

LifeExtension



Join Life Extension today and receive valuable member benefits
[Click to find out more!](#)

HOME

MEMBERSHIP

PRODUCTS

NEWS & INFO

LEF RESEARCH

PARTICIPATE

A

LEF Site Search

News & Info

[Daily News](#)
[Life Extension Magazine](#)
[What's Hot](#)
[What's New](#)

Free Product Directory



[Click for a FREE copy of our Product Directory](#)

LEF Membership

[What is LEF?](#)
[Benefits](#)
[Become a Member](#)
[Renewals](#)
[Become a Subscriber](#)

Our call center has now expanded its hours

Monday thru Friday:
 8:30am to 12:00pm EST
 5:30am to 9:00pm PST

Saturday hours are:
 9:00am to 8:00pm EST
 6:00am to 5:00pm PST

Sunday hours are:
 11:00am to 7:00pm EST
 8:00am to 4:00pm PST

If you'd like to order by phone or speak to a live person for help, just call toll free:
1-800-544-4440.

Report

LEF Magazine July 1997

Thymic Protein A: Its Development May Signal A New Tool for Rejuvenating Immune Function

Studies with this patented thymic protein demonstrate enhanced immune response in the fight against cancer and chronic viral infections, as well as aging.

In 1981, the Life Extension Foundation first published an article about the anti-aging benefits of boosting thymus gland activity. Thymic activity is critical to the maturation of T-cells, and only mature T-cells are able to mount a coordinated attack on cancer cells and infectious agents. However, despite the publicity, and the considerable research dollars spent over the past 30 years, the Food And Drug Administration has not approved immune-boosting drugs such as Isoprinosine and thymosin. The FDA's failure to approve thymus-stimulating medications has left out in the cold those suffering from age-associated immune impairment and diseases such as cancer.

A Two-Decade Search

The Foundation has been pursuing for two decades natural therapies capable of restoring youthful thymic activity. We uncovered evidence that zinc can help to restore thymic function; now we've found a new compound that activates thymic activity with greater specificity, thereby partially reversing age-related immune decline.

Published preliminary data from clinical trials indicate that this thymic protein, called Thymic Protein A, may be an effective aiding therapy for cancer, chronic viral infections like hepatitis C, and possibly some autoimmune diseases.

The thymus is a ductless gland just beneath the breastbone. It is about the size of the heart in a neonatal infant, grows until about age 3, and maintains this weight until puberty, after which it begins to shrink. By age 40, the average person has only a small portion of his or her thymus still intact, as the glandular tissue converts to connective and fatty tissue.

[Customer Service Info](#)

[Privacy Policy](#)



We subscribe to the HONcode principles. [Verify here.](#)

Because the thymus is so small in adults, it was thought to have little importance until its true function was discovered in 1960. One technique researchers used to discover the function of the thymus was to remove it from young animals and study the resulting changes.

When small animals have the thymus removed (thymectomy), they experience profound "wasting disease," characterized by an increased incidence of infection and cancer, immune system suppression, failure to grow, allergies, neuromuscular paralysis and autoimmune diseases.

Greater susceptibility to infection and cancer has been shown to be directly attributable to a dramatic decrease in peripheral blood lymphocytes (lymphopenia), responsible for the body's immunity. Rearing the animals in a sterile environment prevents the increased incidence of infection and cancer, but does not eliminate all the symptoms caused by thymectomy.

Hormones Prevent Wasting

In 1964 it was demonstrated that hormone-like factors from thymus tissue can prevent many of the symptoms of the wasting syndrome caused by thymectomy. In the past 30 years, research has shown that new T-lymphocytes responsible for cellular immunity migrate from the bone marrow to the thymus, where they are "programmed." They go through a rigorous selection procedure from which only about one of every 10 cells is chosen for action, the other nine being destroyed.

The training given to T-cells allows them to distinguish between "self" and "non-self," and produces three main classes of cells: T-4 helper cells, which help to turn on certain immune functions, and stimulate production of antibodies by B-lymphocytes, responsible for blood immunity; T-8 cytotoxic (killer) cells, which are guided by the T-4 helper cells to attack and destroy invading cells such as viruses and cancer cells; and T-8 suppressor cells, which are necessary to terminate attack by the T-8 killer cells. The normal ratio between T-helper and T-suppressor cells is 1.5 helpers to one suppressor. If this ratio varies significantly in either direction, the immune system is disturbed, which can lead to many health problems.

