

Preventative Maintenance of the Immune System

General Preventive Maintenance of the Immune System: A Brief Overview from a Behavioral and Nutritional Perspective

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There is more and more information indicating that dysfunction of the immune system should be included in the category of degenerative conditions that require prevention and maintenance, rather than reacting strictly after the fact by means of symptomatic treatments or antibiotics. After all, we understand the importance of staying fit. We exercise to maintain muscle, heart and lung function. We stop smoking to prevent lung cancer. We eat more fruits and vegetables to avoid cancer. We watch our weight to help prevent hypertension and diabetes. We should treat our immune system with the same dedication.

Although he did not express it in exactly these terms, the use of vitamin C to boost the immune system, and thereby avoid the common cold, was advocated 25 years ago by Linus Pauling. It is really only within the last ten years that the notion that the immune system could be maintained or modulated has become somewhat popular among health care providers and the public. One of the barriers in developing simple preventive approaches for complete immune health is the tremendous complexity of the immune system. Such a complex system can be affected, negatively or positively, in many ways.

The immune system is a diffuse interacting whole-body network, rather than a discrete organ or body part. The heart or brain, and can be divided into three sub-systems as shown in Fig. 1: phagocytic cells that "ingest" and "digest" parasitic invaders, t-lymphocytes that destroy foreign or infected cells by "cell-mediated" immunity, and B-lymphocytes that produce antibodies.

Fig. 1 also indicates the interactions between these three sub-systems as follows:

- Phagocytes "present" antigens to lymphocytes.
- T-lymphocytes stimulate macrophages and B-lymphocytes by secreting cytokines.
- Antibodies mark parasites for destruction.

The failure of any one of the sub-systems seriously impedes the other two.

While we are born with phagocytic cells, which are part of what is called "innate immunity," lymphocytic immunity is "acquired" after birth. The maturation of t-lymphocytes is shown in Fig. 2. Bone stem cells are shuttled to the thymus where they become mature T-cells which

are then seeded into the secondary lymphoid organs. As do all physiological systems of the body, the immune system deteriorates with age. The "involution" of the thymus described in Fig. 3 decreases the capacity to generate new T-cells. Furthermore, as a result of continuous turnover throughout life, the existing T-cells in the body gradually lose their capacity to proliferate. The overall result is the gradual loss of the body's ability to mount an immune response.

Immune System Stressors

Part of this aging process is undoubtedly programmed into our genes. But, a large part is also the result of personal habits and our surrounding environment. There are three general categories of stressors to the immune system:

- Personal habits or lifestyle, such as nutrition, sleep, exercise, alcohol consumption, smoking or drug use.
- Environmental stresses we encounter everyday such as contaminants, toxins, allergens and extreme weather.
- Traumatic or disease states such as trauma, burns, cancer, renal disease, chronic fatigue, and AIDS; and/or various procedures or treatments which address the trauma or disease including surgery, chemotherapy, radiation, corticosteroids, etc.

Some habits and activities are so routine that we may think nothing of their effects on our immune system, such as:

Sleep deprivation, especially when accompanied with jet lag and the resulting changes in circadian rhythm, depresses immune function (Irwin et al 1996).

Exercise, which many people assume can do only good, can have deleterious effects on the immune system when overdone (Nieman, 2000).

Cold weather can set off an asthma attack and can also depress cell-mediated immunity.

Excessive alcohol intake can cause deficiencies in host defense, particularly in T-cell function (Szabo 1999).

Cigarette smoking is immunosuppressive, and has been associated with various autoimmune conditions (Sopori et al 1998; George et al 1997).

The Role of Nutrition

Nutrition affects immunity in many fundamental and subtle ways. Protein-energy

malnutrition and iron have the largest impact, with more impact on cell-mediated and non-specific immunity than on humoral immunity (Scrimshaw and San Giovanni 1997). Protein-calorie malnutrition is part of the problem of immune deficiency and parasitic infections in developing countries, but is rare in North America. However, slight deficiencies in zinc, copper, selenium, and/or vitamins A, C, E, B6 and folate can be linked with immunological deficiencies, especially in children (Chandra 1999) and in the elderly (Lesourd 1997). Although supplementation is generally helpful in assuring an adequate intake of these vitamins and trace elements, care is required in order to achieve the proper balance. For example, excess zinc intake can cause deficiencies in copper nutrition (Greger 1978).

