The Use of Thymus Supplementation as an Anti-aging Supplement

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Introduction

Over the years, researchers have tried to explain not only why we age, but what if anything can be done to reverse the aging process. Several theories presently have evolved in order to explain the many degenerative conditions seen in aged populations. These include:

1. Free radical theory of aging
2. Cross linkage theory
3. Toxic accumulation theory
4. Neuroendrocrine theory
5. Telomere Shortening theory

The Russian gerontologist Vladimir Dilman first proposed the "neuroendocrine" theory of aging in 1954. According to Dilman, aging results from a progressive loss of sensitivity by the hypothalamus and related structures to negative feedback inhibition.[1] This progressive loss of feedback leads to many of the degenerative conditions seen in aging populations such as atherosclerosis, diabetes, hypertension, cancer and autoimmune disease.[2] His theories propose that aging is the result of a progressive breakdown of the immune system.[3]

Prof. Roy Walford, then at UCLA, published his landmark work, The Immunologic Theory of Aging in 1969. In it, Walford stated that aging was caused by a progressive breakdown in the functioning of the immune system. The key to a powerful immune system is the thymus gland. With aging comes thymic atrophy and a reduction in thymic proteins produced by the thymus and necessary for T cell maturation. It is now accepted that the decline in thymic function with a decline in thymic proteins, is due to the interactions of the thymus with the rest of the endocrine system.

The Immune System

Our immune system protects us from dangerous substances and unhealthy lifestyle habits. Simply stated, the immune system is like a 24 hour, a 7 day a week, security guard. It works diligently to check the identity of foreign invaders like bacteria, infection, viruses, fungus, parasites and our own mutant cells, all of which can seriously compromise one's health.

Immunity has both specific and nonspecific components. Innate (nonspecific) immunity refers to the basic resistance to disease that an individual is born with. Innate immunity involves four types of defense barriers to include physical barriers like the skin, protective chemical substances in the blood and tissue fluids, and the physiology reactions of tissues to injury or infection. In general, most of the microorganisms encountered by a healthy individual are easily cleared within a few days by these nonspecific defense mechanisms without the need for any specific immune response.

Acquired or specific immunity requires the activity of a functional immune system, involving cells called lymphocytes and their products.[5] Much attention has recently focused on the role of specific cells of the

immune system whose job it is to identify and eliminate potentially dangerous substances that invade the body.(acquired or specific immunity) Unlike the innate response, acquired immune responses are adaptive and display the following four characteristics:

1. Antigenic specificity
2. Diversity
3. Immunologic memory
4. Self/nonself recognition

In order to generate a normal immune response, two major groups of cells are necessary. These are lymphocytes and antigen presenting cells. Lymphocytes are one of many types of white blood cells produced in the bone marrow during the process of hematopoiesis. The major populations of lymphocytes are B lymphocytes (B-cells) and T lymphocytes (T cells) [5] B lymphocytes mature within the bone marrow and leave the marrow expressing a unique antigen-binding receptor on their membrane. When a naive B cell first encounters an antigen that it is antibody specific for, the cell divides into memory B cells and effector B cells called plasma cells.

T cells mature from hematopoietic stem cells in the bone marrow, but migrate to the thymus gland to mature. There are two well-defined subpopulations of Tcells: T helper (TH) and T cytotoxic (TC) cells. [6] T helper and T cytotoxic cells can be distinguished from one another by the presence of either membrane glycoproteins CD4 or CD8 on their surfaces. Cells with CD4 on their surface usually function as Th cells, while those with CD8 generally function as TC cells.[7]

Master gland of the immune system: Thymus

The key to a healthy immune system is the thymus gland. Located medially in the anterior mediastinum, the gland produces highly active substances called thymic factors or thymic peptides which are directly responsible for the maturation of T-cells and which directly influence the other immune functions such as antibody production and phagocytosis.

