

CRYOTHERAPY

Cryotherapy (negative thermotherapy) is an effective treatment method, during which the organism is exposed for a very short time to extremely low temperatures, which can go down to **−150 °C**, followed by moderate physical activity, such as riding a roped, gym or exercise.

Therapy can take place either locally, or it is applied to the entire body surface of a person. As such, it usually takes place in specially adapted cryochambers or cryo saunas, where the low temperature is ensured by *liquid nitrogen*. A certain paradox is that even in such "harsh conditions" to which the body is exposed for 1-3 minutes, the patient feels a relatively pleasant feeling due to the low air humidity.

The principle of cryotherapy

The principle of **cryotherapy** is the local removal of heat by **radiation**. The dependence of radiation on temperature can be described Stefan-Boltzmann law:

$$E = \varepsilon \cdot \sigma \cdot T^4$$

ε – is the spectral absorption coefficient

σ – is the Stefan-Boltzmann constant

T – thermodynamic temperature

We will use this formula for two bodies in this form:

$$E = \varepsilon \cdot \sigma \cdot (T_2^4 - T_1^4)$$

T_1 is the temperature of the cooled air in the cryo-chamber

T_2 is the body temperature



Cryotherapy is used in several intensities. For cold compresses, the temperatures reach -2 to -5 °C (it is recommended to insert a towel or other fabric between the part of the body treated in this way to avoid damage to the skin), in the cryo-chamber temperatures can reach values of up to -150 °C.

History

The healing effects of a cold environment have been known since the time of ancient Egypt and later Greece, where even the heroic '*Hippokrates*, who discovered the analgesic effects of cold on the human body, devoted himself to cold treatment organisms. Cryotherapy flourished during the Napoleonic Wars when a large number of severe injuries were treated with amputations and compresses of snow and ice were used to numb limbs.

The beginning of modern cryotherapy goes back roughly to the beginning of the 20th century when the first cryo chamber was constructed by the **Japanese Toshiro Yamauchi** (1978). The development is also related to technical progress that has enabled the liquefaction and long-term storage of gases. The improvement of cryotherapy was mainly done by Polish and German experts.

Cryosauna

Cryosauna is one of the means of cryotherapy. It is a cylindrical elastic cabin that contains conditioned dry air, free of moisture. In a cryosauna, the internal body temperature does not decrease, but it cools its surface and this results in a huge peripheral blood flow, metabolism, and healing effects are accelerated. The cold acts on the receptors, thereby **slowing down the conduction of nerve impulses** and thus more endorphins are released.

The effect of the cryosauna cold is to **increase hormones**, which suppresses inflammatory reactions. Stiff muscles relax and long-term pain disappears, including pain in the back and general musculoskeletal system.

Cryochamber

The **cryo-chamber** consists of a pre-chamber complex with a temperature of -40 to -60 °C and the main chamber itself, where the temperature is adjusted from -110 to -160 °C.

This device is used to provide full-body therapy to several people at once. Patients first spend about 1-2 minutes in the antechamber, where they prepare for the extreme cold of the following chambers. They then enter the main chamber for about 1 to 3 minutes.

In the **cryo-chamber**, they are dressed in bathing suits and have a mask over their face, gloves, and closed shoes. During the stay, the inhaled cold air in the Lungs increases to double the normal Volume.

Due to the effect of extremely low temperatures on the organism, mainly on cold receptors, combined with rapid cooling and subsequent heating, there is an **intense blood supply to the surface parts of the body**, such as the skin and muscular apparatus. Rapid temperature changes will cause an **increase in the excretion of many substances beneficial to the body**, such as endorphins and cortical hormones adrenal glands, which have an anti-inflammatory and analgesic effect, and testosterone, which can be especially attractive for athletes, as this phenomenon is directly linked to the increase of muscle mass.

There is also the **elimination of toxic components**. The subsequent physical activity causes a turbulent metabolism associated with the elimination of poisons, free radicals and lactic acids, which cause aging and degeneration of cells.



The cold in the cryo-chamber favorably affects **immune system**. It helps with rheumatic diseases and autoimmune diseases. However, people who have heart rhythm disorders, neurological events, and hypertension are not allowed in the cryo chamber.

Current use in therapy and prevention

Currently, cryotherapy has become an important component of '*rehabilitation* and **regeneration techniques**. Whole-body cryotherapy is an effective modern adjunct to the treatment and rehabilitation of rheumatological diseases (rheumatoid arthritis, rheumatism of soft tissues, collagenosis, vasculitis, Bechterev's disease, arthrosis of small joints of the hand and shoulder joints, orthopedic diseases (conditions after operations on load-bearing joints, conditions after operations for herniated spinal discs), skin diseases (psoriasis and psoriatic arthritis) and some post-traumatic conditions. It also affects and **improves the body's defenses** as it has a positive effect on the entire immune system of the patient.

Cryotherapy also helps in the prevention, rehabilitation, and treatment of many sports injuries, which include, for example, impairment of joints and articular cartilages, rupture and stretching of musculature, and a general overload of movement athlete's apparatus. By cooling down to such a low temperature, the speed of conduction of nerve impulses is reduced, and the patient, therefore, re-feels a certain relief from the pain of the injured apparatus.

During the therapy, there is both regeneration and an increase in joint mobility, physical load tolerance, and a general increase in the performance of the organism as a whole. In women, it can even cause cellulite treatment, because fat is expelled from their cytoplasm by shrinking the cells with cold. Thanks to the release of endorphins into the body, the patient feels in great condition, both physically and mentally.

Links

External links

- Kryoterapie (czech wikipedia)
- Cryotherapy (english wikipedia)

References

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