

# Hypother

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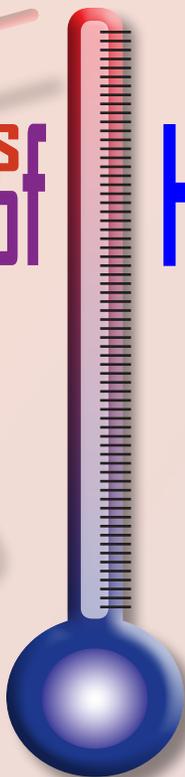
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## Stages of

## HYPOTHERMIA

96°F (35.5°C)

The long slide from, "I'm fine," to coma



98.6°F (37°C)

**PHYSIOLOGY:** Walking and talking. Normal, all systems go.

**COGNITION:** We are mentally sharp, paying attention to details, monitoring our environment, and responding appropriately.

**BEHAVIOR:** We are physically coordinated, feeling strong and capable, making appropriate gear and clothing decisions, setting a pace appropriate for the conditions, eating and hydrating properly.

97°F (36°C)

**PHYSIOLOGY:** Brain functions slow.

The thermoregulatory center in the brain, sensing the heat loss, will initiate several defensive actions. It will vasoconstrict and reduce blood flow to the skin, creating an additional thermal layer to prevent further heat loss.

Piloerection occurs—our hairs stand on end in an attempt to create an insulating layer of dead air space.

The rate of metabolism will increase, burning more glucose to produce more heat.

**COGNITION:** Judgment begins to fail.

We become more focused on the trail in front of us and less aware of the weather and our surroundings. Enthusiasm wanes and apathy sets in.

**BEHAVIOR:** Protective instincts fade. We don't make the best gear and clothing decisions. We don't make the best food and hydration decisions.

Our mood and reactions change; we become more withdrawn.

**PHYSIOLOGY:** All systems are on full alert, and the body is doing everything possible to rewarm itself from the inside.

Shivering begins as a constant, uncontrollable, fine motor tremor, and is caused by opposing muscle groups acting against each other. Shivering produces heat, but it is wasteful exercise that doesn't produce useful work—and interferes with other activities that require precision: swinging an ice axe, lighting a stove, pulling up a zipper.

Decreased fine motor skills—we begin to lose dexterity and our speech starts to slur.

Metabolism increases to meet the new fuel demands.

**COGNITION:** Mental abilities are falling rapidly. Decision-making, judgment, and "common sense" begin to fail. Self-preservation instincts are replaced with a "summit or bust" mentality.

**BEHAVIOR:** In the face of changing weather (e.g., drop in temperature, increase in wind), we may not take any constructive action (e.g., putting on another layer). We may leave clothing or equipment behind.

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# ermia

**HYPOTHERMIA** IS THE LOWERING OF THE BODY'S CORE TEMPERATURE to a level where normal brain and muscle functions are impaired. It typically happens when several things occur simultaneously: low temperatures (<40F/4.5C), wet conditions (damp clothes), lack of fuel and hydration (food and water), and physical fatigue. This cascade of problems causes our thermoregulatory system to fail—it just can't keep up with the heat loss (see the thermoregulation information in the Human Animal section).

94°F (34.5°C)

**PHYSIOLOGY:** Shivering is at its maximum, but other systems are slowing.

Metabolism is peaking, but fuel is being burned at such a furious rate (up to five times) that the stores will not last long (4 – 5 hours, rather than the typical 24). When the stores are used up, shivering (and thus, heat production) will slow, and eventually cease.

**COGNITION:** We are not aware of being cold. We believe that we are thinking clearly, but we're not. Simple problem-solving is impossible (we can't do basic addition/subtraction). When confronted with obvious problems—we're off the trail and thrashing about in a spruce trap—we may agree, but we really don't care.

**BEHAVIOR:** Coordination fails—tripping and falling begins. We have trouble staying on the trail and easily become lost.

We don't take care of ourselves—if we lose a crampon or a mitten or get a load of snow down our back, we don't do anything about it.

