

NUTRITION AND SUPPLEMENTATION IN IMMUNE SYSTEM SUPPORT

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At this time of the year, when people are feeling the effects of sun deficiency and a stodgy diet, it can seem that there is no relief for the immune system, as it is bombarded with infections, colds and flu.

Even the mildest infection needs a large quantity of nutrients to attack invading microorganisms. Furthermore, due to the immune system's fast cell turnover, it needs a high nutrient intake to function effectively. Probably the nutrient that stands out in the public eye for its role in immune function is vitamin C. However, even a slight deficiency in any one nutrient can tip the balance and compromise the immune system. Here we take a look at the role of the key nutrients for immune strength.

Vitamin A & Carotenoids

Vitamin A is absolutely essential to proper immune function. Vitamin A levels are severely depleted by an attack on the immune system, while a vitamin A deficiency also increases one's susceptibility to infections, and in particular attack by viruses (10).

Even before microorganisms get a chance to enter the body, vitamin A has a key role to play in maintaining the integrity of mucosal & epithelial surfaces and their secretions, which are an essential part of the immune response.

Vitamin A also has a direct role to play in promoting immunity. It has been found to promote thymus growth and protect the thymus from free radical damage, due to its antioxidant activity. For this reason, it is suggested that beta-carotene is the preferred form of vitamin A supplementation for immune activity. However, although beta-carotene has the highest vitamin A activity of the carotenoids, its antioxidant activity compares less favourably, with lycopene, which has the highest singlet oxygen quenching effect of the carotenoids thus studied (1). Thus a mixed carotenoid supplement is recommended.

It seems that the effect of vitamin A on the immune system is not merely a result of reversing a deficiency. Supplementing high doses of vitamin A have been shown to stimulate and/or enhance numerous immune responses, including natural killer cell (NKC) activity, white blood cell function, phagocytosis, antibody response and T cell count. Studies show that vitamin A may help prevent the immunosuppression induced by the corticosteroids, severe burns and surgery (2,3,4).

It is important that vitamin A supplementation is supervised, as high levels supplemented over a long period of time can be toxic – especially in pregnancy and children. Supplementing beta-carotene with mixed carotenoids is therefore an effective alternative.

Vitamin C & Flavonoids

Vitamin C is notorious for its effect on immune strength, and in particular its effect on reducing the frequency and severity of the common cold. Like vitamin A, vitamin C levels are quickly depleted under the stress of an infection.

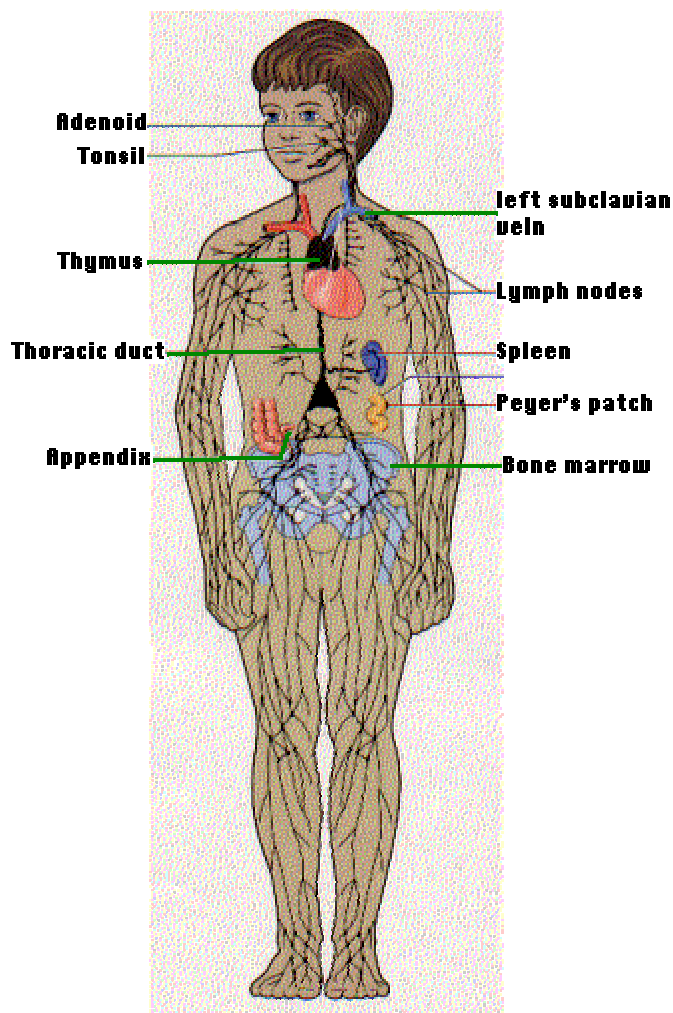
Vitamin C displays anti-viral and anti-bacterial properties and plays an important role in immune enhancement by improving host resistance. The protective antibodies and chemicals in secretions such as tears, saliva and earwax are vitamin C dependant.

