

Thermotherapy

Thermotherapy is a method of physical therapy where **heat** is added to or removed from the body. It is used to alleviate acute or chronic pain, to treat tumors or generally to strengthen the overall health of the organism.

Types of Thermotherapy

Heat can be supplied to the organism (positive thermotherapy) or removed from the organism (negative thermotherapy). Negative thermotherapy is dealt with in the article **cryotherapy**.

According to the method of application

Contact heating'

- Contact heating is usually provided for the whole body (in the form of baths, saunas or steam) or locally (in the form of wraps or compresses).
- alternating current with a high frequency can also be used to generate heat^[1] (at least 10 kHz).

Heat is then created according to **Joule's law**:

$$Q = RI^2$$

Non-contact heating does not require direct contact with the patient's body. Thanks to it, even deeper structures can be targeted. Its specificity can also be an advantage.

- **Capacitor Field Heating**: Heating takes place between two capacitor plates of high AC voltage. Due to this, a **electric field** of high intensity is formed, which is followed by the **dielectric of the body**, which polarizes alternately very quickly in this way. This creates heat. A feature of this heating is a relatively high specificity.
- **Induction heating**: The applicator is a coil around the body or its part, in which electromagnetic induction is induced. The so-called eddy currents are responsible for the heating.
- **Microwave heating**: Uses microwave radiation. It can be very specific.
- **Infrared radiation**: Used similarly to microwave radiation.

According to usage

Physiotherapy and nursing use

- It is the most commonly used method of rehabilitation, effective especially in reducing pain related to muscle tension, spasms, inflammations or swellings.
- Ensuring thermal comfort is one of the basic anti-shock measures.

Oncological use

- Uses heat with respect to some specific properties of tumor cells. This slows down the growth of the tumor or destroys it.

Physiotherapy and nursing use

Temperatures between the **isothermal heat point and the tolerance point** are applied. These points differ for different **heating media**. The isothermal point for water is between 34-36 °C and for air between 24-29 °C. The thermal tolerance point is around 42 °C for water and up to 130 °C for air (in a sauna at zero humidity). Different temperatures are given by different rates of heat exchange^[2]. During rehabilitation, contact heating is more common, of non-contact heating, **capacitor field heating and induction heating are most often used**^[3].

Physiological effects of thermotherapy

- Allows increased flow of blood to the skin by widening the blood vessels ie. higher supply of oxygen and nutrients to tissue.
- muscles near the body surface relax and become more elastic.
- The stiffness of joints decreases.
- Internal pain receptors in heated areas of the body are blocked.
- The post-acute phase of healing is accelerated.
- Inflammation and swellings are reduced.

Principles of using heat in therapy

- The patient must be familiarized with the treatment. With prolonged application, it is necessary to check the patient and determine whether there are any problems with the treatment - for example, ineffective application or unpleasant sensations.

Devices used in therapy'

- **Electric pillow** - preheats the bed or rewarms the patient. As electrical radiation producing heat, the pillow can be potentially dangerous and should not be left on overnight.
- **Thermogel pads** - are basically bags filled with a medium with a high specific capacity. Thanks to it, they can maintain the same temperature for a long time.
- **Thermophor** - is a rubber bag with a stopper filled with water.
- **Lamps emitting infrared (solux) or ultraviolet (mountain sun) radiation** - during application, it is necessary to protect the eyes in particular from unwanted radiation.
- **Hair dryer** is used in the treatment of children's bedsores.

Oncology use

Another use is in the treatment of infections and tumors with heat. Tumor cells and many bacteria have ineffective mechanisms to resist the physiological effects of heat and are more susceptible to heat-induced death than normal cells. These mechanisms have not yet been clearly explained. They are referred to as the **primary thermosensitivity** of the tumor cell. One of the most modern methods is **microwave thermotherapy**. Its main advantage is the possibility of outpatient treatment without the need for anesthesia and without bleeding. The effect is best on cells less blood- and oxygen-supplied, because they slow down the return of heat to the body. The effect of heat gradually leads to the degradation of enzymes, a change in pH of the cell and gradual lysis. In order to spare the surrounding tissue, the use of multiple **sublethal doses**^[2] is preferred.

synergy is used with **radiation therapy**, which, on the other hand, is most effective on cells with a good blood supply.

Links

Related Articles

- Effect of high temperatures on the organism
- Effects of extreme temperatures on living organisms
- Cryotherapy

External links

- Osack Petronela: Oxygen therapy, inhalation, thermotherapy. Multimedia support for the teaching of clinical and medical disciplines :: Portal of the Jessenius Faculty of Medicine of the Comenius University [online] 4/2/2011, last update 2/12/2011 [cit. 2011-12-23] Available from <<https://portal.jfmed.uniba.sk/clanky.php?aid=139>>. ISSN 1337-7396
- [Movement activity in the heat (<http://mefanet.lfp.cuni.cz/clanky.php?aid=268>)]
- Thermoterapy (English Wikipedia)

References

1. ROSINA, Joseph, et al. *Biophysics for medical students*. 1. edition. Prague : Grada publishing, a. s, 2006. 232 pp. pp. 119. ISBN 8024768682.
2. RETURNED, Leoš, et al. *Medical Biophysics*. 1. edition. Prague : Grada, 2005. 524 pp. pp. 77-78. ISBN 80-247-1152-4.
3. HRAZDIRA, Ivo – MORNSTEIN, Vojtěch. *Medical Biophysics and Instrumentation*. 1. edition. Brno : Neptune, 2001. 396 pp. pp. 312-315. ISBN 80-902896-1-4.

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