Fever

Poikilothermic animals
= cold-blooded animals, body temperature depends of the temperature of the environment

Homoiothermic animals
= warm-blooded animals (including humans), able to maintain stable body temperature independent on the temperature of the environment (under common conditions)

Body temperature in humans
Normal temperature if measured in the axilla: 35.8 – 37.0 °C
(rectal temperature about 0.5 °C higher)

Day oscillations: the lowest at 4:00 a.m., the highest late afternoon

Hormones increasing body temperature:
Progesterone, T-hormones, STH, testosterone, adrenalin, noradrenalin

Body temperature is also influenced by activity and environment (particularly in extreme conditions)

Body temperature control
Centre: hypothalamus
Thermoreceptors:
hypothalamus, peripheral receptors (spinal cord, abdominal cavity, large veins)
→ response of the vegetative system → reaction of tissues and organs ensuring thermoregulatory processes
→ behaviour leading to heat loss reduction or preference of more comfortable environment

Situations in which thermoregulation could be less effective
- Alcohol – limited behavioural control, peripheral vasodilation
- Warm water submersion, hot wet climate – disabled (limited) evaporation from the skin surface that would allow to keep the body temperature lower than the temperature of the environment
- Cold water submersion or cold wet environment – cold water takes heat energy easy from the body surface, evaporation of water from the body surface decreases its temperature
- Newborn – immature thermoregulation control, large body surface relative to the body weight

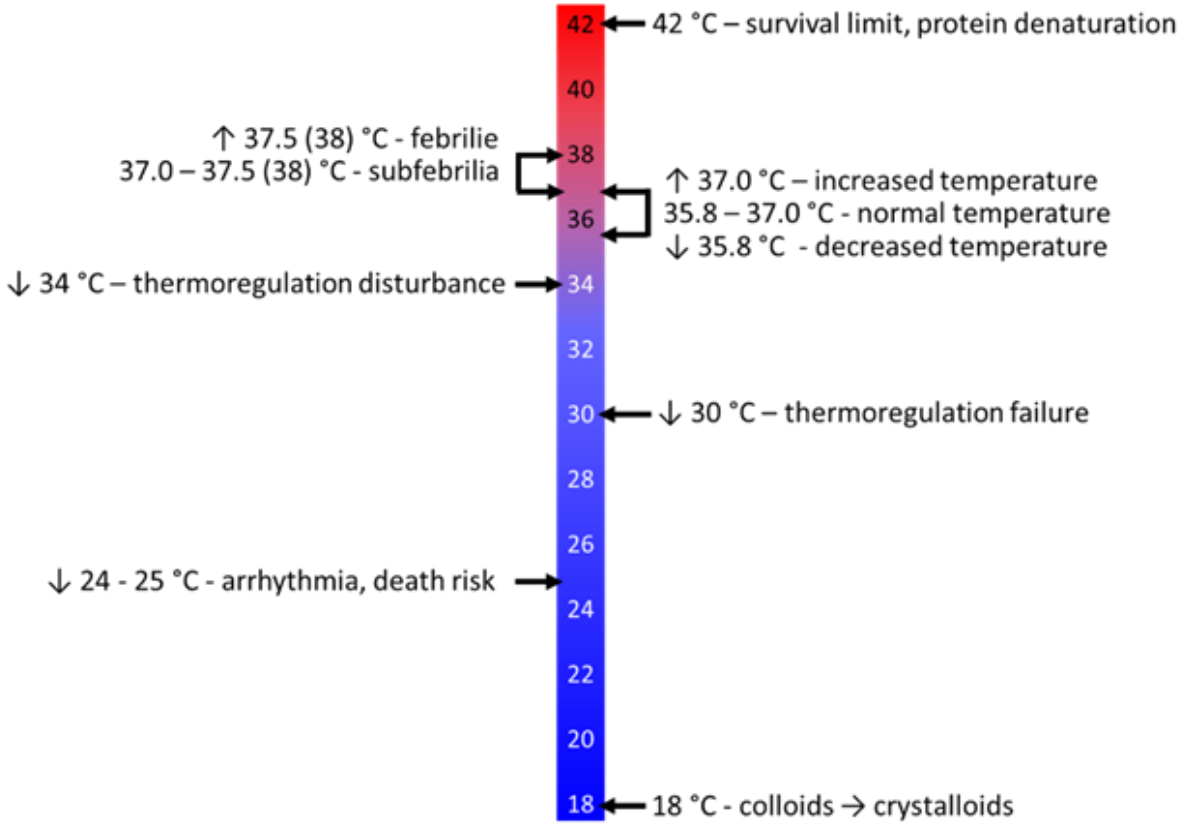

Fig. 1: important values of the body temperature

Fever
= febris
(temperature increase due to hot environment = hyperthermia)
Fever is a symptom of a disease.

Pyrogens: bacterial endotoxins, viruses, products of aseptic tissue damage etc.
Activation of macrophages → production of cytokines (= endogenous pyrogens) IL-1β, IL-6, TNF-α
→ production of prostaglandins (PGE2) → hypothalamus programmed to maintain higher temperature → processes increasing body temperature
Synthesis of prostaglandins is catalysed by cyclooxygenase enzyme (COX). Therefore, COX inhibitors act as antipyretics.

Fever does not need occur in old people and in the case of hypothalamus damage.

Fever stadia:
1) incrementi – cold feeling, temperature increase, shivering (thermogenesis)
2) akme - temperature corresponds with the hypothalamus setting
- cold feeling and shivering disappear
3) decrementi - after provoking factor disappears
→ normalization of the hypothalamus setting

→ processes leading to temperature drop – vasodilation in the skin, perspiration…
- rapid temperature decrease = crisis
- slow temperature decrease = lysis

Fever types
Febris continua = changes of the temperature within one day < 1 °C
Febris remittens = temperature changes within one day > 1 °C
Febris intermitens = period of fewer and of normal temperature

Effects and importance of the fever
- ↑ leukocyte generation
- Acceleration of leukocyte migration
- ↑ antibody production
- Inhibition of microbe growth

Via these mechanisms, fever contributes to defence against infections.

In the organism, fever induces following changes:
- Increase of basal metabolism, increased intensity of catabolic processes
- Cardiovascular system – increased heart rate (1 °C ~ 10 beats/min)
- Respiration - tachypnoea
- CNS - inhibition (somnolence, apathy) or excitation (insomnia, unrest, hallucination), headache
- GIT - decreased secretion of saliva, stomach juice, pancreatic juice, bile
  - increased water resorption
  - These changes lead to thickening of intestinal content and constipation.
- Kidneys - decreased urine production

The consequence of these changes can be severe complications and risks for the patients:
→ cardiovascular system overload
→ energy source reduction
→ dehydration
→ protein denaturation at > 42 °C
→ febrile seizures in newborns
High fever can be dangerous for some patients.

Febrile seizure
= convulsiones febriles
The most common cause of cramps in children (2-5 % of children < 5 years)
Tonic-clonic cramps, potentially unconsciousness

Classification of febrile seizure:
1) Non-complicated febrile seizures
   - disappear within 3 min (max. 15 min)
   - good prognosis
2) Complicated febrile seizures – persist for more than 15 min or recidive within 24 h
3) Febrile epileptic state – cramps persist for more than 30 min

Etiopathogenesis is unclear (genetic predisposition?).
Febrile seizure appears usually at the beginning of a febrile disease in the stage of temperature increase, at the temperature over 38 °C.

Among febrile seizure does not belong symptomatic cramps in febrile diseases affecting the CNS (encephalitis, meningitis…).