Vitamin C also plays an integral role in the activity of macrophages and enhances lymphocyte activity, thus influencing the cell-mediated response to viruses and tumour cells. Vitamin C can also increase antibody response, immunoglobulin levels, secretion of thymic hormones, and protect the integrity of ground substance (11-18). Vitamin C increases interferon levels, as well as having biochemical effects similar to interferon (19).

Vitamin C is a major constituent of collagen and, alongside flavonoids, it is required for tissue integrity, thus helping to maintain the structure of connective tissue and ground substance. When supplementing vitamin C, it is important to choose one containing bioflavonoids, to help potentiate its effects. Flavonoids are antioxidant nutrients found in fruits, vegetables, green tea, grapeseed, pine bark, etc.

Some of the roles of flavonoids in enhancing immune reactions include:

- Potent antioxidant properties
- Anti-inflammatory



- Maintain healthy collagen
- Maintain tissue integrity e.g. capillary strength
- Bind free iron and copper, which can act as pro-oxidants if left uncontrolled

Zinc

Alongside vitamin C, zinc is the nutrient that has been drawing widespread public interest, thanks to its inclusion in several cold and flu remedies. Zinc helps skin to heal, activates the immune system and regenerates tissue. Zinc is also important in maintaining serum levels of vitamin A.

Zinc helps to promote the binding of complement to immune complex (5). It also has a major role in the immune function of other nutrients. For example, it acts synergistically with vitamin A and protects against iron-catalysed free radical damage. It is also important for lymphocyte function and is a necessary co-factor in activating serum thymic factor (5). In vitro, zinc has been shown to inhibit the growth of several viruses and increase T cell count (6).

It is important to note that high levels of zinc, taken over a long period of time can actually impair immune function.

Selenium

The antioxidant enzyme glutathione peroxidase (GP) is selenium dependant, thus giving selenium its reputation as an important antioxidant mineral. A deficiency in selenium will manifest very rapidly in a depressed immune function, while selenium supplementation can quickly augment and/or restore effective immune functions, due to its stimulatory effect on white blood cells and activity of the thymus gland, thus enhancing the body's resistance to infection (7,8,9).

The effects of selenium supplementation go well beyond just restoring normal selenium in deficient individuals. One study showed that supplementing 200mcg per day in individuals with normal selenium concentrations in the blood resulted in a 118% increase in the ability of lymphocytes to kill tumour cells, and an 82.3% increase in the activity of NKCs (8).

Vitamin E

Vitamin E enhances both humoral and cell-mediated immunity. It has been shown to play a role in preventing free radical damage to the thymus as well as enhancing helper T cell activity. Vitamin E is also required for antibody response, macrophage activity and spleen function (20).

Iron

Although iron is often thought of as a pro-oxidant, and its supplementation is not normally recommended in immune compromised individuals, even a marginal iron deficiency can deplete the immune system without affecting haemoglobin concentrations.

Studies show that iron is required for lymphocyte response, macrophage and neutrophil function, and for maintaining T cell and B cell counts (11,12).