Immune System Regulator

Of all the cells in the immune system, the T-4 helper cell is the most important because it controls many key functions of immunity. As a conductor keeps an orchestra playing in tempo and in tune, the T-4 cell controls the delicate balance of the immune system. It does this by secretion of lymphokines and cytokines, among them interleukin-2 and interferon, which act as "messengers" to tell specific cells to attack and destroy invading pathogens.

Special Programming Needed

The T-4 cell also transforms B-cells into producing antibodies to particular antigens. In addition, the T-4 cell calls upon the bone marrow to

manufacture more of itself and other types of T-cells, and has a role in the production of total white blood cell levels, red blood cells, and the important CD56 natural killer cells which also attack and destroy cancer cells.

However, since T-4 cells are "naive" (immature) when born, they will not perform these functions unless they are first "programmed" by a specific thymic protein. The discovery of this protein, Thymic Protein A, and its function was mainly accomplished by Dr. Terry Beardsley, who also was the first scientist to produce it intact in the laboratory.

Once it was discovered that the thymus gland produces hormone-like factors, several groups of scientists began trying to extract and purify hormones from the thymus. The model for this research was the preparation of insulin for therapeutic use in diabetes. However, since the thymus produces extremely small quantities of active factors, the researchers required large numbers of thymus glands or liters of serum to extract small amounts of material. This approach met with only limited success.

This research brought forth thymosin in 1967, the first of many peptides (small protein fragments) to be extracted from the thymus and studied. Thymosin fraction V from bovine thymus is a mixture of 30 or more peptides. An active component isolated from this mixture is a 28 amino acid fragment called thymosin alpha 1 (Ta1), which has displayed a variety of immune stimulatory properties in the laboratory, and has had some success as a treatment for hepatitis B in combination with alpha-interferon.

A number of other peptide fragments have been extracted from calf or pig thymus or from human serum. These include thymopoietin, thymulin and thymic humoral factor (THF). These small peptides are thought to be fragments of much larger molecules which have been localized in the supporting tissues of the thymus.

Research has shown that complete thymic proteins are produced by the epithelial cells of the thymus gland that activate T-cells, which in turn promote immunity. Epithelial cells had been difficult to maintain in continuous culture in the laboratory, but Beardsley overcame that technical roadblock in 1983 by establishing a cultured line of thymic epithelial cells and several human cell lines.

A Natural Intact Protein

From this cell culture, Beardsley purified a specific protein that produces dramatically greater immune stimulation than the thymic extracts because it is derived from live cells and purified by a gentle biological method to produce a natural intact protein. Thymic Protein A is a 500 amino acid chain produced by Beardsley's cell line in exactly the same form as it is produced by the thymus in the body.

Later, Dr. Esther Hayes, in collaboration with Beardsley, demonstrated that this same protein is produced by the human thymus gland. They

transplanted human thymus epithelial cells into the kidney structure of mice without thymus glands. The treated mice were then able to demonstrate an immune response by living outside a sterile environment without developing infection.

Additionally, the mice showed no sign of rejection of the transplant, which in turn demonstrated that the protein-induced, cell-mediated immunity in the mice did not recognize the transplant as foreign. This absence of rejection proves that the human thymic protein is identical or so nearly identical to the mouse thymus protein that it is accepted as self.

A Vital Component of Health

Many physicians are beginning to see that the immune system is a vital component of human health, and has a role in most diseases. This is contrary to a few decades ago when the immune system was poorly understood and not given a great deal of importance by traditional medicine. It is now clear that, when using toxic therapies such as chemotherapy and radiation, the immune system may be severely damaged, resulting in the appearance of opportunistic infections.

In fact, many cancer patients do not die directly from their cancer, but rather from an infection against which they cannot mount a sufficient immune response. It thus stands to reason that strengthening the immune response may well be the single most important goal of any individual who wishes to become, or remain, healthy.

Sixty-five million Americans suffer from a dysfunctional immune system, leading to a variety of diseases, among them being chronic viral infection, chronic fatigue, AIDS and cancer resulting from immune suppression. Autoimmune diseases such as arthritis, asthma, allergy, lupus, diabetes and chronic respiratory problems are caused by immune dysfunction.

The immune system is so complex that immune dysfunction and suppression can have a number of different causes. However, the common denominator in all immune dysfunction appears to be the thymus gland because of its critical role in immune function. We all are subjected to atrophy of the thymus due to aging, disease, radiation, chemicals, and trauma.

