
Benefits of Nutritional Supplements: Immune Function in the Elderly

Prepared by Annette Dickinson, Ph.D.
Council for Responsible Nutrition
June 2002

Infectious disease places a heavy burden on the elderly, and it is likely that improved nutrition could enhance their disease resistance. If immune function could be improved in the elderly, the impact on the individual's quality of life and on the nation's health care cost could be substantial.

People 60 years of age and older are growing in absolute numbers and as a percent of the U.S. population. Their number has grown from 5 million in 1900 to 42 million in 1990 and is expected to reach 84 million by 2030. People in this age group accounted for 6 percent of the population in 1900 and 18 percent in 1990. They are expected to make up almost 25 percent of the population by 2030. (See table below.) The elderly currently account for about 30 percent of U.S. health care expenditures. Nutritional inadequacies may contribute to the burden of disease in the elderly. (Weimer 1997)

U.S. Population Age 60 and Over, 1900–2030

	1900	1990	2030
Number of people 60 and over	5 million	42 million	84 million
Percent of U.S. population 60+	6%	18%	25%

Nutritional Shortfalls in the Elderly

An extensive survey of the dietary habits of 1740 healthy adults (living in Arizona and over the age of 50) showed that more than 60 percent had deficient dietary intakes of vitamin D, vitamin E, folate and calcium. Their intakes were not only below the *recommended* levels, but below the *average requirement*. In terms of dietary patterns, no more than 10 percent of the population met the Food Pyramid recommendations for grain or dairy products, and only about 50 percent met the daily recommendations for fruits and vegetables. (Foote 2000)

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Researchers working in rural Iowa surveyed nutrient intakes of more than 400 elderly residents. All subjects were 79 years of age or older (average age 85) and were living in the community, not in an institution. More than half lived alone. “Eighty percent of subjects reported inadequate intakes of four or more nutrients.” Folate, vitamin D, and calcium intakes were inadequate in most of this elderly population. “Multivitamin/mineral supplementation with additional calcium may be necessary for the old to achieve adequate nutrient intakes.” (Marshall 2001)

Nutrition and Immune Function

The internationally recognized expert in nutrition and immunity, Dr. Ranjit Chandra of the Memorial University of Newfoundland and the World Health Organization Center for Nutritional Immunology, has observed that only about 35 percent of the elderly retain the level of immune function typical of younger adults. His studies “indicate that a causal relationship does exist between under nutrition and impaired immunity in many elderly individuals and that this is a correctable abnormality in the majority.” (Chandra 1988)

In a double-blind controlled trial, Dr. Chandra gave a modest multivitamin and mineral supplement or a placebo to 96 men and women over 65 years of age, in Newfoundland, for a period of one year. During that year, the supplemented group reported only half as many sick days as the placebo group. Several biochemical measures of immune function also improved. Dr. Chandra concluded: “The results of this study substantiate the hypothesis that nutritional status is an important determinant of immunocompetence in old age and that an optimum intake of micronutrients is needed for enhanced immune responses in elderly subjects. Such an intervention led to a striking reduction in illness, a finding that is of considerable clinical and public-health importance.” (Chandra 1992) The supplemented group also showed significant improvements in cognitive function. (Chandra 2001) The formulation provided in this study is shown in the table below.

Formulation Used in the Newfoundland Study

Vitamin A	400 µg retinol equivalents (1200 IU)
Beta-carotene	16 mg
Vitamin C	80 mg
Vitamin D	4 µg (160 IU)
Vitamin E	44 mg (44 to 66 IU, depending on form)
Thiamin (B-1)	2.2 mg
Riboflavin (B-2)	1.5 mg
Niacin	16 mg
Vitamin B-6	3 mg
Vitamin B-12	4 µg
Calcium	200 mg
Iron	16 mg
Iodine	200 µg
Magnesium	200 mg
Zinc	14 mg
Selenium	20 µg
Copper	1.4 mg

Dr. Chandra later studied the effects of this same formulation in a younger population, ages 50-65, with similar results. Over a period of one year, supplementation increased immune responses and decreased the total number of days of infection by half, compared to the placebo group. (Chandra 2002) Similar results were obtained by a researcher in India, in a group ranging in age from 51 to 78 years. (Jain 2002)

According to Dr. Chandra, “Nutritional deficiencies are seen in at least one-third of the elderly in industrialized countries.” People especially at risk include those who are physically or socially isolated, those with chronic disease, and those who are very poor or very old. These nutritional deficiencies can lead to impaired immune function. Several studies have tested the effect of nutritional interventions. “In general, providing extra energy or multiple micronutrients or moderately large doses of single nutrients resulted in improved immune responses. In a few studies, this was associated with reduced infection-related illness. Much more work needs to be done in this area of considerable public health significance.” (Chandra 1997)

“In comparison with the general population, older Americans are twice as likely to visit the doctor and 3 times more likely to be hospitalized; their average hospital stays are twice as long, and they consume twice the number of prescription drugs.” Infection is one of the most common causes of sickness in the elderly, and older people are two to ten times more likely to die of infections than younger adults. A review of clinical trials on nutritional interventions supports “use of a daily multivitamin or trace-mineral supplement that includes zinc (elemental zinc, >20 mg/day) and selenium (100 µg/day), with additional vitamin E to achieve a daily dosage of 200 mg/day.” Health care providers should be aware of common drug/nutrient interactions, since the elderly are heavy users of medications. (High 2001)