Interestingly, iron is an essential nutrient for the proliferation of bacteria. During a bacterial infection, the body automatically reduces serum iron levels (21). One of the body's most important defence mechanisms against invading microorganisms is to increase body temperature and induce a fever. As this happens, blood plasma levels of iron are also reduced, making less available for the microorganisms causing the infection to proliferate. However, if a fever temperature is combined with high iron levels, the bacteria are unaffected by the increased body temperature. Thus iron supplementation is contraindicated during acute infection. However in individuals with chronic infections, impaired immune function and subnormal iron levels, adequate supplementation is essential.

The B Vitamins

Of all the B vitamins, B6, B12 and folic acid have the most important role in immunity. A B6 deficiency results in depressed T cell and B cell function, a reduction in the quantity and quality of antibody production and depressed lymphocyte activity. Megablasic anaemia, induced by a deficiency in folic acid or B12, results in improper white blood cell production and abnormal lymphocyte responses. (11,12).

Garlic

Look into your kitchen cupboard and you are likely to find one of the most potent immune agents in natural health. Garlic exhibits powerful antibacterial, antiviral, antifungal and anthelmintic effects. It has been shown to be effective against a broad spectrum of bacteria, including *Staphylococcus*, *Streptococcus*, *Bacillus*, *Brucella* and *Vibrio*, where it compares favourably with antibiotic medications such as penicillin, streptomycin and erythromycin (22, 23, 24, 25). Anti-candida programmes often employ garlic, as a result of its potent anti-fungal activity. Several studies show that garlic's anti-fungal activity compares favourably against anti-fungals such as nystatin (24, 26). The sulphur components of garlic are thought to be responsible for much of garlic's antimicrobial activity.

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Probiotic Bacteria

It is well documented that the gastrointestinal tract plays an integral role in maintaining the function of the immune system. One of the most important pieces of this jigsaw is the presence of adequate levels of the probiotic bacteria in the gut. *Bifidobacteria bifidum* and *Lactobacillus acidophilus* are two of the most prolific probiotic bacteria present in the GI tract. They have an indirect role to play in competing with pathogenic bacteria for colonisation in the GI tract as well as a direct immune response, as Bifidobacteria can help to reduce colonisation of opportunistic bacteria.

Squalene

Squalene is a lipid substance found in all green plants. It is the parent molecule from which plant sterols, well-known for their anti-inflammatory activity, are formed. In humans, squalene is produced by the pathway that creates cholesterol and steroid hormones. It is required for production of the hormones that stimulate the production of white blood cells. Squalene is normally extracted from shark liver oil, but can also be manufactured by a special process from olive oil.

It is essential that any nutritional deficiencies are corrected, as any one nutrient being out of balance can have a debilitating effect on the immune system. On top of this certain nutrients, as outlined above, can prove beneficial in helping the body repair and heal itself and boost the immune system.

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JANE MCCLENAGHAN works for Vital Nutrition, a nutrition company based in Belfast. She wrote the above article on behalf of Biocare, who are providing MARION KIRKHAM ND, a practising Naturopath, to run two workshops at the SMTO Conference 2003 on Saturday 22nd March 2003. Marion is also a director of the London College of Naturopathic Medicine and runs educational programmes on behalf of Biocare Ltd. She is also trained in Optimum Nutrition, Therapeutic Massage, Celloid Mineral Therapy and Botanicals, Remedial Massage and Manipulative Therapy, Bowen Technique, Cranio-sacral Therapy and Visceral Manipulation.

Both workshops are designed to give delegates an insight into the role of nutrition in common pathology that may present in their practices. On Saturday morning, "NUTRITION & SUPPLEMENTATION IN MUSCULO-SKELETAL & CONNECTIVE TISSUE DYSFUNCTION", so it's "from bone to blood" covering the dynamics of connective tissue including osteoporosis, arthritis, anaemias etc. This workshop discusses the range of nutrients that can be used to assist the body in maintaining healthy musculo-skeletal function. The Saturday afternoon workshop, "NUTRITION & SUPPLEMENTATION IN IMMUNE SUPPORT", takes a look at the many facets of immunity, from barriers to the gastro-intestinal tract, and discusses the nutritional and lifestyle factors that can be used to enhance them.