Still, we remain goal-oriented—onward to the top.

92°F (33.3°C)

**PHYSIOLOGY:** Shivering becomes intense.

**COGNITION:** Mentally, we are beginning to shut down. We enter a dream-like state where nothing seems real.

**BEHAVIOR:** We're unable to walk—though we may still be crawling toward the goal. Speech becomes very difficult.

90°F (32.2°C)

**PHYSIOLOGY:** Shivering becomes convulsive and begins to fail. Shivering is violent for a minute, then absent for a minute. We are running out of fuel and energy and shivering will soon cease.

**COGNITION:** We can still be aroused, and will try to answer questions, but our speech will be slurred, perhaps beyond recognition.

**BEHAVIOR:** Curling and mumbling. We adopt the fetal position—the body's last-ditch effort to protect the core and minimize heat loss.

As things deteriorate, we become less and less arousable, and as the final glucose stores are burned, our shivering mechanism begins to fail.

86°F (30°C)

**PHYSIOLOGY:** We become unconscious, ashen, and gray.

We enter a "Metabolic Icebox" (essentially suspended animation). All systems have slowed to minimize the consumption of oxygen and sugar.

The blood is now 190% thicker than normal, preventing a palpable pulse. Heart sounds will be absent.

Respirations will slow to 3 – 6 per minute—so slow and shallow that they may be impossible to detect.

We may appear dead: pulseless and breathless, with cold, stiff skin, and fixed pupils.

You may have heard the expression that a person "is not dead until they are warm and dead"—this is the state that this expression refers to.

If you place a cardiac monitor on our chest, we will be in sinus bradycardia—this is not pulseless electrical activity (PEA)—we should not be shocked or given any drugs.

**COGNITION:** We are comatose and unresponsive to verbal or painful stimuli.

**BEHAVIOR:** We initiate no action.

**SHIVERING:** the universal sign for "I'm cold." When it stops, you're in real trouble.

**HYPOTHERMIA** is not a disease. The hypothermic person's physiology is normal for their core temperature. People can survive a long time in the "metabolic icebox."

# Types of HYPOTHERMIA

## SUBACUTE/MOUNTAIN/ACCIDENTAL HYPOTHERMIA

This is the most common type of hypothermia, and the condition typically develops over just a few hours.

It is often the result of a mishap (e.g., getting benighted on a winter hike), accident (e.g., broken ankle while ice climbing), or any series of poor decisions that leave a person cold, tired, dehydrated, and hungry.

It follows the classic downward spiral described in the opening spread.



**NICE DAY**, getting dark, though...  
Oh Snap!  
There goes your ankle.  
Can you spell h-y-p-o-t-h-e-r-m-i-a?

## CHRONIC HYPOTHERMIA

Comes on slowly over days or weeks.

It is brought on by the combination of a cold environment and poor nutrition and occurs primarily in the geriatric population.

Older, sedentary people need a much warmer environment (the thermostat should be set close to their age). To save fuel, elderly people often turn the thermostat down way too low.

As the elderly cool, their metabolism will not increase enough to meet the demand. As we age, our appetites change and we may not be consuming enough calories to keep warm.

They may not shiver in response to the cold.

Mentally, they may exhibit symptoms similar to dementia.

Once rewarmed, they will return to a normal physical and mental state.