As recently as 1950, the thymus gland and its role in the immune system still remained a mystery. Many physicians believed that it oversaw some undetermined immune function that remained unfunctional as we age. It was not until the early 1960âs that the thymus was identified as a lymphoid organ that was essential to the immune system. Studies conducted early in the 1960s examined the effects of removing the thymus from newborn mice. These mice lost their resistance to skin grafts form other strains of mice, they also experienced decreased antibody responses and an increase in some cancers. Many died due to an increased susceptibility to infection. Later studies that removing the thymus in later years had little effect on immunity, supporting the theory that the thymus protects the immune system early on in life but is less effective later in life. [18]

The human thymus produces at least seven thymic proteins; thymopoietin, thymosin alpha, thymulin, thymic humoral factor, hormonal thymic factor, serum thymic factor and other thymic factors. 8 Thymus gland hormones increase key immune signals, called “lymphokines”, to include interleukin 2(IL2), interferon, colony stimulating factor and others. [9] They can cause greater numbers of T cells to develop more IL2 receptors, which is necessary for a well functioning immune system.

Walford felt that the alteration in the production of these peptides leads to changes in thymic function, “thymic menopause”. [10] Although the thymus continues to develop after birth and reach maximal size during puberty, after puberty, gradual shrinking of the thymus, called involution, occurs steadily with declining age. The 3-5% annual reduction rate of the cells of the thymus continues until middle age, when it slows down to less than 1% per year. [11] By age 30, the thymus gland has typically decreased mass by two-thirds and its T-lymphocytes content by 90%! By age 60, functional thymic tissue has almost completely disappeared, potentially compromising the integrity of the aging immune system. This loss of cells appears to be under the control of the RE (reticuloendothelial) system and the neuroendocrine system. Many hormones appear to also affect thymus involution. They include testosterone, estrogen, progesterone and corticosteroids.

And yet, even though the thymus becomes reduced in size and functionality, the immune system continues to be assaulted by foreign substances that require a normal immune response. A compromised immune response contributes to poor health, fatigue and many disease states. Some of the events and stresses that can accelerate the aging of the immune system are:

- ✓ Poor nutritional status and poor sleep habits
- ✓ Lack of exercise and/or excess body fat or even overtraining
- ✓ Smoking, certain drugs and excess alcohol consumption
- ✓ Chronic disease and infections
- ✓ Stress and/or depression
- ✓ Allergies, hay fever and asthma
- ✓ Autoimmune conditions
- ✓ Chemotherapy or radiotherapy

Immune Reactions
Abnormal immune responses may lead to tissue injury, inflammation and disease. Food allergy is an example of this form of tissue injury. According to Gell and Coombs, immune tissue injury can be classified into four types:[12]

Type I: Immediate hypersensitivity reactions
This reaction usually occurs less than 2 hours after contact with an allergen. An antigen binds to a pre-formed IgE antibody, which is attached to a mast cell. Various symptoms result, depending upon the location of the mast cell to include; sinusitis, asthma, hives and eczema, joint pain, headaches and malabsorption.

Type II: Cytoxic Reactions
This type of reaction involves the binding of either IgG or IgM antibodies to cell-bound antigen. This results in the destruction of the cell to which the antigen is bound.

Type III: Immune Complex-mediated reactions
Immune complexes are formed when antigens bind to antibodies and are cleared normally by the phagocytic system. When this type of tissue gets deposited or causes inflammation in the endothelial lining of blood vessels, tissue injury results. This response often takes place hours or even days after exposure. They involve either IgG or IgM immune complexes. [13]

Type IV: cell dependent reactions
This is a delayed reaction mediated by T-lymphocytes, within 36 to 72 hours after exposure. This type of reaction does not involve antibodies.

Immune Assessment
Various types are available to the clinician for evaluation of the status of a patient's immune system. Clinicians may simply order a standard CBC to investigate lymphocytic activity. Since food allergy constitutes a major challenge of our immune system, many tests are available to measure reactions between food antigens, mast cells, basophils and food-antigen-specific immunoglobulins. [14]

Oral challenge of foods and even AK testing remains a viable procedure for evaluating immediate food sensitivities. Using oral challenges may be not only costly, but also complicated. RAST and skin testing also commonly used, only measure IgE mediated reactions. They do not offer the clinician the opportunity to explore delayed, non-IgE reactions. ELISA(Enzyme Linked Immunosorbent Assay) offers both IgE and IgG levels. This involves an enzyme binding system to detect antibody levels. It is safe, economical and a highly sensitive test.[15]

Another test that can be used to measure immune status includes the measurement of intestinal permeability (leaky gut). This has been implicated in Type I, Type II and Type IV allergies.[16] According to Andre, evaluation of intestinal permeability provides an objective means of diagnosing food allergy and assessing the effectiveness of anti-allergic agents. [17] Other tests may include CDSA(Comprehensive Digestive Stool Analysis) and measurements of adrenal function, DHEA, DHEAs and cortisol. A new blood test on the market allows for T cell differential to include Th1 and Th2 subsets.

