The thymus

The thymus gland in humans lies below the thyroid and behind the breastbone. Its weight is greatest in childhood. After puberty the epithelial and lymphatic tissues of the thymus gland are increasingly replaced by connective tissue and blood vessels.

In earlier times the thymus gland was thought to represent the "seat of the soul". Other physicians thought that this gland was responsible for maintaining childlike qualities. We now know that the thymus is the most important 'switchboard' for the maintenance of the immune balance.

The active substances present in the thymus gland, the thymic factors or hormones, play an important part in the interaction between the mental/nervous and endocrine/metabolic processes that take part throughout the body. This in turn influences the ability of the body to defend itself against disease.

Individuals with no thymus rapidly die from opportunistic infections due to total failure of the immune system. Experience in cases of infection with the human immunodeficiency virus (HIV) known as AIDS clearly shows that the thymus gland and the thymus helper lymphocytes (T cells) dependent on it are destroyed in the course of the disease. This generally triggers a series of severe consequential illnesses.

Thymus organ and age

![Thymus organ and age](image)

Thymic active substances in the immune system

The immune system is made up of a network of cellular and humoral systems to combat micro-organisms, parasites and viruses. The ability to do this is particularly important in the removal of cells that have degenerated within the body and become “foreign”. The first cancer cells to develop should be destroyed by the immune response. A sufficient number of thymic lymphocytes must be present in the blood and tissues at every moment of life. The entire natural and specific immunological defence system depends on their activity. Thymus lymphocytes originating from the bone marrow are trained in the normally functioning thymus gland.

Thymus helper lymphocytes

receive information from macrophages (dendritic cells) about foreign material (antigen presentation). They activate the B lymphocytes to produce specific immunoglobulins (antibodies). They produce lymphokines, e.g. interleukin-2, which is used in cancer patients to activate the lymphocytes.

Thymus suppressor lymphocytes

ensure, with specific lymphokines, that the activating lymph cells are suppressed. This can be very important if there is any overproduction of antibodies.

Cytotoxic thymic lymphocytes

have the task, in particular, of removing somatic cells that have become foreign (e.g. cancer cells). Together with granulocytes, macrophages and natural killer cells they are at the forefront of the cellular response.

Detection of impaired thymic response

Impairment of the immune response is almost always due to malfunction of the thymus gland. Detection of a compromised immune system is very important. Indications can be gleaned from the previous history.

Medical history

Frequent colds and flu without fever, allergies, atopy, autoimmune disease, a series of recurrent and severe viral infections (e.g. hepatitis, measles, infection with Epstein-Barr virus = glandular fever, recurrent herpes infections), weight loss, low body weight or severe overweight, diabetes mellitus, arteriosclerosis, amyloidosis, ageing.

Laboratory findings

Low thyroxine levels in the blood (myxoedema type), high immunoglobulin E values, elevated C-reactive protein levels, low serum zinc values.

Haematology

Low absolute lymphocyte values (below 1,000 per cubic millimetre) and a lack of T-helper lymphocytes (T4/T8 quotient reduced to below 1) are indicative of thymus deficiency.

Thymic peptides – synthetic versus natural

In the past 40 years comprehensive experience has been gained with the total thymus extract known as TH-X. The manufacturing process has in the meantime been refined. It was found that particularly low molecular weight peptide fractions of thymic factors were effective in immunomodulation therapy of the compromised immune system. Many of the thymic factors have now been chemically identified. Individual molecules can be synthesised. However, their half-lives in situ are short, at
only 30 seconds to a few minutes. This means that continuous infusions are necessary, which complicates their use. In practice, natural thymic peptides are clearly superior to synthetically produced thymic factors. In comparative studies, the peptides showed significantly superior efficacy.

The thymic peptides currently in use are produced by modern methods and have now replaced the total thymus extract previously made by Sandberg. Nor do they have anything in common with products known as live cell preparations. Thymic peptides are now prepared using sophisticated laboratory technology.

The methods of preparation developed by Dr. Miller GmbH for their own production ensure careful harvesting of thymic peptides, followed by sterile filtration and virus depletion. The objective is to preserve the natural constituents of the young thymus glands in working order. This is also why the thymic peptides are deep frozen here and not lyophilised or preserved with chemical additives, as is the case with most other products. Each batch is tested by an independent laboratory. This guarantees that these thymic peptides are well tolerated by patients and generally free from side effects.

