Cold Environments – Health Effects and First Aid – Fact Sheet

WHAT ARE THE HEALTH EFFECTS OF EXPOSURE TO COLD?

Cooling of body parts may result in various cold injuries – with hypothermia being the most serious. Nonfreezing cold injuries include chilblain, immersion foot and trenchfoot. Freezing injuries include frostnip and frostbite.

Toes, fingers, ears and nose are at greatest risk because these areas do not have major muscles to produce heat. In addition, the body preserves heat by keeping the internal organs warm; thus, reducing the flow of blood to the extremities under cold conditions. In addition, hands and feet tend to get cold more quickly than the body (torso) because:

- they lose heat more rapidly since they have a higher surface area-to-volume ratio, and
- they are more likely to be in contact with colder surfaces than other parts of the body.

If the eyes are not protected with goggles in high wind chill conditions, the corneas of the eyes may freeze.

The most severe cold injury is hypothermia which occurs from excessive loss of body heat and the consequent lowering of the inner core temperature (internal temperature of the body). Hypothermia can be fatal.

What are examples of 'nonfreezing' cold injuries?

Chilblains are a mild cold injury caused by prolonged and repeated exposure for several hours to air temperatures that are cold, but not freezing (from above freezing (0°C or 32°F) to as high as 16°C (or about 60°F)). In the affected skin area there will be redness, swelling, tingling, blisters, and pain. Seek medical help if an infection occurs. Chillblains will usually resolve on their own, especially in warmer weather. Recurrence is common for many years.

Immersion foot occurs in individuals whose feet have been wet, but not freezing cold, for days or weeks. It can occur at temperatures up to 10°C (50°F). The primary injury is to nerve and muscle tissue. Symptoms include tingling and numbness; itching, pain, swelling of the legs, feet, or hands; or blisters may

develop. The skin may be red initially and turn to blue or purple as the injury progresses. In severe cases, gangrene may develop.

Trenchfoot is “wet cold disease” resulting from prolonged exposure in a damp or wet environment from above the freezing point to about 10°C (50°F). Depending on the temperature, an onset of symptoms may range from several hours to many days but the average is three days. Trenchfoot is more likely to occur at lower temperatures whereas an immersion foot is more likely to occur at higher temperatures and longer exposure times. A similar condition of the hands can occur if a person wears wet gloves for a prolonged period under cold conditions described above. Symptoms are similar to an immersion foot.

What are examples of ‘freezing’ injuries?

Frostnip is the mildest form of a freezing cold injury. It occurs when ear lobes, noses, cheeks, fingers, or toes are exposed to the cold and the top layers of a skin freeze. The skin of the affected area turns paler than the area around it and it may feel pain or stinging, followed by numbness. Skin may also appear shiny and rosy, as well as hardened. The top layer of skin feels hard but the deeper tissue still feels normal (soft). It is a warning that frostbite is beginning.

Frostnip can be prevented by wearing warm clothing and foot wear. It is treated by gentle rewarming (e.g., holding the affected tissue next to unaffected skin of the victim or of another person). As for all cold-induced injuries, never rub the affected parts – ice crystals in the tissue could cause damage if the skin is rubbed. Do not use very hot objects such as hot water bottles to rewarm the area or person.

Frostbite is a common injury caused by exposure to cold or by contact with cold objects (especially those made of metal). It may also occur in normal temperatures from contact with cooled or compressed gases. Skin may look waxy and feel colder than the area around it. It may also be harder to the touch. Blood vessels may be severely and permanently damaged, and blood circulation may stop in the affected tissue. In mild cases, the symptoms include inflammation of the skin in patches accompanied by pain. In severe cases, there could be tissue damage without pain, or there could be burning or prickling sensations resulting in blisters. Frostbitten skin is highly susceptible to infection, and gangrene (local death of soft tissues due to loss of blood supply) may develop.

What first aid can I do if someone has frostbite?

