DISEASES/ DISORDERS	SYMPTOMS
Asthma	Breath shortness, tightening of chest or pain, wheezing when exhaling, coughing or wheezing attacks that are worsened by cold or flu
Autoimmune polyglandular syndrome	Hypoparathyroidism, adrenocortical insufficiency
Diabetes type 1	Extreme thirst, dry mouth, frequent urination, blurry vision, fatigue, increased hunger
Immunodeficiency with hyper-IgM leukemia	Fever, cough, abnormally rapid breathing, bluish discoloration of dermis and connective tissues
Chronic myeloid severe combined immunodeficiency	Viral infections, diarrhea, failure to thrive
Systemic sclerosis- SS	Calcium deposits in skin, dilation of capillaries causing red marks on surface of skin
Systemic lupus erythematosus	Butterfly rash over the face, photosensitivity
Rheumatoid arthritis	Pannus, progressive joint destruction, granulomas
Dermatomyositis	Muscle weakness, violet colored/red colored rash development on face and eyelids, elbows, knees and chest
Auto immune hepatitis	Mild- severe chronic hepatitis
Addison disease	Weight loss, fatigue, anorexia, depression, skin hyperpigmentation
Hashimoto thyroiditis	Lymphocytic infiltration with germinal centers
Graves' disease	Exophthalmus, symmetric enlargement of gland and hyperthyroidism
Xerostomia	Dental caries, difficulty in swallowing and speaking
Sjogren syndrome	Dry eyes and Dry mouth
Thymic Hypoplasia	Viral, fungal, protozoal infections and tuberculosis
Severe combined immunodeficiency	Candida, CMV, Pseudomonas
Bruton disease	Under development of lymphoid tissues

Immune system boosters to maintain a strong immune system

In order to maintain a strong immune system in human beings, one must keep it in optimum shape by following healthy-living strategies such as;

- Eat a diet which contains high amounts of vegetables, fruits, whole grains and low in saturated fat.⁽¹¹⁾

- Quit smoke. If you already have a habit of smoking, try to quit as quick as possible even if you've been unsuccessful in kicking your smoking habit in the past.
- Drink alcohol in a moderate way, if you have a habit of drinking alcohol.⁽¹²⁾
- Add multivitamin intake in your diet if you doubt that you aren't receiving all the required nutrients through your regular diet.
- Regular exercise gains physical fitness as well as strong immune system.
- Healthy weight maintenance.
- Keeping blood pressure and stress levels in control.
- Adequate sleep which is minimum of 7 hours/nights for adults.⁽¹³⁾
- Try to take diet which contains protein, vitamins, minerals, carbohydrates, fiber, omega fatty acids, probiotics, catechins, etc.in regular diet.
- Practicing correct hand-washing and oral hygiene.
- Including diet which contains trace elements such as selenium, iron, zinc, copper in order to influence both adaptive and innate immune system to maintain a healthy immune system.
- Having supplements of milk, milk products, eggs, fresh meat and marine food in order to provide adequate amount of protein, calcium and mushrooms for beta-glucan to provide adequate nutrition to the human body.⁽¹⁴⁾

Table 2: Sources and uses of various food supplements to boost immune system

Sources	Uses
Blue berries	Anti-oxidant and flavonoid called anthocyanin which plays major role in respiratory tracts immune system
Dark chocolate	Anti-oxidant called Theo bromine which protects body cells from free radicals
Turmeric powder	Curcumin which has anti-oxidant and anti-inflammatory effects
Oily fishes like Salmon, tuna, pilchards and other	Rich source of omega-3 fatty acids which reduces the possibility of rheumatoid arthritis
Broccoli	Vitamin C, potent anti-oxidants such as sulforaphane ⁽¹²⁾
Sweet potatoes	Rich source of beta carotene which contains vitamin A which provides protection from UV rays
Spinach	Flavonoids, carotenoids, vitamin C and vitamin E helps to prevent common cold
Ginger	Anti-inflammatory and anti-oxidative properties
Garlic	Contains allicin which reduces risk of getting cold
Green tea	Catechins, flavonoids reducing risk of getting cold
Kefir	Fermented drink containing bacteria live cultures benefitting fighting against bacteria, reducing inflammation and increasing anti-oxidant activity ⁽¹³⁾
Sun flower seeds	Rich source of vitamin E and anti-oxidant which mainly helps in fighting off free radicals
Almonds and nuts	Vitamin E, manganese, magnesium and

