

NUTRI NEWS



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IMMUNITY

James L. Wilson ND, Ph.D.

The Immune System

The human immune system is a magnificent and well-coordinated network of cells, organs, glands, and physiological processes. Nearly every cell, organ and tissue in the body is involved either directly or indirectly in the immune process.

From the outside in, the skin and mucous membranes offer the first line of defense. The intact layers of skin form a magnificent and nearly impenetrable shield against most microorganisms. Mucus membranes covering the entire length of the nasal mucosa, respiratory, gastrointestinal and urogenital tracts continue this immune protection within. In addition, the hairs of the nostrils along with the sneeze and cough reflexes slow down, block and expel organisms that might otherwise infect the respiratory tract. The coordinated efforts of the cilia in the lungs, bronchia and trachea effectively remove mucus and trapped microorganisms by constantly driving them upward and into the esophagus. Once in the esophagus the potential pathogens, along with the mucus trapping them, are swallowed into the stomach where the actions of strong hydrochloric acid combined with digestive enzymes such as pepsin and trypsin destroy the proteins in bacterial cell walls and viral envelopes, thus keeping the body from harm.

Despite this strong front line, occasionally invading pathogens do prevail and the body has to call upon a deeper layer of defenses, the leukocytes and the products they secrete. Millions of leukocytes are produced every minute in the bone marrow. From there, these highly coordinated and ever vigilant immune cells move out to circulate continually throughout the body or wait in strategic positions for the opportunity to serve. There are five major types of leukocytes (lymphocytes, monocytes, neutrophils, basophils and eosinophils); each with their own important role to play in immunity.

Innate and Acquired Immunity

A portion of this elaborate network of immune defense is functional at birth (innate immunity) and the rest develops as the body interacts with the environment (acquired immunity). The leukocytes involved in innate immunity include neutrophils,

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GENERAL PREVENTIVE MAINTENANCE OF THE IMMUNE SYSTEM:

A BRIEF OVERVIEW FROM A BEHAVIORAL AND NUTRITIONAL PERSPECTIVE

Stephen Behr, Ph.D.

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.

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basophils, eosinophils, monocytes and a sub-set of monocytes, the macrophages. These white blood cells (WBCs) circulate unceasingly from birth to death, defending the body against invaders. They have each been preprogrammed to attack anything that is not identified as part of the host body. Each cell in the body has a self-marker that distinguishes it from cells of any other plant or animal or from any foreign substance. One of the functions of the WBCs of innate immunity is to check each substance or cell they come in contact with for a self-marker. If it lacks a proper self-marker, the substance is attacked and destroyed.


The leukocytes involved in acquired immunity learn with exposure to the environment what the body needs to be protected against. Chief among these immune cells are the B and T lymphocytes, the commanders of the two major categories of learned white blood cell defense. Each is in charge of a different aspect of acquired immunity.

Humoral and Cellular Immunity

B-lymphocytes are in charge of humoral immunity, which is primarily concerned with the manufacture and deployment of immunoglobulins. Immunoglobulins have the ability to act against what they determine to be antigens, and for this reason, these immunoglobulins are known as antibodies. In classic immunology the many different kinds of antibodies are divided into five major classes: IgA (immunoglobulin A), IgD, IgG, IgM and IgE.

Each of these classes of immunoglobulins has different functions and capabilities. For example, IgG is the only immunoglobulin that crosses the placenta. IgM is a powerful antibody that can activate other serum components to cause a breakdown of bacteria and other foreign cells, but generates no appreciable immune memory. IgA is the major antibody found in tears, saliva and the gastrointestinal tract. IgD is the only antibody found on immature lymphocytes and IgE causes the release of histamine by mature basophils (mast cells). IgG, IgM and IgE are all involved in the immediate hypersensitivity reactions such as food or environmental allergies (Benjamani '88).

It is convenient to think of the B-lymphocyte as the artillery of the immune system. Keeping a safe distance from the foe, B-lymphocytes fire off round after round of antibodies to destroy the perceived enemy without having any direct contact with it. In a simplified manner, the defense provided by B-lymphocytes is as follows. A naive B-lymphocyte (one that has not been exposed to a foreign substance or antigen) is introduced to a foreign antigen, most commonly a protein. Once a B-lymphocyte is exposed to this antigen, it becomes dedicated to producing IgA, IgM or IgG (but not IgD or IgE) antibodies solely against this antigen. The B-lymphocyte, now finely attuned to the presence of this antigen, causes other B-lymphocytes to be produced that are sensitive to this particular antigen making a small army of B-lymphocytes ready to spring into action the moment the antigen is detected. Once the antigen is detected, the B-lymphocytes dedicated to that antigen release a multitude of antibodies that circulate seeking this foreign antigen to which they can attach themselves. When the antibody attaches to the antigen it acts as a signaling device to recruit more antibodies, WBCs, and other implements of destruction to



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eliminate the perceived antigen. A different set of B-lymphocytes is needed for each antigen.

