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Cold Weather Training
Cold Injury

Frostnip is a superficial injury.

Superficial frostbite involves all layers of the skin but not the underlying fat, muscles, etc.

Means of Heat Loss

- Convection: heat is carried away from the body by currents of air or water
- Conduction: direct transfer of heat from the body to a colder object (e.g. wet clothes or cold ground)
- Evaporation: of sweat or water from the surface of the skin
- Radiation: the loss of heat from a warm body to a surrounding colder environment. This is independent of wind or contact. Radiative heat loss is significant in cold, dark, cloudless nights.

Sources of Heat Gain

- Radiation: heat from the sun of a fire.
- Exercise: 75% of muscular energy is produced as heat; exercise, therefore, rewarms the body.
- Shivering: shivering can increase body metabolism fivefold but consumes energy and oxygen in achieving this.
- Food: provides calories for basic body functions and exercise. Carbohydrates provide energy quickly; protein provides greater energy, but more slowly and at the expense of more body energy.
- Blood Vessel constriction; skin blood vessels constrict, thereby keeping warm blood circulating in the core, where it is most needed by the vital organs (brain, heart, liver, kidneys) and reducing heat loss through the skin.
- Insulation: prevents heat loss but does not by itself produce heat. Water an *excellent* heat *conductor, reduces* the insulating value of most fabrics. Wool, polypropylene, and pile insulates well by trapping air in the interstices of the fibers, which do not collapse when wet. The more layers of clothing the better the insulation. Windproof, water-repellent fabrics, as an outer layer of clothing, trap warm air in the inner layers and diminish heat loss by convection, conduction, and evaporation.

Deep frostbite involves the skin and underlying tissues to a variable depth.

Mild Hypothermia The core temperature of the body will range from 95 to 91 degrees

Severe Hypothermia the body core temperature falls below 90 degrees.

Immediate warming easily treats Frostnip and there is *no* residual damage.

Frostbite it is associated with swelling and blisters filled with clear fluid.

Deep Frostbite The affected part has no feeling; blisters do *not extend* to the tips of the fingers or toes are blood filled; and the tissue remains cold even after attempts to warm.

What to look for:
White waxy skin that has no feeling and is wooden to the touch
Possible thawing, in which case
- The skin is soft and the part may appear gray or purple
- The skin tingles painfully
- Blisters develop within a few hours

What to do: avoid a freeze-thaw-refreeze cycle
- If you are more then 8 hours from help, allow the part to *thaw*
- Keep the part clean
- Cover with a dry protective dressing
- Elevate the limb above the level of the heart to reduce swelling
- Evacuate as soon as possible

Do not:
- rub with snow
- Break blisters
- Allow to refreeze
- Warm the part in front of a fire or heater

Mild Hypothermia

What to look for:
shivering, the first sign of body cooling. Shivering becomes uncontrollable.

Uncharacteristic behaviors the person can still talk, but grumbles and mumbles about feeling cold. Inappropriate excitement or lethargy, poor judgment, and, poor decision making are common. The person becomes confused and may hallucinate.

Stiff muscles and cramps; uncoordinated movements

Cold, pale, and blue-gray skin owing to constricted blood vessels.

What to do:
Find shelter out of the *wind*
Light a fire or stove, change the victim's clothes, add layers to increase insulation, give food and a hot drink.
If the victim is shivering strongly, remove wet clothing and allow shivering to continue inside a dry steeping bag, keep the *victim* well insulated from the ground.
Give warm, sweet liquids.
Do Not Delay.
Never leave a hypothermic victim alone.

Severe Hypothermia

A practical way to classify victims as shivering and non-shivering A victim who is shivering is mild hypothermic. A barely conscious victim who is a so cold that he or she is no longer shivering is severely hypothermic

What to look for:

No shivering
Behavior changing from erratic to apathetic to unresponsive Stiff muscles and uncoordinated movements Weak, slow irregular pulse
Slow breathing
Coma, with dilated pupils (It may be difficult to determine if the victim is dead or alive.)

What to Do:

The leader or most competent in the group must take charge.
Shelter everyone, as well as the victim.
Stop further heat loss. Remove wet or freezing clothing, dress the victim in dry clothes.

Provide heat urgently to victim's trunk

Cover the victim's head with a wool cap to reduce heat loss.

Preventive

To avoid cold injury:

- Wear windproof, water-repellent clothing
- Avoid wetness or handling metal with bare hands
- Avoid tight clothes, boots, and crampons
- Wear gaiters to keep snow out of boots
- Change socks frequently to keep feet dry
- Carry spare dry socks that double as mittens
- Warm feet or hands as soon as they begin to feel cold or loose feeling
- Wear mittens rather then gloves with silk or polypropylene liners
- Watch each other's faces for white patches of frostnip
- Limit the use of alcohol and smoking tobacco. Alcohol causes the blood to cool quickly and tobacco inhibits circulation to extremities.
- Caffeine dilates the blood vessels, which does not allow warm blood to circulate to hands and feet.