**Active substances and contents**

In-house production obtains a complex thymus extract containing a number of immunologically active substances. These include lower peptides and polypeptides, including the homeostatic thymic hormone preparation prothymosin alpha 1, thymosin fraction 5, thymomodulin and thymostimulin. It also includes proteins and enzymes that play a part in basal metabolism (energy and basic functions) and in the immune cascade. Further constituents are amino acids, small quantities of carbohydrates and nucleosides as well as water-soluble organic substances and mineral salts such as calcium, magnesium, potassium and zinc salts. The peptides are obtained from the glands of young calves or pigs, as the active substances are present in higher concentrations at that age. They originate from known Australian breeding stock, in the case of pigs from German herds, all subject to veterinary monitoring and certified BSE-free by the veterinary health authorities. In addition to other requirements of BSE legislation, the specified values required by the 20-point plan for risk reduction are achieved.

**How does thymus therapy work?**

Primary thymus deficiencies in children with an impaired immune response and a tendency to autoaggressive and atopic diseases are suitable for treatment with thymic peptides, as are all diseases involving an impaired immune system.

The older a person becomes, the lower the level of active thymic factors in the serum. This was demonstrated by Astaldi in 1975 (see Figure 3). Many chronic diseases involve immunodeficiencies that can often be successfully treated with thymic peptides. This is also the case for iatrogenic immunodeficiency due, for example, to chronic use of cortisone derivatives or cycles of treatment with cytostatic agents (chemotherapy).

![Figure 2](image1)

**Active substances of thymic peptides**

**Evaluation of an electrophoretogram**

![Figure 3](image2)

**Thymic hormones, age and disease**

Diseases of old age
- Autoimmune diseases
- Osteoarthritis
- Arteriosclerosis
- Amyloidosis
- Malignant disease

Childhood diseases
- Leukaemia
- Sarcoma

Connective tissue disease

In general, the mechanisms of a satisfactory immune balance are regulated by thymus peptides. They also affect the coagulation of blood by increasing antithrombin III levels.

Marked effects are also demonstrable on the mind, the autonomic nervous system and internal secretory glands. This is clear from the new science of neuro-endocrine immunology, which is beginning to explain phenomena including some psychosomatic processes. Thymic peptides also appear to exert a promoting effect on the function of the thyroid gland.

**Possible uses of thymic peptides**

**Immune deficiencies**

Immune deficiency in children with thymic deficiencies, in many viral and fungal infections and resistance to antibiotics.

Immune deficiency in adults as a result of age, cachexia, weight loss, marasmus, in advanced malignant disease and following chemotherapy with bone marrow depression, to prevent severe viral infections (herpes zoster, Epstein-Barr virus = glandular fever, viral hepatitis, etc.).
**Diseases of old age**
Arteriosclerosis with cerebral, cardiac and peripheral circulatory disorders, consequences of hypertension, post-thrombotic syndrome with crural ulcer and poor tendency to heal, late-onset diabetes (e.g. with retinopathy and amyloidosis).

**Degenerative disease**
Osteoarthritis deformans, ankylosing spondylitis, skin atrophy, hair loss, prostatic hypertrophy, mastopathy.

**Mycoses**
For example in mycotic infections caused by yeasts, those of the gut and vagina and in refractory fungal infections of the skin.

**Chronic recurrent infections**
For example with bacteria, fungi and protozoa, including infections of the respiratory tract (chronic or asthmatic bronchitis), frequent viral infections of the gastrointestinal tract (e.g. infections with Helicobacter pylori, colitis) and of the genitourinary tract (e.g. recurrent cystopyelitis, prostatitis, adenitis, thrush and genital herpes).

**Opportunistic infections**
Herpes simplex, Herpes zoster, other viral, bacterial or fungal infections with the tendency to become systemic.

**Adjuvant treatment in malignant disease**
Leukaemia, lymphoma, sarcoma and solid tumours often respond very well to thymus therapy. Thymic peptides are particularly effective when combined with other supplementary immunostimulant treatments. (See information leaflet: Further treatment combinations).

**Adjuvant treatment in AIDS**
Publications in recent years have indicated that adjuvant treatment with thymic peptides in patients with lymphadenopathy who are infected with HIV can make them feel better and have a favourable effect on the further course of the disease.