T-lymphocytes are in charge of cellular immunity. As a group they act as a command post from which most orders for the immune system flow. This part of immunity is analogous to the ground troops and involves the hand-to-hand combat so vital for the ultimate protection of the body against disease. The cellular branch of immunity is responsible for defense against the deeper bacterial infections, strong viruses, most fungi, cancer and some parasitic infections. It is the cellular immune system that is responsible for protecting the body against most chronic, disabling and fatal diseases.

A sub-group of T-lymphocytes, the T-helper cells, also known as CD4s, are the generals of cellular immunity and control the various WBCs by issuing commands in chemical codes known as cytokines. Many cytokines such as interleukins and interferons have profound effects on other WBCs including their fellow T-lymphocytes, B-lymphocytes, and the two WBCs most involved in direct combat – macrophages and killer cells. By secreting a variety of these chemical codes or messengers, the T-helpers coordinate the combined efforts of the WBCs to contain and destroy any non-self substance detected. Without the T-helpers, the deeper immune responses that keep the body healthy would be unable to function as swiftly and as effectively as they do.

In order to keep the battling WBCs from overreacting, another type of lymphocyte known as T-suppressor or T-8 cells secrete counterbalancing cytokines to down-regulate the destructive activities of cytokines from other WBCs. This keeps them from destroying the host along with the foreign substance. The proper ratio of T-helper to T-suppressor cells is very important because it maintains a balance between necessary aggressive action that targets the enemy and all out generalized destruction that may target healthy body cells as well.

Evaluating Immune Enhancing Products

Immunity is a hot topic, not only in standard medical and alternative health circles, but also for the person on the street. The question I am asked most often at lectures and by patients is whether there are any products that really improve immune

function. To be sure, there are many substances that favorably affect some aspect of immunity. As a researcher in immunology and a practicing physician, I have investigated the science as well as the clinical data for many “immune enhancers.” In the process of looking for the best among the many, I developed a set of performance criteria for their consistent evaluation. They are as follows:

- 1) Capable of deep action – able to make fundamental changes in immunity
- 2) Capable of sustained action – effective after continual use
- 3) Produce broad immune stimulation
- 4) Enhance both humoral and cellular immunity
- 5) Effective in both acute and chronic conditions
- 6) Dose dependent
- 7) Versatile – beneficial for a number of health conditions
- 8) Safe and effective for all ages
- 9) Reliable – consistent quality, producing same effects time after time
- 10) Non-toxic
- 11) History of use in humans
- 12) Manufactured with high quality controls
- 13) Compatible with all medications
- 14) Easy to use
- 15) Few or no side effects
- 16) Improvement evident by both clinical observation and lab results
- 17) Economical
- 18) High patient compliance

My goal has been to find substances that meet all the above criteria. The best answer to date came to my attention not as a scientist or doctor, but as a father. Four years ago my 9 year-old son began having a series of attacks of cold sores followed

by otitis media. The episodes came every three weeks and despite everything I tried, natural and pharmaceutical (including 2 rounds of antibiotics), nothing disrupted the cycle. As a father and as a physician I was distraught that nothing I'd done had really changed my son's recurrent and very painful illness. One evening after I reluctantly confessed to my wife that I'd run out of options, she suggested we try a product made from lactobacillus cell walls and cell wall fractions that a European business associate had given me as a sample. With nothing to lose, but not very optimistic, we gave my son his first tablet just as he was coming down with another bout. To my surprise, the next morning he was better instead of worse and the following day he was well enough to return to school. This got my attention!

Although I have since learned that recovery doesn't always happen that quickly, during the intervening years, I have been continually impressed with the breadth and depth of immune stimulation demonstrated by this substance. With my patients I have used it for everything from viral pneumonia to heightening the immune response before and after surgery, radiation or chemotherapy.

Immune Enhancing Properties of Certain Lactobacilli Cell wall Fractions

Impressed by my own clinical experiences, I started investigating the scientific basis for immune enhancement with Lactobacilli cell walls and cell wall fractions. Of the various combinations commercially available, the cell wall fractions of specific strains of Lactobacillus bulgaricus (*L. bulgaricus*) appear to be the most potent.