Thymus Extracts
Similia stimilibus curatur means "like cures like". This is the leading principle of glandular therapy. Animal gland preparations have been used throughout time for healing and good health, with medical documents dating as far back as 1550 B.C. and A.D. 23-79. Bovine thymus extracts have been available for more than 65 years. Extracts from the glands of young healthy animals are rich in signaling factors that regulate functions of the corresponding gland, which leads to optimal physiological responses. Examples of these extracts include the adrenal, the pancreas, the liver and especially the thymus. There are numerous studies supporting the use of oral thymus extracts. It has been used in a wide variety of conditions, is extremely non-toxic and in some instances, it has been the only effective treatment!

Liquid Thymus Extracts
Liquid thymus extracts are derived from juvenile calves for oral administration. When considering thymus extract supplementation, it is important to find a liquid that is concentrated and standardized for peptide content with multiple thymic factors with molecular weights less than 10,000 Daltons.

Some liquid extracts use an exclusive fractionation process that allows the break up of cell membranes and the ability to extract the desired proteins. They are then filtered according to their molecular weight, less than 50,000 Daltons. These procedures are carried out at low temperature near zero degrees C to preserve the integrity of the peptides.

Administration is via the sublingual route allowing for absorption via the mucosae of the mouth. This avoids degradation by the gastrointestinal tract and therefore preserves the properties of the proteins. In vitro tests indicate that liquid thymus extract enhances lymphocyte proliferation and modulates their activity and maturation. Studies have shown liquid thymus extracts to be completely non-toxic with few side effects. Contraindications for their use would include pregnant or lactating women, persons taking immunosuppressive drugs. Children under twelve should consult their practitioner prior to use.

Freeze Dried Sublingual Thymus Extracts
Thymic Protein A is a synthetically produced copy of a thymic protein that has been shown to have immune enhancing properties. First discovered by Terry Beardsley, Ph.D., at the Baylor College of Medicine, it has been described by Dr. Julian Whitaker as likely the most powerful natural stimulant of the immune system ever discovered. Dr. Beardsley also was able to develop a procedure to produce the purified protein in the laboratory. Studies have shown that this specific protein causes T-4 lymphocytes to mature, initiating cell-mediated immunity.

Thymic protein A comes as a powder in individual packets. Each packet contains 4 mcg of the protein in a maltodextrin base. Physicians using this product recommend one to three packets a day, taken sublingually. It is important for patients not to swallow the contents because gastric secretions will digest the protein. The product can be taken on a daily basis to support immune function. Because the protein isolated is identical to human thymic protein, it has a low potential for toxicity. To date, there have been no reported allergic reactions.

Clinical Implications for the Use of Thymus Extracts
Thymus extracts support the body's own abilities to defend itself. Clinically, thymus extracts have been shown to be extremely versatile in treating a wide variety of illnesses. Some of the applications for Thymus Extracts include: Aging, AIDS, Allergies, Autoimmune conditions like Rheumatoid Arthritis, various cancers and in conjunction with chemotherapy, Fungus, General infections, Herpes Simplex, Hepatitis B, Immunodeficiency conditions, Liver Conditions, Lupus, Pulmonary Conditions, Respiratory infections, Scleroderma, Skin disease, Viral conditions, Yeast and others.

Others that may benefit from Live Proteins are those interested in maintaining a strong immune system, those involved with enhancing growth hormone release. Studies have shown that thymic factors are synergistic with oral secretagogues. And, finally, those who want to increase energy and vitality.

Case Studies
Over the last several years, I have had the opportunity to treat a number of patients using both freeze-dried and liquid thymus extracts. I would like to take this opportunity to share several success stories with you.