**OKAY** to spend a night or two in here, but, um...not a month.

## ACUTE OR "SHELL" HYPOTHERMIA

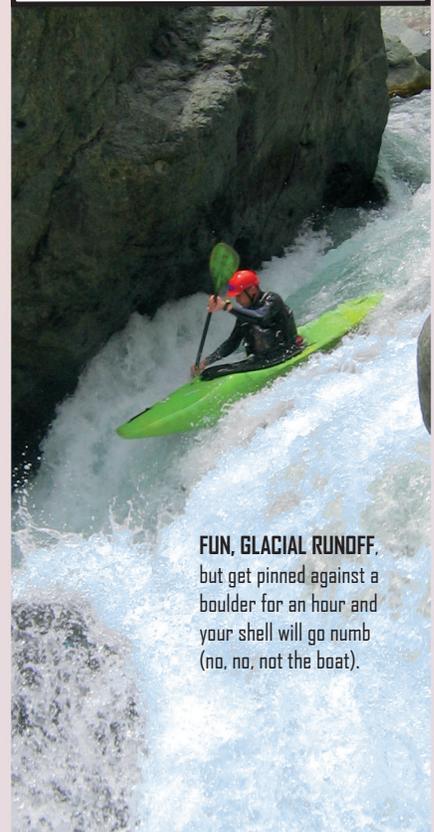
This is caused by a sudden plunge into cold water (think ice fisherman on thin ice).

The "shell" cools suddenly, impairing muscle function and coordination.

The core temperature remains normal.

Death can occur after an hour or so, not because of deep hypothermia, but rather because the rapid cooling of the muscles prevents the victim from the kind of purposeful movement that allows them to stay afloat—death occurs from drowning.

It is a myth that a person plunged into ice cold water will die within three minutes because of hypothermia—you may drown, but you will not die quickly from hypothermia.



**FUN, GLACIAL RUNOFF**, but get pinned against a boulder for an hour and your shell will go numb (no, no, not the boat).

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# Treatment of HYPOTHERMIA

**FOR MILD TO MODERATE HYPOTHERMIA** (the patient is still conscious and responsive—their core temperature has not dropped below 92F (33.3C).

- 1 Remove the patient from immediate danger and further exposure.
- 2 Create shelter: tent, bivouac, snow cave.
- 3 Get them dry and keep them dry.
- 4 Remove their wet clothing, dry them off, and re-insulate them with dry clothing.
- 5 Place the patient in a hypothermia wrap and protect them from the ground.
- 6 If conscious and can safely swallow, feed the patient sickly sweet fluids, such as Jell-O in warm water or warm Gatorade. Have them sip constantly. You cannot give them too much water or sugar. Hypothermia victims cannot digest solids. If unconscious, do not try to feed them orally.

**FOR SEVERE HYPOTHERMIA** (patient unconscious and likely in the fetal position). Do the above, plus:

- 1 Avoid excessive movement or jarring.
- 2 Give rescue breaths.

**DO NOT DO CPR!** The myocardium of the heart is very susceptible to fibrillation because of elevated potassium levels surrounding the cells. **Bumping or jostling** can cause the heart to go into **ventricular fibrillation**. It is almost **impossible** to defibrillate a hypothermia patient.



Protect from the ground with a waterproof layer (tarp) and foam.



Protect with multiple layers of dry insulation. Use extra insulation at the head and feet. Poor circulation in the feet can lead to frostbite.



Surround with a windproof/waterproof outer layer.

## HYPOTHY-WRAP



May add external heat sources near the feet, armpits, or hands (wrap in socks).

## Prevention of HYPOTHERMIA

- Know your enemy: be prepared for wet, wind, and cold.
- Wear fabrics that stay warm when wet. Do not wear cotton—the phrase “cotton kills” really has validity: cotton loses almost all its insulating ability when wet.
- Get dry and stay dry—it can be difficult to re-warm a damp or wet person, and it can be extremely difficult to keep a damp person warm.
- Stay well-hydrated.
- Snack often on quick-burning carbohydrates (energy bars, candy, etc.).
- Carry bivouac gear and know how to use it.
- Be attentive to yourself, to your companions, and to the environment—pay particular attention to mental-status changes.
- Turn around before you get in trouble. This is a difficult point to determine, but there are almost always early warning signs.
  - ➔ Someone in the party is moving slowly or complaining of being cold and/or tired.
  - ➔ Weather/route conditions are not what you expected or are changing for the worse.
  - ➔ You fall behind the schedule of your plan for the day.
  - ➔ Someone (anyone) says something like, “I don’t feel good about this.”