Cell walls and cell wall fractions of Lactobacillus bulgaricus have been used in Europe as immune stimulators for many years. Because of the consistent success these substances have exhibited in the treatment of and prophylaxis of so many health conditions they are rapidly becoming available in North America.

The most effective strains appear to come from Bulgaria and are capable of profoundly stimulating both cellular and humoral immunity far beyond the generally mild immunogenic

effects seen in yogurt cultures, even though the base structure is the same. The difference between these immune enhancing strains of *L. bulgaricus* and yogurt cultures or the common lactobacilli preparations sold for intestinal bacteria replacement is like the difference between a "supermodified" race-car and a street model Ford Pinto. Both are cars, but the difference in performance is vast.

Research on Lactobacillus Bulgaricus Cell Wall Fractions

These special strains of *L. bulgaricus* contain specific peptidoglycans, lipopolysaccharides and other cell wall fractions whose presence tremendously enhances immunity. The peptidoglycans and lipopolysaccharides of immune enhancing *L. bulgaricus* have been shown to stimulate mitogenesis of lymphocytes in both mucosal and circulatory lymphocytes (Kitazawa '98) and increase cytokines such as tumor necrosis factor-alpha (TFN-alpha) and interleukin 2 (IL-2) in macrophages (Marin '98). TFN-alpha and IL-2 are important cytokines in the catabolism of tumor cell walls and are two of the key constituents necessary for the successful attack against invading pathogens by phagocytes. It is interesting to note that the immune-enhancing factors in these special strains of *L. bulgaricus* also seem to normalize the production of TFN-alpha and IL-2 levels thus preventing an overproduction of these cytokines that could lead to destructive processes in the body if left unchecked.

Blood monocytes in the presence of *L. bulgaricus* show an increase in TNF-alpha, Gamma Interferon (IFN-gamma) and interleukin-1B (IL-1B) (Solis-Pereyra '93). IFN-Gamma is a cytokine which, besides having anti-viral properties, is also able to activate Natural killer (NK) cells, regulate antibody production and stimulate the antigen-specific helper T-cells (De Simone '86). NK cells also need TNF-alpha to destroy cancer cells. Certain strains of *L. bulgaricus* and its cell wall fractions have proven to effectively potentiate NK cell activity by increasing TNF-alpha (Guencheva G. '92) as well as IFN-gamma (De Simone '86) and IL-6 (Davidkova G '92). These cell wall fractions caused IFN-gamma levels to increase by 10-20 times in the presence of only a small amount of antigen such as a bacteria or virus (De Simone '86).

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ECHINACEA

Andrew Halpner, Ph.D.

Echinacea, a member of the daisy family, was first introduced into medicine by a Nebraskan doctor who learned of its value from the Indians in 1871. At that time the herb was claimed to be effective at treating every disease, including rheumatism, migraine, infections, pain, eczema, malaria, hemorrhoids, tumors etc. Like other herbs, most of the research surrounding Echinacea has been conducted in Germany and Europe, with much of the literature in non-English languages. Of all its purported actions, its immuno-enhancing effect appears to have the most substantiation. Clinical trials investigating the effectiveness of Echinacea have provided us with compelling information regarding its effectiveness.

There are two species of Echinacea commonly used, *E. angustifolia*, and *E. purpurea*. The latter has become most popular and is now the commonly cultivated species. Numerous compounds identified in the herb have been shown to exhibit antiviral and immunostimulatory properties. Polysaccharides contained within Echinacea extracts have been demonstrated to enhance non-specific cell-mediated immunity, increasing the production of cytokines such as IL-1, IL-6, IL-10 and TNF- α . These same polysaccharides have also been reported to have anti-inflammatory activity, and can reduce leukocytic infiltration associated with dermatitis.

