

Immune System Support

Thymosin Alpha 1

WHAT IS THYMOSIN ALPHA 1?

Thymosin alpha 1 (T α 1) is a [peptide](#), or small protein, produced naturally by the thymus gland. The thymus is where immune cells known as T cells mature and are released when prompted to do so by the T α 1 peptide. T cell production and action within the body is vital to adaptive immunity. This is the mode by which immune cells are able to recognize and kill foreign invaders. Specifically, T α 1 has been shown to enhance the function of certain immune cells called T and dendritic cells. These white blood cells play pivotal roles in the body's defense process to anyone with a depressed immune system or suffering from an infection.

Benefits of Thymosin alpha 1:

- Enhances the function of certain immune cells called T and dendritic cells
- Help eradicate the unhealthy cells and stop the infection or cancer growth
- Exhibits antibacterial and antifungal properties
- Suppresses tumor growth
- Increases vaccine effectiveness
- Protects against oxidative damage

T cells, for example, come in two forms: killer and helper T cells. Killer T cells are responsible for hunting down and destroying our body's own cells that are cancerous or infected with bacteria or viruses. Helper cells work with the other cells of the immune system to orchestrate and carry out appropriate immune responses.

It is approved in more than 37 countries for the treatment of hepatitis B, hepatitis C, and as an adjunct to chemotherapy and various vaccines. T α 1 has been found to have a profound effect on the immune system and is the active ingredient in the immune modulating drug, Zadaxin[®]. Zadaxin[®] is used to treat hepatitis B and C and has been studied extensively for its ability to support an immune system that has been suppressed by chemotherapy in cancer patients. Additional possible indications are malignant melanoma, hepatocellular carcinoma, drug-resistant tuberculosis, chronic fatigue and Di George's syndrome as well as any chronic cancer or viral disease.

Thymosin Research:

Studies have shown that individuals fighting infection have a lower amount of circulating T α 1 and suppressed helper T cell numbers compared to healthy individuals. This is problematic, as the optimal immune function is vital to recovery from infection. Supplementation with T α 1 has the potential for great therapeutic benefit for patients suffering from an infection or autoimmune disease.

In addition to its use in the treatment of Hepatitis, AIDS, and cancer, T α 1 has shown great promise in the treatment of Lyme disease. This is unsurprising when one considers the large role the immune system plays in combating the disease.

T α 1 assists the immune system in the location and eradication of the Lyme bacteria and infected cells, while helping to prevent oxidative damage, thereby decreasing inflammation and enabling a better quality of life throughout treatment.

CARE AMERICA PHARMACY

Thymosin Beta 4

Thymosin is a hormone secreted from the thymus. Its primary function is to stimulate the production of T cells, which are an important part of the immune system. Thymosin also assists in the development of B cells to plasma cells to produce antibodies. The predominant form of thymosin, thymosin beta 4, is an actin, a cell building protein. One of the main mechanisms of action of Thymosin Beta-4 is its regulation of Actin. This cell-building protein is an essential component of cell structure and movement which leads to its role in tissue repair. T β 4 has been found to play an important role in protection, regeneration, and remodeling of injured or damaged tissues. After an injury, T β 4 is released by platelets and numerous other types of cells to protect the most damaged cells and tissues and to reduce inflammation and microbial growth.

Benefits of Thymosin beta 4:

- Calms muscle spasm
- Improved muscle tone
- Increased exchange of substances between cells
- Encourages tissue repair
- Stretches connective tissue
- Helps maintain flexibility
- Reduced inflammation of tissue in joints
- Encourages the growth of new blood cells in tissue
- Increased endurance and strength
- Prevents the formation of adhesions and fibrous bands in muscles, tendons, and ligaments

Recent studies have revealed that the first gene to be upregulated after an injury is a T β 4 gene. As the body begins the recovery process, T β 4 aids in the creation of new vessels in the injured area, which carry blood, nutrients, and reparative substances to the site. T β 4 also has anti-inflammatory properties and works to decrease the amount of inflammatory substances, called cytokines. Inflammation plays a large role in many of the symptoms associated with a number of other conditions (i.e., Lyme disease, CFS, FM, autoimmune diseases, infections, etc.), making the potential impact of T β 4 quite extensive.