Thymic extracts generally consist of ground whole thymus, which is then dried or strained into liquid and administered in capsules or sublingual drops. By the very nature of how these extracts are processed, the resulting product is a conglomeration of thymus tissue, cell debris, fragments of thymus proteins and thymus byproducts. Such extracts have been available for years and have shown some degree of effectiveness in treating various immune deficiencies and medical conditions.

Thymic extracts are only slightly effective because they are mere fragments. To attain full effectiveness, a protein must have a specific shape with precise transmitter and receptor sites. Only a whole biomolecule would be expected to have full biological activity.

Beardsley has patented his new technology to grow thymus cells in the laboratory and then purify Thymic Protein A from the product of the cells' metabolism. It has now been proven in laboratory that this specific thymus protein is the protein that causes the T-4 lymphocyte to mature, thereby initiating a specific cell-mediated immune response. It also has been demonstrated that this specific protein is conserved among species.

A Cascade of Events

This protein has been successfully assayed chemically. It has been shown to be a stimulant for the production of interleukin-2 production by T-4 cells, which is the benchmark measurement for T-cell maturity and the initiation of immune response. The protein has been routinely tested in mice for the suppression of flu virus, which further demonstrates the initiation of the cascade of events resulting in an immune response to a specific pathogen (cell-mediated immune response).

A study with this protein in 22 cats infected with feline immunodeficiency virus (FIV) concluded that it enhanced immune response to infectious agents measured serologically, diminished disease symptoms, lengthened survival, and increased lymphocyte values.

Since the thymus is atrophied by age 40, it no longer produces sufficient proteins to properly "program" newly born T-cells. These cells are constantly manufactured in the bone marrow, but cannot function unless programmed by the proper thymic protein. It may well be that the atrophy of the thymus is one of nature's methods of "programmed death" in humans. Longevity medicine seeks to extend life by measuring the body's vital functions, determining which organs are performing at reduced capacity, and attempting to restore their function by replacing missing natural substances such as hormones. Witness the use of human growth hormone, melatonin, DHEA and other substances. We now have added to this arsenal one of the most important of these natural substances, Thymic Protein A.

Cancer Years Later

A daily dose of a mere 4 micrograms of Thymic Protein A could make a major difference in longevity by strengthening the immune system through its T-cell "programming" role. It is said that everybody gets cancer every day of their lives, since at least some newly manufactured cells are "defective." A healthy immune system is well-equipped to handle these "aberrations," but if it is weakened enough, a "mutant" cells can survive and multiply. Years later, a cancer may be discovered.

The benefits of strengthening the immune system with Thymic Protein A include increased stamina, energy, well-being and ability to ward off infections.

While clinical research is already underway, anecdotal reports have poured in from users describing protection against the flu, the resolution of many types of infections, and benefits for serious illnesses such as cancer. Most significant are reports from cancer patients undergoing

chemotherapy who have maintained their total white blood count at acceptable levels after taking Thymic Protein A.

Blood tests have been developed to measure the strength of the immune system. The usual test involves a count of the key white blood cells T-4, T-8, B-lymphocytes as well as CD56 natural killer cells. However, this test only measures the total count of these cells, not the "activity" level. It is possible for a person with a total count of 1,000 T-4 cells to have only 50 percent of these cells "activated" by the thymus. The other 50 percent are useless and non-functional.

There are now additional tests available to measure T-cell activity. This is done by subjecting T-8 cytotoxic or natural killer cells, drawn from a person's blood, to known cancer cells. The number of cancer cells killed in a specific period is expressed as a percentage of activity. In the case of T-4 cells, measurements are made of interleukin-2 secretion when exposed to certain cells. One lab that performs these tests is Immuno Sciences Laboratory, in Los Angeles. They may be reached by calling (310) 657-1077. A written doctor's order is necessary to perform these tests.

At present, this lab is involved in an open trial of Thymic Protein A used for prostate cancer. The immune competence of the participants is being measured before and after the three-month trial on a dose of 12 micrograms daily. The results not only will reveal any reduction in prostate-specific antigens, but also whether the immune status of these individuals is improved. Other clinical studies with the hepatitis C and Epstein-Barr virus also are in progress.

A Lack of Control There is a common school of thought in medicine that stimulating immunity is harmful for those who suffer from autoimmune diseases because it will exacerbate the body's attack on itself. However, Beardsley is one of an increasing number of scientists and physicians who view autoimmune diseases as a result of a "dysregulation," or lack of control, of the immune system, in which the thymus is functioning poorly and in which cell-mediated immunity has been significantly lowered.

