Chapter 5

Nutrient Control of Immune Function

Jeffrey B. Blumberg

INTRODUCTION

Nutrition scientists are approaching a goal of being able to recommend diets and provide functional foods that can promote optimal immunity in healthy individuals and maintain normal immune defenses in compromised patients. Although immunologic tests are increasingly recognized as a useful complement to traditional methods of nutritional assessment, correcting malnutrition and enhancing even apparently adequate nutritional status may prove to be effective in reducing the rate and severity of infectious diseases, increasing the responsiveness to immunization, and protecting against several chronic diseases associated with impaired immunity. These interventions involve provision of the nutrient substrates required by the immune system under stimulatory conditions in response to infectious disease or other traumas as well as under quiescent states.

Scrimshaw, Taylor, and Gordon (1959) were the first to review the early scientific work in this field and present the concept of a synergistic interaction between nutrition and the immune response.
to infectious disease. This interaction is now appreciated to be bi-directional, i.e.; nutritional status influences host immune responsiveness, and infectious disease has a detrimental influence on nutritional status. Interestingly, conditions associated with chronic overnutrition, e.g., obesity, cardiovascular disease, and adult-onset diabetes, significantly modulate immune function; the diets employed to treat these afflictions appear to have a far-ranging influence on host defenses.

Our growing understanding about the mechanisms by which nutritional factors affect immune function and the ontogeny of the immune response is critical to the development of functional foods targeted to this system. The general nature of the influence of diet on immunity has been shown to be both qualitative and quantitative varying with the individual nutrients. Diet may act specifically upon the lymphoid system and immune cell function or nonspecifically upon associated factors. Nutrient availability can also impact metabolic, neurologic, or endocrine functions that influence immune function. Further, nutrients are involved in the stability of the plasma membrane and the differentiation and expression of its cell surface characteristics such as antigenic determinants. Thus, nutritional factors can affect the development and maintenance of immunocompetence through many pathways; for example, nutritional factors act at multiple sites within the immune system by modulating metabolic processes. These metabolic changes may include the activation or inhibition of key enzymes, immunoregulatory mediators, and/or products of the major histocompatibility gene complex. These nutritionally induced changes can result in altered cellular immune functions, particularly in cells of T lymphocyte lineage.

Experiments with nutritional intervention in animal and cell culture models are essential to our understanding of the roles and mechanisms of individual nutrients. However, these studies may or may not be directly applicable or relevant to clinical or public health conditions. Thus, this review emphasizes clinical studies in which beneficial effects of selected nutrient interventions have been reported.

**VITAMINS**

**Water Soluble Vitamins**

**B Complex Vitamins**

Specific and nonspecific immune responses can be severely compromised when the B complex vitamins are deficient as a result of