First aid for frostbite, as well as immersion or trenchfoot, includes:

- Never ignore numbness. If you feel numb or tingly, take steps to warm the area immediately. (e.g., put your hands under your armpits, or pull your arms into the inside of your jacket for more direct contact with the body)
- If possible, move the victim to a warm area.
- Remove wet clothing, and gently loosen or remove constricting clothing or jewellery that may restrict circulation.
- Warm the person by wrapping them in blankets or by them putting on dry clothing. Cover the head and neck. Warm the person slowly. Avoid direct heat which can burn the skin.
- Loosely cover the affected area with a sterile dressing. Place some gauze between fingers and toes to absorb moisture and prevent them from sticking

together.
- If the person is alert, give them liquids to drink.
- Check for signs of hypothermia and seek medical attention. If necessary, quickly transport the victim to an emergency care facility.
- Treat the person gently and monitor breathing
- DO NOT attempt to rewarm the affected frostbite area on site (but do try to stop the area from becoming any colder) – without the proper medical care, tissue that has been warmed may refreeze and cause more damage.
- DO NOT thaw the area if it may freeze again.
- DO NOT rub area or apply snow.
- DO NOT allow the victim to drink alcohol or smoke.

What is hypothermia?

In moderately cold environments, the body's core temperature does not usually fall more than 1°C to 2°C below the normal 37°C because of the body's ability to adapt. However, in intense cold without adequate clothing, the body is unable to compensate for the heat loss and the body's core temperature starts to fall. The sensation of cold followed by pain in exposed parts of the body is one the first signs of mild hypothermia.

As the temperature continues to drop or as the exposure time increases, the feeling of cold and pain starts to diminish because of increasing numbness (loss of sensation). If no pain can be felt, serious injury can occur without the victim's noticing it.

Next, muscular weakness and drowsiness are experienced. Additional symptoms of hypothermia include interruption of shivering, diminished consciousness and dilated pupils. As hypothermia progresses, severe symptoms may occur, including death.

What are the signs of hypothermia?

Regulators lists the levels of cold stress to include:

Cold stress (not hypothermic)

- Shivering
- Normal mental status
- Able to care for self

Mild hypothermia

- Vigorous shivering and complaining of the cold
- Decreased physical function
- Difficulty taking care of self

Moderate hypothermia

- Weak and intermittent shivering, or shivering that later stops
- Sometimes complaining of the cold
- Lack of coordination or speech; confused or unusual behaviours
- Impaired judgement
- Possible unresponsiveness

Severe hypothermia

- Shivering has stopped
- Unresponsiveness; breathing has slowed down or stopped
- Body feels stiff
- No pulse

What first aid can I do for hypothermia?

Hypothermia is a medical emergency. At the first sign, find medical help immediately. The survival of the victim depends on their co-workers ability to recognize the symptoms of hypothermia. The victim is generally not able to notice his or her own condition.

First aid for hypothermia includes the following steps:

- Seek medical help immediately. Hypothermia is a medical emergency.
- Check for ABC – Airway, breathing and circulation.
- Handle the person gently. Do not massage or rub the skin.
- Allow them to lay down. No standing or walking.
- Move the person out of the cold, and/or insulate the person (e.g., by applying a hypothermia wrap).
- Warm by carefully applying warm water bottles, heating pads or electric blankets to the upper body (such as the armpits, chest, and upper back). Wrap items in towels or clothing if available. Body heat from another person can also help in an emergency.
- DO NOT rewarm the person too quickly (e.g., do not use a heating lamp or stove, or soak in a hot bath/shower).
- Give high calorie food or drinks (caffeine-free, non-alcoholic) ONLY if the individual has mild hypothermia (e.g., when the person is conscious and responsive).
- Perform CPR (cardiopulmonary resuscitation) if the victim tops breathing. Continue to provide CPR until medical aid is available. The body slows when it is very cold and in some cases, hypothermia victims that have appeared “dead” have been successfully resuscitated.

What is meant by a hypothermic wrap?

Regulators suggests the following supplies for a hypothermia wrap:

- a tarp or plastic sheet to act as a vapour barrier
- an insulated ground pads
- a hooded sleeping bag (or equivalent)
- another plastic or foil sheet (2×3 metres) to act as a vapour barrier inside the sleeping bag
- source of heat (e.g., warm water in bottle or hydration bladder, chemical heating pads)

When the person has dry or damp clothing, leave the clothing on.

When the person has very wet clothing, if shelter and transport are:

- less than 30 minutes away, then wrap the person immediately
- more than 30 minutes away, protect the person from the environment, remove wet clothing, and apply wrap.

To apply a hypothermia wrap:

1. place an insulation pad (or pads) between the person and the ground
2. apply as much insulation as possible. Add extra clothing and wrap the person in blankets or sleeping bags
3. cover the person’s head and neck with a toque, heavy hat, or hood
4. place a vapour barrier (plastic or foil) outside the insulation wrap if the person is dry. If the person is still wet, place the vapour barrier inside the insulation wrap. If you have two vapour barriers, place one inside and one outside the insulation wrap.