Although the number of clinical trials investigating Echinacea are somewhat limited, the data are very

encouraging. Hoheisel et al. examined the expressed juice of *E. purpurea* on its ability to shorten the duration of the common cold in a group of Swedish factory workers. Patients were randomized to receive either 20 drops of expressed juice in water every 2 hours for the first day and thereafter, 3 times daily for up to 10 days, or placebo. The authors reported that subjects receiving the extract demonstrated a significantly more rapid time to recovery compared with placebo. The median time to improvement was 4 days for the treated group compared with 8 days for the placebo group. No specific adverse reactions were observed. It should be noted that the extract used in the above study was the expressed juice. *While other positive studies have used dry extracts, the results of studies using the expressed juice of the flowering tops of the plant have resulted in the expressed juice becoming a popular form for this immune-boosting herb. Most of these juice preparations are made by steeping the herb in alcohol for an extended period in order to extract the beneficial components. Unfortunately, the resulting liquid then contains a significant amount of alcohol. For those concerned with ingestion of excess alcohol (especially children), this may not be the most appropriate form. Consequently, a process has been developed whereby the herb is steeped in alcohol for one year, which is then followed by the removal of the alcohol. The alcohol is removed by a process filtering and distillation at temperatures below 30° C. The*



Echinacea purpurea

low temperatures allow for the maintenance of the integrity of the components, including the polysaccharides. The remaining mixture is then combined with maltitol, resulting in a pleasant tasting Echinacea syrup that is both alcohol and sugar free as well as suitable for children.

Safety/Toxicity

Animal studies have not reported any toxic effects from doses of Echinacea many times greater than what is typically consumed by humans. Carcinogenicity tests in hamster embryo cells have also proven negative. Debate remains concerning long term, chronic supplementation with Echinacea. While no clinical studies have reported that supplementation with Echinacea continuously for an extended period of time results in any down regulation of the immune system, many still recommend that it be taken at the onset of the cold, continued for the duration of the cold, and then stopped.

Peptidoglycans of *L. bulgaricus* are also effective in activating the complement system and facilitating the release of complement factors that help mediate the immune response (Kozlov LV '83).

The cell wall fractions appear to increase immunity to an even greater degree when pathogenic microorganisms are present (DeSimone '86), probably because some of the peptide sequences in the peptidoglycans of certain lactobacilli and the peptide sequences in the peptidoglycans of some pathogenic bacteria are homologous (Dimitrijevic, Maassen, Sommer, Sibiriakova). This means that the immune system is stimulated to mount a response when stimulated by the *L. bulgaricus* cell wall fractions, even though they are not pathogenic. Therefore, in the presence of just a small amount of pathogenic bacteria, fungi or viruses, the cellular immune response is magnified (Kitazawa). Extrapolating *from this data*, it is easy to see how immunity is significantly enhanced when a microscopic pathogen begins to invade our bodies in the presence of these cell wall fractions.

Clinical Applications of Immune Enhancing *L. Bulgaricus* Cell Wall Fractions

Although I found the research on the immune enhancing properties of special strains of *L. bulgaricus* fascinating and its clinical implications exciting, actual clinical data or use of a specific product was often lacking in the peer-reviewed literature. To fill in the missing pieces I began to correspond with some of the scientists involved in the original research and development of immune products containing cell wall fractions of these special *L. bulgaricus* strains. Eventually I visited the facilities in Europe where these products are being cultured and used clinically.

The most widely used of these products (Nat-Stim™) has been available in Bulgaria since 1988 and is the one I gave my son. It originated with scientists commissioned by the Bulgarian government to develop an effective and inexpensive method of keeping their employees at work instead of succumbing to the frequent bronchitis, pneumonia and other respiratory ailments seen in that country. Worker absenteeism due to infectious illnesses was a problem, but after Nat-Stim™

was developed and dispensed to the factory workers prophylactically, absenteeism from illness decreased by 80%.

A health official of the Bulgarian government provided additional clinical data that illustrates the clinical usefulness of these cell wall fractions. Improvement in humoral immunity after using Nat-Stim™ has been demonstrated by laboratory indicators such as increases in serum levels of non-specific IgG, IgA, Secretory IgA and IgM when they are low and also in response to the presence of specific antigens. This overall normalization of humoral immunity corresponds to clinical improvement of several conditions, the most extensively studied of which are upper and lower respiratory infections (Pedan '99).

Nat-Stim's™ enhancement of cellular immunity has been indicated by lab results that show a normalization of both T helper and T suppressor cells¹ as well as improvement in interferon and interleukin levels, and cytotoxic T cell and Natural Killer cell activity. Nat-Stim™ not only produces functional, but also structural changes in the immune system. These have been repeatedly demonstrated by the enhancement of stroma and parenchyma of lymphoid and spleen tissue in animal studies (Pedan '99).

Because of both the specific and general beneficial effects of Nat-Stim™ on the humoral and cellular immune system, there is a broad range of acute and chronic clinical conditions that it has been shown to be effective in. These include many upper and lower respiratory ailments such as bronchitis, pneumonia, tonsillitis, rhinitis, sinusitis, COPD and bronchial asthma, and even infectious conditions that are a result of treatment resistant bacteria or are of viral origin (Pedan '99). No bacterial resistance has developed, nor is it expected to be a factor because Nat-Stim™ acts to strengthen immune responsiveness rather than directly on the pathogenic organisms.

