

IMMUNOMODULATORY ACTIVITY OF PHYTOCHEMICALS

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The significance of nutrition as a key factor in host defense has become evident during the last decades. However, the specificity of this interaction at the level of the immune system is still unclear. In industrialized countries nutrition affects the immune system mainly by supplying a surplus of energy and fat and by an inadequate intake of vitamins and minerals. The increasing knowledge on the contribution of the immune system to the pathogenesis of common diseases like cancer, cardiovascular diseases and AIDS as well as allergies has stimulated studies to modulate the immune system by nutritional intervention.

In contrast to the many studies on the impact of nutrients on the immune system, the impact of dietary non-nutritive factors like phytochemicals on the human immunocompetence have not been studied well. The carotenoids are the only group of phytochemicals, which have been intensively investigated in animal as well as in human studies. The main emphasis has been on the effects of β -carotene, and few studies have looked at carotenoids without provitamin A activity, such as canthaxanthin and astaxanthin. β -Carotene affects phenotype expression of lymphocytes in humans and enhances effector functions, like natural killer cell activity, lymphocyte proliferation and delayed type hypersensitivity. The flavonoids are another major group of phytochemicals, of which individual compounds show immunomodulatory activity. Various animal studies indicate that they inhibit inflammatory, proliferative and allergic activities. Most of the flavonoids studied in animals so far exerted immunosuppressive effects. Based on this knowledge flavonoids have been used in animal studies to counteract an overreacting immune system. However, in most of these studies flavonoids have been applied parenterally and studies with humans are still missing. Flavonoids could affect the immune system by inhibiting key enzymes important for the synthesis of endogenous mediators of the immune response as well as by interfering with signal transduction factors like $\text{NF-}\kappa\text{B}$.

Further groups of phytochemicals, for which in vitro and animal data indicate an immunomodulatory activity are the saponins, the sulfides and phytic acid. However, the current data are rather poor and additional studies are necessary to identify the clinical significance of these compounds for the immunocompetence of healthy subjects. In conclusion, certain

1st KARLSRUHE NUTRITION SYMPOSIUM

Physiological Functions of Dietary Phytochemicals and Complex Carbohydrates

**September 29 - October 1, 1996
Congress Centre Karlsruhe**

ABSTRACTS