**Storage and use of thymic peptides**
Thymic peptides prepared by the therapist are shock-frozen in 5 ml ampoules at minus 196° Celsius. They can then be stored in the freezer at minus 40° Celsius for 6 months or at minus 18° Celsius for 6 weeks. The ampoules are stable for 2 years if stored at minus 80 ° Celsius. They are thawed as required (possibly with a hair dryer) and brought to room temperature. The ampoules are shaken briefly to disperse any fine frozen lumps. Thawed ampoules should be used without delay.

The therapist gives the injection. This is given into the usual area in the upper outer quadrant of the gluteus maximus. Prior to injection, the intramuscular placement of the cannula must be checked by repeated aspiration using the plunger. In practice, intravenous cortisone (e.g. Urbason® solubile 40-80 mg (methylprednisolone)) and anti-allergic preparations (e.g. Tavegil ampoules (clemastine fumarate)) must be kept to hand in case of unexpected anaphylactic shock – so far seen only very rarely after incorrect administration.

**Treatment recommendations**
Thymus therapy must be planned in the long term. It is introduced intensively and then the transition is made to lower-dose maintenance treatment. Patients can recognise the effect of thymus deficiency and often come of their own accord for a booster injection. Close contact between the therapist and patient builds confidence and this has a positive effect on the entire treatment and life situation.

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*T = injection of 5 ml thymic peptides, total of 20 thymic peptide injections in 6 weeks, followed by transition to 1 injection per week every 14 days or once a month as a booster, depending on the status of the illness.

For patients with cancer the dosage may be increased, e.g. weeks 1 to 4 one 5 ml injection daily, possibly 10 ml, then stepwise reduction to 3 injections per week, then 2 and finally 1 injection per week as a booster, depending on the status of the illness.

For children and adults who are temporarily unable to come in for treatment, oral thymus preparations can be recommended. Information on oral preparations is available from the GSTT.

(Further information in: “Spleen Therapy in Practice”).

**Thymus in combination with spleen therapy**
Recent research has shown that the combination of thymic and spleen peptides can have a favourable effect. The principle substances, thymosins and splenins, show some similarities and some differences. While thymic peptides regulate T lymphocytes and recruit new T cells from the bone marrow, splenic peptides have a stronger effect on B-lymphocytic defences. This can limit the excessive production of immunoglobulins.

Combinations of both peptides are often desirable in general immunodeficiency, particularly in geriatric failure of body functions. Good outcomes can also be achieved in endocrine and metabolic disorders that compromise the immune system.
Further treatment combinations

In addition to the usual treatments required for chronic diseases, there are no restrictions regarding combination with thymus therapy. Additional measures in the form of comprehensive order therapy may be recommended depending on the patient’s condition. These include mental and physical activation and relaxation, physiotherapy (e.g. Kneipp therapy), heat/cold therapy, dietary change to whole foods, supplementation of minerals and trace elements, e.g. magnesium, calcium, potassium, zinc, selenium, vitamin supplements in particular A, C, D and E and administration of herbal mitogens such as mistletoe and Echinacea, bacterial lysates, Omnadin-type oxygen multistage therapy or intravenous oxygen administration, neural therapy, proteolytic enzymes, bowel cleansing and focal cleansing.

Contraindications

Many patients tolerate thymic peptides with no local or general reactions. Patients with an overactive thyroid and those with a tendency towards tetany due to calcium deprivation should not be treated intensively with thymic peptides. Because of similar effects, the insulin dose can be adjusted during treatment. High doses of cortisone given long term weaken the effect of thymus therapy. These can usually be reduced during treatment.

Unwanted effects

After the first injections, redness and swelling may be seen at the injection site; these disappear rapidly with application of an ice pack. Preliminary testing with intracutaneous injections of 0.1 ml thymic peptides (fine cannula) should be given as a precautionary measure, to avoid allergic reactions.

H1 blockers, e.g. Lisino tablets (loratadine), taken in the evening and in the morning before the injection may reduce possible allergic reactions. In long term follow-up, specific antigens to thymic factors were detected only in small quantities.

At the start of the series of thymus injections, influenza-like symptoms can affect general health, but these usually disappear after a short time. An increase in appetite is generally noted and obese patients should be warned of this. Potency and libido may be increased.

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Publishers

German Society for Thymus Therapy
Harvestehuder Weg 65
20149 Hamburg
Germany
Tel.: +49-(0) 1805 - THYMUS (849 687)
E-mail: info@thymus-therapie.org
Homepage: www.thymus-therapie.org