Nat-Stim™ has proved to be somewhat dose dependent in that larger doses (50 mg/day) are more effective in the beginning, with chronic or severe infections, but the dosage can be decreased by half or more as the condition improves. A study following a group of workers at a nuclear power plant showed that Nat-Stim™ sustains its immune-enhancing qualities

even when taken daily on a continuous basis over a period of years. When it has been taken prophylactically, most of those taking it appeared to develop a relative immunity to upper respiratory infections, flus and other commonly encountered conditions of bacterial and viral origin (Pedan '99).

It is also important to note that during the 14 years the Bulgarian Health Department has monitored its use by the public, no adverse reactions have been reported² (Manahilov '99). For the same reason it is safe during pregnancy and for all ages from 6 months up, and can be used with any medications without interference or adverse effects (Pedan '99). Bulgarian government tests showed no toxicity in test animals even when given 5,000 times the usual human dose for 4 months (Manahilov '99).

The results of the studies and historical use of this *L. bulgaricus* cell wall product clearly demonstrates the broad clinical effectiveness of enhancing the body's own defenses. It is an approach that deserves much more attention than it receives from conventional medicine.

Other Factors Contributing to Immunity

Every factor that contributes to the vitality of the immune system is important to regaining or maintaining good health. No matter how effectively a therapy supports immunity, lifestyle has a decisive influence on the outcome of that therapy. If nutritional intake is not sufficient, or air and water quality is poor, or stress levels are too high, recovery cannot be expected to be either rapid or complete. Taking care of these problems may require dietary and habit change, allergy testing, nutritional supplements, environmental improvements, fitness training and psychological or stress management counseling before more focused therapies can produce the desired results.

Once the immune response has been suppressed to any significant degree, either by illness or by drugs such as corticosteroids, recovery is challenging and often requires extended time and treatment. Immune suppression adversely affects every system in the body. However, even fairly extreme

cases of immune response deficiency can sometimes be overcome with the proper therapy. For example, I had one patient whose immune system was so suppressed that she was forced to remain a virtual prisoner in a "clean" room and on a very restricted diet. After following the therapy program I designed for her, she was not only able to come out of confinement but successfully took on the lead role in a musical.

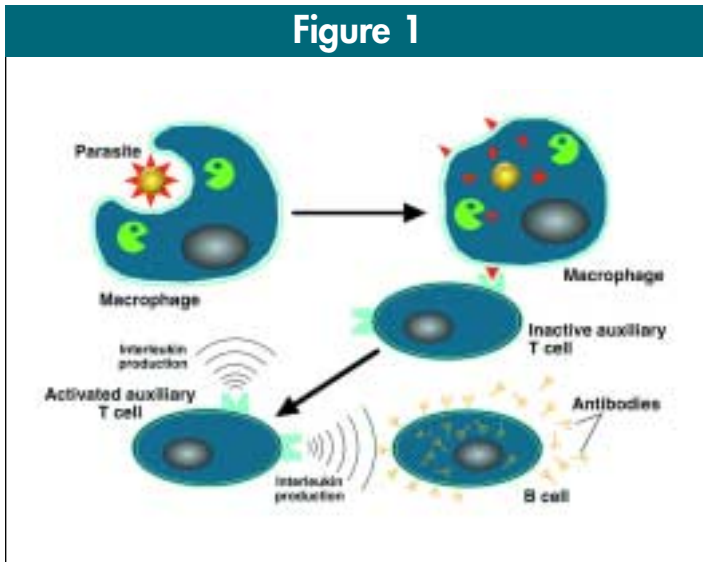
Each case is individual and has to be treated as such. As mentioned earlier, every cell, tissue and organ is involved in the immune process. This results in a variety and complexity of immune problems that no single therapy can fully address. However, the use of a general immune enhancer that meets the criteria given above can make the physician's job considerably easier and the patient much healthier.

¹ Note – in AIDS, ARC and HIV+ individuals, or those with similar immune dysfunction, the absolute T-4 count may not improve dramatically at first. The absolute T-8 values may initially increase faster than the T-4s. However, during this time clinical improvement is still seen in a decrease of opportunistic infections both in frequency and severity in conjunction with an overall improved clinical picture. After the more rapid rise in the absolute T-8 count, the T-4 count increased and the T-4/T-8 ratio trends toward normal. These results require 4-6 times the usual dosage on a continual basis until T-4/T-8 ratios return to normal.

