

# Hypothermia

Hypothermia occurs when the body temperature drops below 35°C due to excessive heat loss.

## Causes of hypothermia

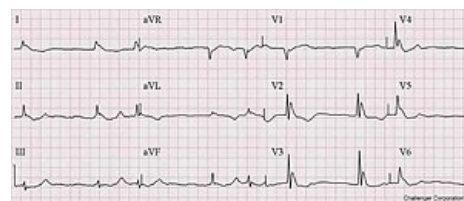
- Environmental influence - '*hypothermia*' (+ high humidity, wind, physical exhaustion, drunkenness, injuries, ...)
- **Reduced metabolism** - severe hypothyroidism, hypoglycemia, hypopituitarism, ketoacidosis, malnutrition
- **Intoxication** (alcohol, barbiturates, sedatives)
- Brain damage, trauma, sepsis
- Increased heat loss through the skin - burns

## Consequences of hypothermia

- The **first signs** arise from the effect of abnormal temperature on the **CNS** - ataxia, amnesia, speech disorders, behavior (paradoxical undressing), hallucinations, ...
- Below 33 °C, muscle tremors stop, metabolism decreases (at 28°C by 50%)
- Hematocrit and viscosity of the blood increase
- **Impaired renal function** - cold diuresis followed by oliguria
- **Rise in pH** (spontaneous return when the temperature rises)
- Impaired detoxification and conjugation function of the liver, hyperglycemia
- Often pancreatitis and gastric bleeding

### Effect on the heart

- Progressive decline of heart rate and MSV!
- Blood pressure first rises, then falls - poorly palpable pulse
- Despite hyperkalemia, myocardial excitability increases - frequent atrial fibrillation
- When the temperature drops below 28 - 30 °C **risk of ventricular fibrillation!** (terminal stage!)
- Changes on ECG (Osborn wave)



An example of an Osborn J wave in a hypothermic person.

The body can cope with hypothermia (up to 20 °C) surprisingly well. This is because there is a reduction in metabolism and requirements for O<sub>2</sub>.

Therefore, prolonged resuscitation is recommended and justified in critical hypothermic states. In case of death due to hypothermia, the postmortem signs are - purple skin, swelling in the face, gastric erosion, multi-organ infarctions as a result of hypothermic shock.

## Use of hypothermia in medicine

- Controlled **surgical hypothermia** (heart, brain surgery), local anesthesia
- **Cold treatment** (hypoxic conditions, physiotherapy, sports, swelling, inflammation, hardening, cryotherapy, cryosauna, ...)

## Links

### Related Articles

- Hyperthermia
- Cryosurgery
- Cryotherapy
- Thermoregulation
- Effects of extreme temperatures on living organisms

### External links

- [1] (<https://www.akutne.cz/algorithm/en/84-hypothermia/>)
- [2] (<https://www.akutne.cz/algorithm/en/235-avalanche-injury/>)
- Hypothermia (TECHmED) (<https://www.techmed.sk/hypotermia-podchladenie/>)
- Osborn wave (TECHmED) (<https://www.techmed.sk/j-vlna-osbornova-vlna/>)
- About hypothermia and their treatment, article on the Objective Source of E-Learning server, 2012 (<http://www.osel.cz/6135-o-podchladenych-a-ich-liecbe.html>)
- Homeostasis, IHW March 2006 (<http://www.biologymad.com/resources/A2%20Homeostasis.pdf>)
- Lecture by Ladislav Sieger - polar scientist, non-physician, practical information ([https://www.youtube.com/watch?v=UoqKQ0MO8\\_A](https://www.youtube.com/watch?v=UoqKQ0MO8_A))

## References

BLATTEIS, Clark. *Physiology and Pathophysiology of Temperature Regulation*. - edition. World Scientific, 1998. 294 pp. ISBN 9789810231729.