	fiber
All types of citrus fruits such as oranges, lemons, amla, kiwifruit, cantaloupe, strawberries and watermelon	Vitamin C which reduces common cold symptoms ⁽¹⁴⁾
Red bell pepper	Vitamin C for reducing common cold symptoms
Yogurt	Probiotics which shortens the cold episode
Sunlight exposure, red meat, liver, egg yolks and fortified foods	Vitamin D which helps in boosting immune system mechanism ⁽¹⁵⁾
Cheese, eggs, milk, mango, papaya and apricots	Vitamin A which is also known as retinol which helps in body's natural defense against illness and infection ⁽¹⁶⁾
Peas, nuts, bananas, wholegrain breads and fortified breakfast cereals	Vitamin B1/Thiamin which mainly helps in nervous system healthiness
Milk, eggs, mushrooms and plain yogurt	Vitamin B2/Riboflavin keeps healthy eyes, nervous system and skin
Meat, fish, eggs and wheat flour	Vitamin B3/Niacin maintains skin and nervous system healthily
Pork, soya beans, oats, chicken, turkey, some fish, wheat germ, milk and bananas	Vitamin B6/Pyridoxine helps in hemoglobin production in which it supplies oxygen all around the body ⁽¹⁷⁾
Broccoli, brussels sprouts, cabbage, kale, spinach, spring greens, chickpeas, peas and kidney beans	Vitamin B9/Folate and folic acid reduces the chances of birth defects in unborn babies such as spina bifida and also helps in formation of healthy red blood cells
Fish, meat, milk, cheese, eggs and fortified breakfast cereals	Vitamin B12 which produces erythrocytes and releases the energy from food
Vegetable oils, cereal grains, broccoli and spinach	Vitamin K which keeps bones healthy ⁽¹⁸⁾
Soya drinks, milk, cheese, okra, kale, spinach, bread and fishes like pilchards and sardines	Calcium which helps in regulation of muscle contractions, heartbeat and helps in fabrication of strong teeth and bones
Sea fish and shellfish	Iodine helps in keep cells and maintenance of metabolic rate
Red meat, nuts, red kidney beans, edamame beans, chickpeas, soy bean flour and apricots	Iron which helps in making red blood cells ⁽¹⁹⁾
Honey from honey bees	Nutritive, demulcent, laxative which contains amino acids, proteins, vitamins and dextrin's
Oysters	Contains zinc which acts against viruses
Miso	Japanese seasoning which contains probiotics which helps in fighting against infectious diarrhea ⁽²⁰⁾
Elder berry	Contains anti-oxidant and anti-inflammatory action which blocks flu viruses

CONCLUSION

Our immune system is a system provided with self-defensive mechanism in order to shield the host from pathogenic microorganisms and exogenous noxious agents within our environment. Many mechanisms get used by the immune system to combat infection by microbes. Toxic or allergenic components entered through surfaces of mucosa get erased by the host's immune system. It responds to foreign pathogens

and cancer cells by activating specific and non-specific immune responses.

The different sources which are depicted in this article might be useful for the readers to maintain a good immunity to fight with many diseases which are uncontrollable now-a-days.

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How to cite this article

Gottipati Kavya, Darsi Eswar Tony, Ankem Narendra Babu, Rama Rao Nadendla, Yerram settee Gayathri, Kanda Bala Bhavana, 2021. Prosper the immunity through diet – a must in unease situations. *Jour. of Med. P'cutical & Alli. Sci.* V 10 - I 3, 1093 P-2979-2983. DOI: 10.22270/jmpas.V10I3.1093.