The discovery of the role of T β 4 in the process of immune regulation has led to its use as a valuable therapeutic agent. T β 4 has been used in the treatment of HIV, AIDS, Influenza, colds, and various infections. It has been utilized in the management of various inflammatory conditions, as well as part of treatment following a heart attack due to its cardio and neuroprotective effects.

T β 4 is very well tolerated and has not been found to cause any significant side effects. It can be taken on its own or in conjunction with an existing therapy, making it a versatile and valuable peptide.

LL-37

LL-37 is an anti-microbial peptide. It has been shown to have antimicrobial activity against multiple Gram-positive and Gram-negative human pathogens. Antimicrobial peptides (AMPs) have the potential to serve as an alternative to antibiotics. It's simple, AMPs kill the microbial pathogens (the bugs). AMPs can possibly regulate bacteria/virus invasion and may control infection. It has been reported that AMPs could be used to activate the innate mucosal immune response in order to get rid of the infections. (Mucosal refers to the immune response at mucosal membranes of the intestines, the urogenital tract and the respiratory system, i.e., surfaces that are in contact with the external environment).

LL-37 belongs to the cathelicidin family of AMPs. It is released as a mature peptide when neutrophils (type of white blood cell) are stimulated. LL-37 is expressed in various cells and tissues such as circulating neutrophils, bone marrow cells, epithelial cells of the skin, cells in the gastrointestinal tract, as well as in the epididymis and lungs.

Production of LL-37 in macrophages is stimulated by vitamin D released by sunlight through the skin. LL-37 plays an important role in the first line of defense against infection and systemic invasion of pathogens at sites of inflammation and wounds. It is toxic to both bacterial and normal cells and is very resistant to proteolytic degradation.

Staphylococcus aureus, (staph for short), is one of the largest problems facing modern medicine, particularly since it has become resistant to a number of antibiotics. Research with LL-37 shows that it is effective against staph at nanomolar concentrations. It kills the bacteria both when it invades cells and when it is free, and is more effective than conventional antibiotics. These features make LL-37 of particular interest to the medical field and it is hoped that the peptide will be useful in treating chronic infections, such as those who have diabetes or immune system dysfunction. It has also been effective in treating Candida albicans and E. coli.

Several studies show that LL-37 is effective in treating certain cancer cell types. LL-37 inhibits gastric cancer cell proliferation by the activation of bone morphogenetic protein (BMP) signaling. However, overexpression of LL-37 was found to promote development and progression of ovarian, lung and breast cancers.

LL-37 and Tissue Healing

In addition to its ability to be anti-biofilm and antimicrobial, LL-37 plays an important role in regulating the balance of pro- and anti-inflammatory molecules. The balance between inflammation and tissue healing is a delicate one. Inflammatory responses are absolutely necessary if the body is to fight off invading pathogens. Unfortunately, these same inflammatory responses can prevent adequate healing, promote scar tissue formation, and even lead to autoimmune diseases if left unchecked. LL-37 appears to play a role in balancing inflammation with healing and at least part of that role is mediated through effects on macrophages.

Macrophages promote inflammation when foreign pathogens are detected. They do this by first detecting the pathogens and then sending signals to the rest of the body that a defense needs to be

mounted. Once the tide shifts and the immune system begins to overtake that pathogens, macrophages begin producing a new set of signals that calm the inflammation so that the body can move to the next phase of healing. It turns out that peptides like LL-37 play an important role in reversing the activation of macrophages. The presence of LL-37 converts anti-inflammatory macrophages into pro-inflammatory macrophages.

The ability of LL-37 to inhibit biofilm formation is another promising feature with regards to the treatment of chronically infected wounds by *S. aureus* and *P. aeruginosa*. It's anti-biofilm properties help to expose and clear the underlying bacteria. The peptide interaction with keratinocytes and fibroblasts also encourages wound closure.

Benefits of LL-37

- Broad spectrum antimicrobial activity against bacteria, enveloped viruses, and fungi
- Helps promote wound healing
- Can help control infection
- Can balance tissue inflammation
- Inhibits biofilm formation

LL37 is a multifunctional host defense peptide. Besides its antimicrobial and antibiofilm activity, it stimulates a complex group of responses in many cells, either directly or through modulation of cellular responses to microbial compounds and other immune mediators. Membrane-disrupting antimicrobial peptides provide broad-spectrum defense against localized bacterial invasion.