Glutamine, normally a non-essential amino acid, may become "conditionally essential" in certain situations of catabolism, such as sepsis, injury, burns, surgery and even over-training in athletes. Intravenous supplementation of glutamine has been shown to decrease infections in bone marrow transplantation (Calder and Yaqoob 1999). Glutamine benefits the immune system and other rapidly-turning-over tissues in situations of stress, such as infection and injury (Wilmore and Shabert 2000). Finally, something that may be more relevant in North America, overnutrition and obesity can alter the immune state. Obese persons tend to have deficiencies in cell-mediated immunity (Keith and Jeejeebhoy 1997).

Additional Factors

Studies have shown that physical trauma and particularly trauma to the head is accompanied by a decrease in cell-mediated immunity (Meert et al 1992). Surgery is often followed by an "anergic" state, ie, one characterized by lack of immune responsiveness. This is especially the case when the surgical patient is already affected by trauma, malignancy, cirrhosis, diabetes, or malnutrition (Cheadle et al 1996).

Cancer itself may be an indication of immune weakness, and chemotherapy and radiotherapy, which are designed to kill rapidly replicating tumor cells, further suppress the rapidly turning over immune cells.

Glucocorticoids, prescribed for dozens of conditions, have potent adverse effects, including serious viral, bacterial, and fungal infections (Barbuto JAM, 1995).

Illicit drug use can also be extremely destructive to the immune system.

What can be done to counteract these negatives?

As a minimum, the "preventive base" is as follows:

- Get the proper amount of sleep (the average requirement actually is between 8 and 9 hours) (Dement, 1998). Combine a sleep program with exercise and stress reduction program. Useful information can be obtained in William Dement's book "You deserve good sleep" (Dement 1999).

- Moderate alcohol intake. According to numerous epidemiological studies, two to three alcoholic beverages per day is the level at which incidence of chronic diseases is at its lowest. Cancer, cirrhosis, stroke, and infections are higher in those with increased alcohol

intakes.

- Stop smoking.
- Exercise and maintain appropriate weight.
- Proper nutrition and diet. Supplementation with vitamins A (natural, mixed carotenes are best), C, E (again, natural is best), B6, and folic acid is recommended (Meydani 1995). Moderate supplementation with copper, zinc and selenium is also recommended.
- In addition to this preventive base, specific supplementation may be helpful in many cases and might include:
 - Glutamine supplementation which may help overtrained athletes, post-surgical and other stressed patients.
 - Supplementation with liquid thymus extract helps to support normal lymphocyte proliferation and to help maintain an aging or dysregulated immune system (Kouttab et al 1989; Hadden et al 1992). Considerable evidence supports the use of herbal approaches such as *Andrographis paniculata* (Panossian et al 2000) *Echinacea* (Stimpel et al 1984) and other herbal remedies.

The necessity of administering immune suppressive drugs should be seriously evaluated before administration. Their use should be limited in time and subject to serious routine reevaluation.

These above recommendations can be adapted for use in the following general situations:

- Individuals who are in basically good health and who are aiming for prevention or self-healing should implement the preventive base of the immune health structure. Within this base, vitamins and minerals help to round out the balance of nutrients and avoid any borderline deficiencies. Immune-modulating supplements can be added when needed, for example during the flu and allergy seasons.
- Subjects with tenacious or chronic conditions should attempt to incorporate most aspects of the preventive base, and may find that using a variety of immune modulators works for them (thymus, andrographis, echinacea, etc).
- Finally, for those with acute disease or serious chronic conditions, their attending health care providers should provide nutritional support (with possible glutamine supplementation) and supplementation of a potent liquid thymus extract.

A healthy base of immune health can be acquired by sleep improvement and stress reduction, moderation of alcohol intake and smoking cessation, weight loss and moderate exercise, optimal nutrition combined with basic nutritional supplementation. To this foundation, specific immune supplementation may help to maintain optimal health. These

recommendations are fully compatible with other preventive health maintenance programs, and as with other programs, the best results come from a consistent application of a combination of therapies.

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