

## Immunonutrition

It has been recognised for many years that states of nutrient deficiency are associated with an impaired immune response and with increased susceptibility to infectious disease. In turn, infection can affect the status of several nutrients, thus setting up a vicious cycle of under nutrition, compromised immune function and infection. Thus, the focus of much of the research into nutrition, infection and immunity has related to identifying the effects of nutrient deficiencies upon components of the immune response (often using animal models) and, importantly, upon attempts to reduce the occurrence and severity of infectious diseases (often in human settings). Although it is often considered that the problems of under nutrition relate mainly to the developing world, they exist in developed countries especially amongst the elderly, individuals with eating disorders, alcoholics, patients with certain diseases and premature and small-for-gestational age babies. Thus, immunological problems in these groups probably relate, at least in part, to nutrient status. In addition, many diseases which exist amongst the apparently well nourished have a strong immunological component and it is now recognised that at least some of these diseases relate to diet and that their course may be altered by specific changes in nutrient supply. Examples of these diseases include rheumatoid arthritis, Crohn's disease and atopic diseases. Furthermore, it is now recognised that atherosclerosis, a disease strongly influenced by diet, has an immunological component. Thus, understanding the interaction between nutrition and immune function is fundamental to understanding the development of a multitude of communicable and non-communicable diseases and will offer preventative and therapeutic opportunities to control the incidence and severity of those diseases. The potential to modulate the immune system by specific nutrient interventions has been termed 'immunonutrition'.

It is now recognised that immune dysfunction plays a role in the events which follow trauma, burns or major surgery. In many patients there appears to be biphasic response with an early hyper-response of some immune cells which is characterised by the production of large amounts of inflammatory eicosanoids, cytokines and other mediators. If uncontrolled this can lead to organ failure and death.

Indeed, after a period of time there appears to be a compensatory response which involves the production of large amounts of anti-inflammatory cytokines. However, an excessive compensatory response is associated with immunosuppression. It is believed that appropriate provision of nutrients can exert modulatory effects on both the hyper-inflammatory phase (sometimes termed the systemic inflammatory response syndrome or SIRS) and the compensatory phase (often termed the compensatory anti-inflammatory response syndrome or CARS) of this response. Among the nutrients considered useful here are glutamine, arginine, *n*-3 polyunsaturated fatty acids, antioxidant vitamins, glutathione precursors and nucleotides.

In June 2000, a group of international experts in the field of immunonutrition gathered at Schloss Rauischholzhausen in Hesse, Germany for an International Workshop on Immunonutrition. The aim of this workshop was to review the latest developments in the field. Experts provided overviews of the basis of the immunomodulatory actions of glutamine, arginine, *n*-3 polyunsaturated fatty acids, and nucleotides and reviewed studies involving these in a variety of clinical settings. A series of presentations described the outcomes of recent clinical trials of immunonutrition in chronic inflammatory diseases and in trauma patients. This supplement contains papers selected from amongst those presented at the workshop. It includes a mix of review articles and research papers presenting previously unpublished experimental results. Taken as a whole this collection of papers demonstrates the potential efficacy of immunonutrition in a range of situations. Most excitingly, it appears that judicious use of certain nutrients at particular times during the host response to injury or surgery not only modifies the course of SIRS and CARS, but also can have beneficial effects on clinical outcomes.

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