In this case, "humoral" immunity—that is, from antibodies in the blood as opposed to cellular immunity—may not be sufficiently controlled by the T-4 helper cells, and may run wild, producing antibodies to the body's own cells. This situation may well be aided by giving supplemental thymus protein to rejuvenate the dormant T-4 cells, further produce new T-cells, and re-establish control over B-cells.

It is important to understand how B-cells work. The B-cell with the specific receptor for an antigen attaches to it and engulfs it. The B-cell then presents a piece of this antigen to the T-4 cell, which releases interleukins that transform the B-cell into an antibody-secreting cell, to make the antibodies necessary to defeat the antigen.

It is clear that the T-4 cell's presence is necessary to regulate the production of antibodies by B-cells. If there is too little Thymic Protein A available, too few T-cells are activated, and there is insufficient control over B-cells. Uncontrolled B cells can produce "errant" antibodies against

the body's own tissues. While this is only a theory, it points to the possibility that strengthening cell-mediated immunity may be helpful for autoimmune disease. Anecdotal reports from users of Thymic Protein A with autoimmune illnesses have shown no adverse effects with some benefits.

Thymic Protein A is the most potent way yet devised of rejuvenating the thymus gland in order to strengthen immune function with advancing age.

For Further Reading

Miller, J.F. 1961. Immunological function of the thymus. *Lancet* 2:748.

Osoba, D. and Miller, J.F. 1964. The lymphoid tissues and immune responses of neonatally thymectomized mice bearing thymus tissue in millipore diffusion chambers. *J. Exp. Med.* 119:177.

White, A. and Goldstein, A. 1967. Thymosin: an extract of calf thymus. *Proc. Nat'l Acad. Sci.* 64:964.

MacKay, J.R. and Goldstein, G. 1966. The thymus: Experimental physiology and pathology in man. *Austral. Ann. Med.* 15:24.

Cooper, M.D., Gabrielson, A.E. and Good, R.A. 1967. Role of the thymus and other central lymphoid tissues in immunological disease. *Ann. Rev. Med.* 18:113.

Lau, C. Y. and Goldstein G. 1980. Functional effects of thymopoietin. *J. Immunol.* 124:1861.

White, A. and Burton, P. 1979. Isolation from human plasma of a protein fraction with thymus hormone-like activity. *Ann. N.Y. Acad. Sci.* 332:1.

Hays, E. and Beardsley, T. R. 1984. Immunologic effects of human thymic stromal grafts and cell lines. *Clin. Immunol. Immunopath.* 33:381.

Waksal, S.D., Cohen, I.R., Waksal, H.W., St. Pierre, R.L., Wekerie H. and Feldman, F. 1975. Induction of T-cell differentiation in vitro by thymus epithelial cells. *Ann. N.Y. Acad. Sci.* 249:493.

Beardsley, T. R., Pierschbacher, M., Wetzel, G.D. and Hays, E.F. 1983. Induction of T-cell maturation by a cloned line of thymic epithelium (TEPI). *Proc. Nat'l. Acad. Sci.* 80:6005.

Beardsley, Hays. Gross Murine Leukin Virus-induced alterations in the thymus of pre-leukemic AKR Mice. *American Association of Cancer Research*, Vol. 39 pp. 480-486, February 1979.

Bonyhadi ML et al. HIV Induces Thymus Depletion in Vivo. *Nature* 1993 Jun 24,363(6431):728-32.

Hays SM et al. Thymic Involution in Viable Mice. *Dev Immunology* 1992;3(3): 191-205.

Beardsley, Swain, and Dutton, *Mechanisms of Lymphocyte Activation*, (Resch and Kirchner, Eds.), p. 384. Elsevier/North-Holland, Amsterdam, 1981.

[Back to the Magazine Forum](#)

LIFE EXTENSION MAGAZINE ARCHIVE

[1995](#) | [1996](#) | [1997](#) | [1998](#) | [1999](#)
[2000](#) | [2001](#) | [2002](#) | [Current Issue](#)

Search

[Subscribe to LIFE EXTENSION Magazine](#)

[Home](#) | [Membership](#) | [Products](#) | [News & Info](#) | [LEF Research](#) | [Participate](#) | [At](#)

All Contents Copyright © 1995-2002 Life Extension FoundationSM