Nutritional Intake & its Impact on Immune Function in the Elderly

A Research Paper by the All4Smiles Research Team

September 2024

Abstract

Alongside water, access to clean air, and shelter, proper nutrition is one of the core components of living a healthy and long life. During childhood and adolescence, a steady and consistent supply of nutritional food is what allows for growth and maturation into adulthood, and later, old age. However, lacking proper nutrition as an elderly individual is linked to several disadvantages, including a negative impact on the immune system. Those effects will be explored in this paper, as well as other lenses within the topic of nutrition and elderly immune function; such discussions include the role of protein and antioxidants in the immune system, the gut microbiome's influence on the immune response, and how specific dietary patterns can slow immunosenescence, or immune aging.

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An Introduction: How is Nutrition Related to Immune System Health?

By: Ifra Iyoob

As individuals age, their immune system declines. Most significantly, the adaptive immune response suffers; specifically, both T cells and B cells are affected. Of these two leukocyte types, T cells are affected the most. In fact, it is the decline in T cell function that has been associated with immunosenescence. However, proper nutrition can act as a mediating factor in this scenario and help to buffer the effects of aging on the immune system. By that same vein, nutritional deficiencies can catalyze immune system degradation as well.

In a study completed by the National Institute of Health (NIH), it was found that vitamin E deficiency can prevent proper T cell function in both aged humans and animals. T cells are a crucial component of the human immune system, specifically the adaptive immune response. These leukocytes are responsible for recognizing antigens and producing cytokines, which help with the antiviral response through regulating and mediating immune and inflammatory responses. In fact, it was found that intake above the recommended levels of vitamin E can actually enhance T cell function. This effect leads to increased resistance to infections like influenza and upper respiratory infections.

A common nutritional deficiency among the elderly is reduced zinc levels. Zinc deficiency has been associated to impaired immune function and increased risk for acquiring infection. Unlike vitamin E, an increased zinc intake can actually adversely affect immune function. Zinc deficiencies can also be genetic, like in the case of zinc-specific malabsorption. Individuals that have this metabolic disorder often have thymic atrophy and lymphopenia which is caused by impaired immune function. Increased zinc supplementation can easily reverse this. This phenomenon is applicable to the aging-related immune system defects seen in elderly,

proving that increased zinc supplementation can help reverse immunosenescence as it does reverse immune system impairment in those with genetic deficiencies.

Probiotic intake has also been recognized as an effective, immune-modulating nutritional factor. For instance, an increased intake of fish or a nutrient called n-3 PUFA can be beneficial to inflammatory and autoimmune disorders as well as to several age-related diseases. However, too much of N-3 PUFA intake can actually compromise an elderly individual's ability to fight against infection, mirroring the effects of increased zinc intake.

Often, as individuals reach older age, calorie restriction or strict diets have been advocated as necessary and helpful measures to maintaining proper health. However, recent studies have found the opposite. Instead, calorie restriction may actually compromise an elderly individual's ability to defend themself against pathogenic infection, leading to higher morbidity and mortality. Increasingly, research has begun to show that the timing of calorie restriction is crucial to whether it is beneficial or disadvantageous to the older individual practicing it.

Currently, the existent body of research on specific nutrients and their effects on elderly immune function are still being explored in greater detail and accuracy. However, it is clear that maintaining at least the recommended intake of certain food groups and nutrients is key to fighting immunosenescence as one reaches old age.

Role of Antioxidants in Supporting Immune Health in Elderly

By: Evelyn Yao

One common concern among the elderly population is debilitating immune health. Deteriorating immune health compromises the body's health by reducing the barrier between disease and infection. Weak immune systems lead the elderly exposed to harmful pathogens and illnesses, increasing the risk of contracting a disease. Thus, boosting immune health is essential to preserving the wellbeing of the elderly and preventing them from becoming sick. A crucial element in supporting immune health is antioxidants.

Antioxidants are compounds that may reduce or prevent cell damage. According to *Journal of Dairy Science*, "Diets contain naturally occurring antioxidant compounds that can stabilize highly reactive, potentially harmful molecules called free radicals." Normal cellular metabolism and the metabolism of certain drugs and xenobiotics increase the number of free radicals in the body. Additionally, exposure to UV light, cigarette smoke, and other environmental pollutants may also cause damage to the enzymes, membranes, and DNA of the human body by increasing the count of free radicals. Luckily, antioxidants are able to destroy free radicals by way of neutralization, thus relieving the burden of these negative molecules. The immune system has been found to depend on micronutrients in the form of antioxidants to function. Specifically, the study in the *Journal of Dairy Science* found that supplementation with vitamins C, E, and A or β-carotene activated more cells found in tumor immunity in the elderly.

Antioxidants contain the nutrient antioxidants, vitamins A, C, and E, and minerals copper, zinc, and selenium. Some foods that are great sources of antioxidants include tea, vegetables, seafood, fruit, and a variety of herbs. Research has discovered that it is best to

consume nutrients from actual food rather than dietary supplements. In fact, according to Better Health Channel, research has suggested that vitamin supplements can increase the elderly's risk for certain types of cancer and can act as pro-oxidants when consumed in higher doses. To meet one's nutritional needs, it is best to consume food from the five main groups each day: vegetables, fruit, dairy, grain, and protein.

To protect the immune system in elderly, consuming antioxidants is necessary. Antioxidants neutralize the harmful effects of free radicals, which can include inflammation of the joints, increased risk of coronary heart disease, and acceleration of the aging process. A few sources of free radicals are stress, alcohol consumption, pollution, and cigarette smoking. Ultimately, antioxidants play an essential role in maintaining strong and healthy immune systems among seniors.

Role of Protein in Elderly Immune Health

By: Joyce Sato

Importance: In the elderly, as well as all age groups, protein plays a significant role in muscle maintenance, producing antibodies, and helping the body recover from illnesses. Individuals of older age may find that with a protein deficiency, anabolic processes decline, and discover an increase in the amount of protein needed to offset chronic illness. Studies show that around one-third of seniors don't eat an adequate amount of protein everyday- some may even need more protein intake in comparison to their youth. Getting a sufficient amount of protein, as well as the other food groups, should be consistent and done in moderation- too much of anything is bad.

Benefits & Habits: The effects of protein intake are adamant in overall health, although there is a more tangible physical impact. In a 2018 study, researchers found that seniors who ate the most protein were 30% less likely to become functionally impaired than those who ate the least amount. In another study, it was discovered that seniors who ate the least amount of protein were twice as likely to have difficulty climbing a flight of stairs compared to those who had a higher protein intake. Eating protein consistently throughout the day has made a positive impact on the anabolic efficiency of seniors, which promotes growth and repair of the tissues and bones. Nutrition experts in 2013 recommended that older adults should consume 1 to 1.2 grams of protein per kilogram of body weight daily; which for reference would be 69 to 81 grams for a 150-pound woman, and 81 to 98 grams for a 180-pound man.

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