A study of immune function in elderly persons in New Jersey showed that taking a daily multivitamin for one year resulted in a stronger immune system and higher blood levels of several vitamins. The researchers suggested that current recommendations for some micronutrients may be too low to support optimal immune function in healthy, independently living older adults. (Bogden 1994)

In a two-year study in a nursing home in France, residents were given zinc and selenium *or* vitamin C, vitamin E, and beta-carotene *or* all five nutrients *or* a placebo. People who were supplemented with the minerals, with or without the vitamins, had significantly fewer respiratory infections and urogenital infections over the two-year period. (Girodon 1997)

In a Boston study of 88 healthy people 65 years of age or more, vitamin E supplementation was found to improve some measures of immune function. Researchers at the USDA Human Nutrition Research Center on Aging indicated that the best responses were observed in people given 200 mg of vitamin E per day. Other levels given were 60 and 800 mg of vitamin E. (Meydani 1997)

In an editorial accompanying the Meydani study (above), Dr. Chandra recognized that the amounts of vitamin E and some other nutrients found to be beneficial for immune function in the elderly “apparently cannot be provided by a reasonable quantity and variety of natural foods.

Thus nutrient supplements may be important for health promotion and prevention of chronic diseases.” (Chandra 1997)

Further, according to Dr. Chandra: “It is expensive and impractical to estimate dietary intake or blood levels of various nutrients in individuals. Since there is no evidence to suggest that physiological amounts of vitamins and trace elements given for prolonged periods have any toxic or adverse consequences and given the high prevalence of deficiencies of several micronutrients in old age, it would be prudent to opt for a suitable micronutrient supplement in modest amounts for all elderly individuals in order to achieve the maximum physiologic and health benefit with the least risk of toxicity. Further research is needed to confirm the type and amount of micronutrient(s) to be included in the supplement.” (Chandra 1997)

Nutritional Supplements Should Be Provided in Nursing Homes

Elderly persons residing in nursing homes may be particularly at risk of unrecognized inadequacies of vitamins and minerals because of difficulties in feeding and because they are already suffering from numerous diseases or disorders. While other nutritional problems observed in nursing homes may be difficult to remedy, micronutrient deficiencies can be avoided through inexpensive, safe supplementation. Dr. Connie Bales of the Duke University Medical Center emphasizes that “the benefits could be remarkable, with the potential for improvements in a number of vital functions, including but not limited to cognitive ability and immunocompetence.” (Bales 1995)

A study of Veterans Administration nursing homes found that 88 percent of the residents had dietary intakes below 50 percent of the RDA for three or more nutrients. Researchers observed that “essential nutrient inadequacies can lead to adverse effects on nearly all organ systems and can contribute to many of the physical and mental complications commonly seen in nursing home residents.” They urged nursing home administrators to assure that residents unable to feed themselves receive a multivitamin/mineral supplement daily. (Rudman 1995) Some of the complications related to nutrient inadequacy are:

- Inadequate intakes of calcium, phosphorus, and vitamin D predispose to bone loss and fractures, both of which are common in the nursing home population.
- Deficient intakes of copper, iron, folate, or vitamin B-12 can cause or contribute to anemia, which is present in 50 percent of residents.
- Deficiency in zinc predisposes to dermatitis, slow wound healing, and altered mental status.
- Pyridoxine (B-6) deficiency can cause or intensify anemia and affect the incidence of convulsions.
- Low intakes of thiamin or niacin can predispose to abnormal behavior or dementia.

While it is assumed that the RDAs apply to the nursing home population, some studies have shown that higher-than-RDA levels of some nutrients are required by some patients. “It would appear that in some nursing home patients, changes in absorption, transport, storage, metabolism and excretion are such that an intake at the RDA level does not result in a normal blood level.” Further research is warranted, but in the meantime “it would appear prudent to place all nursing home residents on an inexpensive multiple vitamin containing the RDA and to consider placing

the more debilitated residents on generic supplements containing several times the RDA of water soluble vitamins.” (Drinka 1991)

Dr. Bales has concluded, “While only a small proportion of the elderly population actually resides in nursing homes at any point in time, it is likely that many of us will pass that way at some point in our lives . . . Perhaps by moving forward with a common sense approach [supplementation] for dealing with remediable nutritional problems in the facilities where they occur, we could be doing ourselves and/or our loved ones a nutritional favor—in advance.” (Bales 1995)

Bottom Line

The elderly are at risk for nutrient inadequacy, and that inadequacy can have a specific negative impact on their immune function as well as other aspects of their health. Vitamin and mineral supplements have been shown in some studies to improve immune function in the elderly. Generous intakes of some individual nutrients such as vitamin E have also had a positive effect. Some experts believe it makes sense to encourage the elderly to use multivitamin and mineral supplements, though more research is needed on the optimal composition of the product to be recommended. Some have also advocated providing a multivitamin and mineral product to the elderly in nursing homes, as a matter of policy, to avoid risking the consequences of inadequate intakes.

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