Case #1
DB, was a 34-year-old record executive with a chronic history of allergies, asthma and candida. He frequently was treated for sinusitis and complained of sinus headaches. He had seen several specialists and was treated with conventional corticosteroids and anti-inflammatory drugs. He had mixed results. History and other clinical symptoms lead me to a diagnosis of yeast related chronic sinusitis. He tested positive for intestinal permeability. A supplement regime was started with mixed results over the course of several months. We then started a course of liquid thymus. DB was advised to take two vials weekly for 2 months. After the third week he reported that he generally felt better, had more energy and his sinuses seemed better. He remains on one vial every two weeks and has not had an attack of sinusitis or a cold in almost 3 years.

Case #2
JS, was a thirty seven-year-old lawyer who complained of being sick all the time. As a child, she had had her tonsils removed at age 5 and since that time was always treated for ear infections and upper respiratory tract infections. She had tried many herbals and nutrients to help her immune system. Thymus support was started on her at the dose of one vial weekly. She saw no results until the 5^{th} week, when she stated that she felt stronger than ever. She reports a gradual improvement in her health since. She reports no sickness some 3 years later.

Case #3
JP, was diagnosed with scleroderma, two years previous to being seen at my office. Her major complaints were joint pain and swelling and tightening of the skin on her face. She had no organic involvement. Scleroderma (systemic sclerosis) means hardening of the skin and has been applied to a broad range of acquired connective tissue diseases, all of which have skin thickening as a prominent clinical feature. The etiology of SSc is unknown, although genetic factors and environmental factors such as vinyl chloride, silica, silicosis and silicone have all been linked as possibilities. JP was placed on two vials of thymus, 2x weekly. After the third month she noticed that her skin was not as tight and her hand and finger movement had dramatically improved. She was able to wear her wedding band for the first time in 4 years. Her specialist also remarked on her overall improvement. JP remains to date on one vial per month.

Conclusion
The immune system is an integral part of the neuroendocrine system. The thymus gland, the master gland of the immune system, involutes rapidly with aging. This involution, coupled with cellular aging of lymphocytes throughout the body, leads to a generalized decline of the immune system, especially when various stresses or diseases are present. The decline of the immune system in turn is related to the

development of many age-related conditions. Liquid thymus extract supplementation appears to be a viable tool in helping to reverse the effects of age related thymic involution and immune system weakening.

References

1. Dilman, Vladimir, and Dean, Ward. The Neuroendocrine Theory of Aging, 1992. The Center for Bio-Gerontology, Pensacola, Florida
2. Dean, Ward, Vitamin Research News, June 1999
3. Walford, R.L., Maximum Life Span, W.W. Norton & Company, New York, 1983
4. Stites, D., Abba, T., Parslow, T., Medical Immunology, Appleton & Lange, Stamford, Ct., 1997
5. Stites, D. ibid
6. Kuby, J., Immunology, 3rd Ed., Freeham and Company, New York, 1997
7. Kuby, J., ibid
8. Brodey, B., Involution of the mammalian thymus, one of the leading regulators of aging, In Vivo, 11(5):421-40 1997 Sept-Oct
9. Wilson, JL. Thymus extracts: Live Cell Fractions Therapy, Physicians Research & Information Series, pp. 1 & 2, 1995
10. Morton, M., Clinical Applications of Frozen, Sublingual Thymic Extract, Townsend Letter for Doctors & Patients, pp.82-88, Dec 1999
11. Written communication, Aeterna Laboratories, Quebec City, Canada
12. Buckley RH, Metcalfe D. Food Allergy. JAMA 1982;248:2627-31
13. Perlmutter L. Non-IgE mediated atopic disease. Ann All 1984;52:640
14. Pagnelli F, Levinsky RJ, Atherton DJ. Detection of specific antigen within circulating immune complexes. Lancet 1979;1: 1270
15. Hamberger R. Proceedings of the First International Symposium on Food Allergy; 1982; Vancover(BC)
16. Butkus SN, Mahan LK. Food allergies: immunological reactions to food. J Am Dietetic Assoc 1986;86(5):601-608
17. Andre C., Measurement of intestinal permeability to mannitol and lactulose as a means of diagnosing food allergy and evaluating therapeutic effectiveness of disodium cromoglycate. Ann Allergy 1987;59(5 Pt II):127-130
18. Blakeslee, Dennis. The Thymus and Immunologic Reconstitution. JAMA Newsline, HIV/AIDS Information Center. February 8, 1999