Cancer, Immunology and Aging: The Nutritional Influence of Vitamin C

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Abstract

This paper will discuss, in a brief form, the importance of the role of vitamin C in the development of cancer and its influence on the immunologic status of the elderly.

Key Words

cancer, immunology, aging, vitamin C

The total population of the United States over age 65 is increasing steadily. Some 31 million people in the United States (approximately 12% of the population) are of age 65 or over.[1]

As we know from previous studies, older people are more susceptible to infectious diseases and more at risk to the development of neoplastic diseases.[2] Also, one of the most prominent factors determining susceptibility to cancer is age. If we add to this the fact that the elderly is a particular population at risk to some degree of malnutrition,[3] and that the nutritional status can influence the immunologic system; we can state without reservations that the interaction between immunology, aging and the nutritional status of a person can be a clue to the development of disease.

Unfortunately, few studies have considered nutrition and the immune function simultaneously in elderly subjects.[5] Furthermore, there is a lack of reliable references for nutritional requirements of the elderly population and the nutritional parameters necessary for the evaluation of the aged. This is manifested in the 1989 Recommended Dietary Allowances (RDA's), instituted by the Food and Nutrition Board of the National Academy of Sciences, which include two major age grouping, 51 to 75 years and 76 years and over, for energy allowances, but only one group of age 51 years and over for all the other nutrients.[6]

We do not need to do specialized research in order to assure in a logical manner that, as other different age groups (i.e., infants and lactating women), the elderly may have special requirements for other nutrients in addition to that of energy allowances.

Many of these nutrients can influence the immunological status and the future incidence and prevalence of degenerative conditions that can affect negatively the health status of the elderly. Some of these nutrients are vitamins C, E, A and minerals as Zn and Se.[7] It has been demonstrated by epidemiological studies that the consumption of foods rich in vitamin C may lower the incidence of certain cancers.[8]

This paper will try, in a brief way, to describe some influences of ascorbic acid (vitamin C) in the prevention of the development of cancer and its. role in the immunologic status of the elderly. We think that a well checked supplementation program can positively affect the immune function in the elderly. However, only minimal information has been produced concerning human cancer initiation as a direct result of a specific dietary etiology in the elderly.[9] Nevertheless, many studies show that the relation between aging and immunosuppression may act as a risk factor in the development of neoplasia.[10] Nutritional deficiencies may enhance this kind of risk.

Results from various studies show that vitamin C by enhancing the cellular immune functions of humans, can have beneficial effects on the elderly through preventing or even reversing, to some extent, the impediment of cell-mediated immunity associated with the aging process.[11-12]

Moreover, some preliminary studies in the 1930s and 1940s have indicated that vitamin C requirements of the elderly may be higher than that needed by younger individuals. These studies concluded that the elderly require approximately 50 percent more vitamin C than their younger counterparts.[13,14] More updated research demonstrated that it is not rare to find the elderly with lower levels of vitamin C.[15]

Elderly population groups that are at higher risk are psychogeriatric and the institutional-

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ized patient.[16-17] It is important to mention that the requirement of vitamin C for the elderly might be higher than those suggested by the R.D.A.'s.[17-18]

It is proposed also that vitamin C is of considerable importance in the neutralization of toxic-phagocyte derived reactive oxidants. It is well known that oxidants compounds can cause degenerative changes in the extracellular milieu when released by activated phagocytes; if not neutralized by intrinsic biological system antioxidants as, for example, vitamin C in the blood.

Furthermore, the ingestion of supplementary vitamin C in a short term of 3 to 5 days produces a stimulation of the lymphocyte responsiveness to mitogens, also enhances chemotaxis and phytohemagglutinin-induced blastogenesis; in addition the quantity of interferon increases as vitamin C concentration increases, until certain limits.[19-22] In relation to this, there is an inhibitory effect that vitamin C produce in human polymorphonuclear neutrophils, providing evidence of a molecular mechanism for the efficacy of vitamin C as an immunomodulator and its interaction with the prostaglanding metabolism.[23]

In contrast, cancer patients have increased requirements for vitamin C, and rapid metabolic depletion of vitamin C stores. It is suggested, among other reasons, that tumors tend to accumulate vitamin C needed for the creation of protoglycan, glycosaminoglicans, glucosamine and collagen fibers, which might help encapsulate or restrain the growth of these tumors.[24]

In addition, leukocyte and plasma ascorbic acid concentrations were lower in patients with a diversity of neoplasias including those of the breast, lung, skin, rectum and mouth, than in healthy subjects.[25] Thus, this gives us a general idea of how important it will be a supplementary vitamin regimen for these types of patients.

The immunologic system is not completely affected by the aging process. There are certain factors as total numbers of white blood cells, lymphocytes, granulocytes and the phagocytic function of neutrophils that do not change perceivably with age, including the complement activity system.[26,,28] On the other hand, changes that may have important implications occur in cellular immunity in such functions as delayed type hypersensitivity, resistance to viruses and tumor cells.[29,,31] We also know that functionally mature T cells are decreased in number with age,[32] and that B-cells confront problems differentiating into plasma cells which are capable of secreting adequate levels of high affinity antibodies.[33] Moreover, helper T-cell function is usually diminished due to a lower production of Interleukin-2.[34] Recent reports inform that natural killer lymphocytes activity decreased in the elderly.[35-36] Because natural killers are capable of target cell lysis without prior sensitization, it represents a very important first line of defense against developing tumor cells, viral and bacterial infections. Also as the incidence of autoimmune disorders increase with age, we become aware of how important it is to maintain normal immunocompetence in the elderly.

Vitamin C supplementation, including megadoses, can be helpful in immunocompromising individuals, including those suffering from cancer. Very few, adverse effects have been reported.[37] However, there are some reservations in order to suggest massive supplementation of vitamin C because of potentially dangerous symptoms in some patients with cancer, as for example, acute pyrexial illness and mediastinal compression,[38] which seem uncommon. Other adverse effects reported in the literature are a higher oxalate excretion that can predispose for renal stone formation.[39,,40] The previous effect looks unlikely, because of the diminished pH of the urine when higher doses of vitamin C are given.

In summary, the aging process is associated with many body impairments, one of them is the cellular immune mechanism. We can conclude that vitamin C can be important in maintaining the immune health status in the elderly. By stimulating this mechanism, we will have a great weapon against many health problems in the elderly. More scientific research is needed in order to be able to give specific recommendations as for instance, doses and period of supplementation for patients, especially the geriatric ones, or those who suffer from neoplastic diseases. This will be the future goal.

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