
Extremes of Body Temperature

The human body must remain at an almost constant temperature (averaging at 36.9°C) in order for its systems to operate at optimum levels. Any significant deviation from normal temperature may have severe, and even fatal, effects.

The body incorporates mechanisms which normally maintain the body temperature within very close limits to the norm. However, these mechanisms may be overcome by prolonged or extreme exposure to adverse temperature conditions.

The very young, the old, and the otherwise unfit, are more likely to succumb to the effects of temperature extremes.

Body temperature scale

Body core temperature	Likely effects
above 41°C	Probable death
40 - 41°C	Restlessness and confusion, reduced level of consciousness
38°C	Sensation of heat, sweating
37°C	<i>Normal</i>
35 - 36°C	Sensation of cold, shivering
34 - 35°C	Confusion and amnesia
33°C	Muscular rigidity (in place of shivering), irregular heartbeat
31°C	Drowsiness, reduced level of consciousness
30 - 33°C	Deep unconsciousness, dilated pupils, loss of reflexes
28°C	Apparent death - pulse undetectable
24 - 28°C	Probable death

Hypothermia

Hypothermia is a lowering of the body's core temperature to 35°C or less.

Causes

- Long term existence in a 'cold' environment, especially coupled with inactivity.
- Exposure to cold weather, especially windy and rainy conditions (the term 'exposure' is often used in such cases).
- Immersion in cold water, or exposure to very cold air, without appropriate protective clothing.

Signs & symptoms

Signs & symptoms will vary as hypothermia develops:

- Initially, a sensation of cold, shivering.
- As the core temperature falls, the sensation of cold dissipates, and shivering ceases.
- Cold, pale, dry skin - 'as cold as marble', maybe with cyanosis at extremities.
- Lethargy, apathy.
- Irrational behaviour, maybe awkward and aggressive.
- Slow, weak pulse.
- Slow, shallow respiration.
- Dilated, unreactive pupils.
- Falling level of consciousness.
- As the temperature falls towards 24°C, pulse, breathing, and level of consciousness all decline.

Young babies do not shiver. They may appear a normal colour, but will be very quiet, and will not react to their surroundings.

Those suffering from the early stages of 'exposure' may have disturbances of vision, slurred speech, and may become unnaturally 'energetic', but with a reduced level of muscular control.

Treatment

The general rule is to bring the casualty back to normal temperature at the same rate at which they cooled down.

For hypothermia in the home:

Use blankets, or clothing, to retain remaining body heat.

Attempt to raise the temperature of the surroundings, but not suddenly, or by too much.

If the casualty is conscious, give warm nourishing drinks.

Transport to hospital.

Do not apply external heat directly to the body, or give alcohol.

For exposure:

Shelter the casualty from the weather.

Remove wet clothing, and replace with dry clothing / blankets / sleeping bag, etc.

If the casualty is conscious, give warm nourishing drinks.

Transport to hospital.

For acute exposure to cold:

Remove clothing.

If possible, allow the casualty to use a 'hot' bath or shower (water temperature no more than 40°C).

Treat as for exposure.

Transport to hospital.

Those who have been immersed in cold water, but who have obviously not drowned, may have undetectable pulses. Cardiac massage may lead to ventricular fibrillation. Respiratory support may be appropriate if the respiration rate is below 10 breaths per minute.

Hypothermia coupled with an overdose of barbiturates may well cause the casualty to appear dead. In such cases it is very important not to cause sudden heating which will bring circulation to the body surfaces too rapidly.

Babies should be wrapped to prevent further heat loss and taken to hospital.

Thermal blankets ('space blankets')

A thermal blanket is a thin sheet of reflective material similar to aluminium foil. A cloth backing may be attached.

It may be used in the treatment of hypothermia casualties, as it much reduces heat loss through radiation. Note that heat losses through convection or conduction are not significantly affected.

Use of a thermal blanket

Take the casualty to a sheltered place.

If the casualty is conscious, remove any wet clothing and dry the skin.

If the casualty is unconscious, do not remove clothing even if wet.

Wrap the thermal blanket around the casualty - shiny side inwards.

Wrap conventional blankets over the thermal blanket to reduce heat loss by convection or conduction.

Mediwrap® blankets comprise a thermally insulating layer bonded to a foil layer. They are designed to be used without additional blankets and should be wrapped around the casualty with the foil layer outermost.

Space blankets and Mediwrap® blankets are intended for single patient use only.

Heat exhaustion

This occurs when the body loses excessive amounts of fluid and salts through sweating, as the body temperature rises towards 38°C.

Causes

- Working or exercising in conditions of high temperature.
- Fever, especially coupled with diarrhoea and vomiting.

Signs & symptoms

- Faintness, dizziness.
- Pale, clammy skin, which may even seem cold.
- Headache.
- Confusion.
- Nausea.
- Maybe cramps in the limbs or back.
- Rapid, weak pulse.
- Rapid, shallow breathing.

Treatment

Move the casualty to a cool environment (if possible).

Instruct the casualty to rest.

(As long as the casualty is conscious) give cool drinks, in small but frequent quantities.

Administer salt (sodium chloride) dissolved in water (1 teaspoonful in 1 litre).

If recovery is rapid, advise the casualty to seek medical attention.

If recovery is slow, or the condition worsens, transport the casualty to hospital.

Heatstroke

Heatstroke is a condition which occurs when the body's temperature rises, out of control to 40°C and maybe above. It may follow on from heat exhaustion. It often has a rapid onset, and may quickly be fatal if not treated as a medical emergency.

Causes

- Prolonged exposure to conditions of high temperature.
- Illness involving high fever eg. malaria.

Signs & symptoms

- Faintness, dizziness, general discomfort.
- Restlessness and confusion, maybe delirium.
- Hot, flushed, dry skin.
- Full, bounding pulse.
- Rapid, noisy breathing.
- Convulsions.
- A rapidly falling level of consciousness, or a sudden loss of consciousness.

Treatment

Remove the casualty from the heat (if external) and into a cool environment.

Cool the casualty immediately: remove clothing and cover with a damp sheet (if available).

Use fanning to assist the cooling action.

Place 'cool packs' (if available) under the arms and behind the neck.

Transport to hospital.