

Reduction of Immune Related Disease with Diet Rich in Antioxidants



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Abstract

Immune system is an intricate mechanism, the functioning of which maintains a balance between various diseases. The proper functioning of Immune system is dependent upon the healthy, nutritional diet which thereby helps in combating many diseases and pathogen attack.

Introduction

The nutritional value of the food that we consume plays a very important role in combating many diseases. Industrialization, urbanization, economic and social development has brought to prompt changes in diets and life style. Consequently people have become more prone to cancer, hypertension, strokes etc due to inappropriate diet. One of the major causes of many of these diseases is oxidative stress caused by disturbance in the balance between antioxidants and prooxidants. Prooxidants or free radicals are the species capable of independent existence that contain one/more unpaired electrons [1]. Free radicals not only contribute to the elimination of infected cells, but when present in higher concentrations react with cellular DNA, proteins, lipids and other macromolecules. The disease such as brain dysfunction, cancer, autoimmune pathologies, gastrointestinal inflammation and ulcers [2], heart diseases and immune decline could be due to these free radicals [3]. In physiological condition, the human body can compensate for a mild degree of oxidant stress and remove oxidatively damaged molecules by activating antioxidant enzymes like superoxide dismutase, catalase, glutathione peroxidase, etc. Thus, owing to their ability to reduce oxidative damage.

The deleterious impacts of these free radicals can be reduced down by adding natural antioxidant rich diet in our daily routine. It is tempting to speculate that the restorative and rejuvenating power of these antioxidants be due to their action on the immune system which is responsible for the protection of the organism from extraneous substances and maintaining homeostasis. Nutritional

Immunology arose largely during the early 20th century. The recognition of various vitamins and advancement in the field of Immunology made it possible to study the impact of free radicals on Immune system and thereby generation various diseases and disorders.

Free Radicals and Antioxidants in the Immune System

The immune cell functions such as those involved in the inflammatory response, cytotoxic activity and particularly in phagocytes as regards their microbicidal activity, are specially linked to reactive oxygen species (ROS) generation. However, it is very well known fact that excessive amounts of ROS which are not counteracted by the antioxidant defenses of the cell, can become a source of tissue damage, since free radicals can attack cellular components and lead to death because of the molecular damage resulting from oxidative stress.

Thus, the immune cell functions are strongly influenced by the antioxidant=oxidant balance and, As the Immune cells have high percent of polyunsaturated fatty acids in their plasma membranes and a higher production of reactive oxygen species (ROS), which makes them more sensitive towards the oxidative stress. Additionally, the oxidative stress damages the membrane which in turn affects the defense function and binding of antigen by the immune cells. Antioxidant levels in these cells play a pivotal role in maintaining immune cells in a reduced environment and in protecting them from oxidative stress and preserving their adequate

function [4]. The studies have shown that many pathogenic attack, and other diseases are more severe in immunocompromised host. Further the studies has shown that Immune system is very well affected by the deficiencies of other elements also (Table 1) showing the impact of these elements on Immune system.

Table 1: Various Antioxidants and their impact on immune system.

Antioxidants	Impact on Immune System
Zinc.	(a) Competes directly with copper and iron, thereby decreasing hydroxyl radical formation via Fenton and/ or Haber-Weiss chemistry thus, saves immune cell membranes (b) Protects protein sulfhydryl groups from oxidation; and (c) Stimulates the immune system.
Selenium	(a) Glutathione peroxidase (GPx) , antioxidant enzyme inactivates H ₂ O ₂ in the presence of GSH, thereby preventing the formation of the hydroxyl radical (HO), decreased selenium affects GPx activity (b) Lower concentration declines natural killer cell activity & T cell-mediated cyto- toxicity (c) Enhances Th-1 type immune response
Copper	Deficiency reduces Antibody production, phagocytic activity, T and B cell proliferation
Iron	Deficiency reduces cytotoxic activity, proliferation of TH cell, Phagocytic activity and Immunoglobulin levels
Vitamin E	(a) low vitamin E levels lead to unstable immune cell membranes, which lead to enhanced production of immunosuppressors (b) vitamin E supplementation enhances cell-mediated immunity
Vitamin C	Ascorbate efficiently neutralized phagocyte-derived extracellular oxidants; intracellular antimicrobial oxidants remained unchanged. Enhances phagocytic activity
β-carotene	Increases cell mediated immunity, NK cell activity, IL production

The data suggests that that antioxidant nutrients commonly includes vitamin E, vitamin C, β-carotene, selenium, copper, iron and zinc improve different immune function exhibiting an important protective role in infections caused by bacteria, viruses or parasites. Fruits and vegetable are the rich source of natural antioxidants. Foods with darker, richer colors like orange, yellow, blue, and red tend to be higher in antioxidants. In addition to these fruits and vegetables, nuts and spices are also a good source of antioxidants. The intake of these antioxidants by many immunocompromised persons or with weakened immune system also showed tremendous results against infections and other pathophysiological conditions.

The results of recent studies emphasized that functional role of antioxidants as depends upon their concentration. Higher levels may leads to adverse effects where as low levels may lead to many diseases. All these antioxidants have been shown to improve the immune functions *in vitro* and *in vivo* [5-7]. Furthermore, the inhibition of activation of the nuclear transcription factor NF-κB produced by oxidative stress, which could result in a decrease of free radicals and pro-inflammatory cytokine production hence, showing anti-inflammatory action of these antioxidants. The imbalance in immune homeostasis leads to many diseases.

Conclusion

Immune system is very well affected by various antioxidants present. The functioning of immune system can be balance by consuming proper antioxidant diet and thereby many health issues can be avoided.

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