² This correspondence was received in 1999. In a recent (Sept. 2001) check with government officials, there have still been no adverse reports to date.

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.

Figure 1



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.

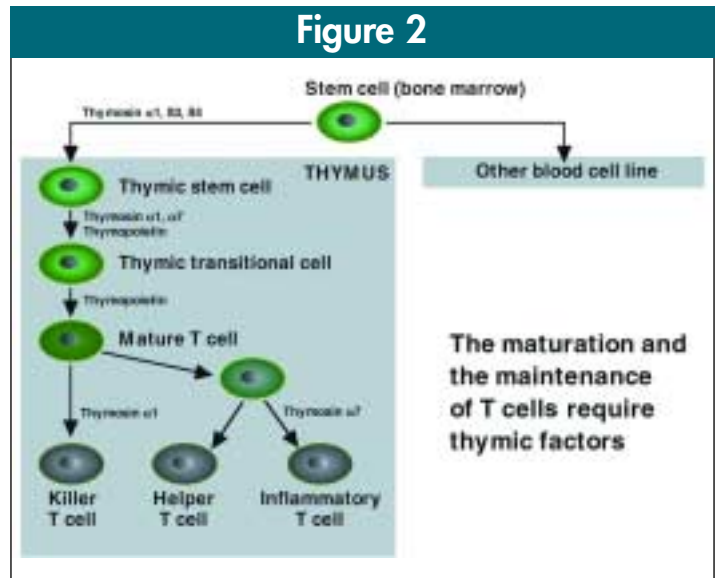
Fig. 1 also indicates the interactions between these three sub-systems as follows:

- 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.

Figure 2

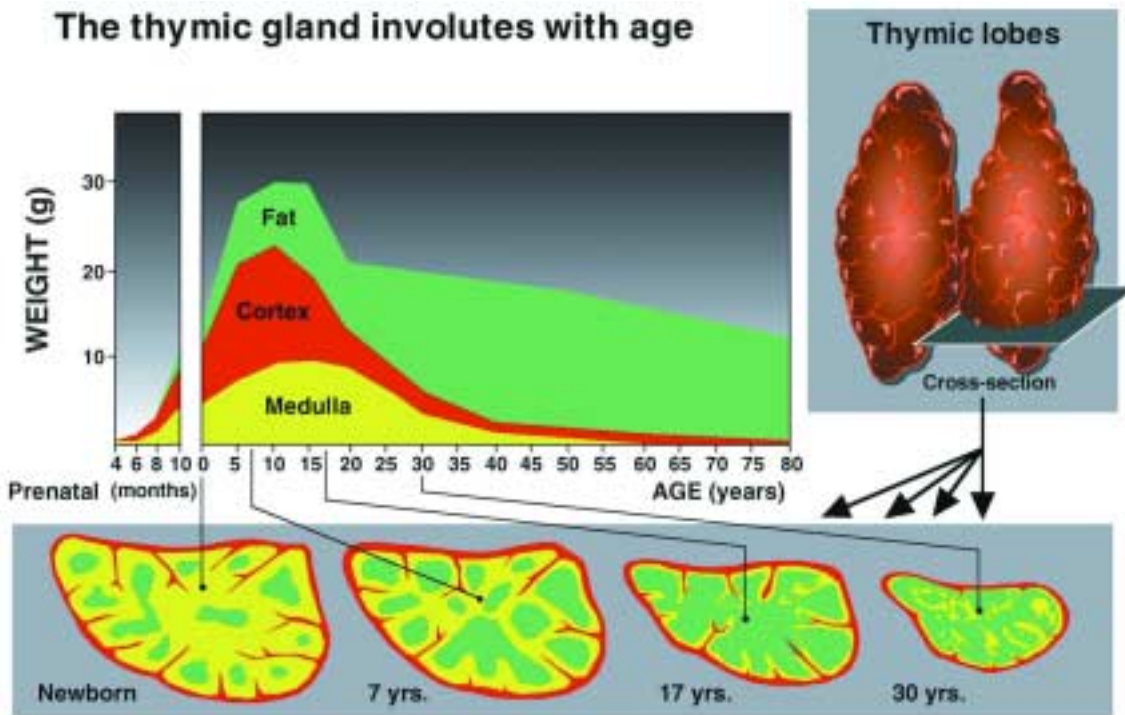


Immune System Stressors

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.

Figure 3



- 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 overtraining 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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