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Winter First Aid and Nutrition

Cold Weather Physiology

Your Body and the Cold

When the body becomes chilled, the blood flow to the extremities is reduced by a mechanism called vascular constriction. By reducing the flow of warm blood to those parts of the body most distant from the body's core (and vital organs) the body attempts to maintain its core temperature. In other words, your body will sacrifice the feet and hands for the well being of the vital organs.

While the blood flow to the arms and legs is reduced when the body is chilled, the flow of blood to the head is not because the brain requires oxygen rich blood, and the head has no mechanism for vascular constriction. Therefore a bare head will lose a larger amount of heat (radiant energy) than bare hands or bare feet. The old saying "When your feet are cold, put on your hat," has scientific basis. A neck covering also provides significant benefit as it covers the carotid arteries. These arteries, often used to detect a pulse, are very near the surface of the skin allowing them to be cooled easily if not protected.

The body is its own source of heat, and it is essential you control that heat. You must understand and respond to slight internal temperature differences in order to remain comfortable in extreme conditions. As a defense to the cold, the body shivers to generate heat. You need to provide the body with food, water and oxygen to maintain a steady temperature of 98.6 degrees Fahrenheit.

Types of Body Heat Loss

1. **Radiation** heat loss is the process of emitting or giving off rays of heat from the body's surface. Example: A bare head or other body part in a cold environment.
2. **Conduction** heat loss happens when the body has direct contact with cold objects. Example: Holding metal tools; working and playing in the snow with bare hands or tight gloves; sitting on the snow without an insulation pad.
3. **Convection** heat loss is the transmitting or conveying of heat away from the body's surface by its presence in a cold environment. The body continually tries to maintain a layer of body temperature air next to its surface. Convection is the removal of this warm layer of air or the lessening of the temperature of the layer of air.
4. **Evaporation** heat loss is the process of losing body sweat or insensible moisture (and the heat they contain) to the environment. Wear fabrics that "breathe" so evaporation can take place. Do not let your clothes become wet.
5. **Respiration** heat loss is inhaling cold air and exhaling warm air. There is nothing you can do to prevent this heat loss. Do not attempt to "save" that heat by breathing into your sleeping bag as the moisture in your breath will then add to your evaporation heat loss, and will reduce the effectiveness of your sleeping bag's filling material.



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Cold Weather First Aid

Medical Emergencies

Most medical emergencies that can happen during a summer backpacking outing can also happen during a winter outing, and are not discussed here. Emergencies that are more common during the winter months, or that might require additional consideration are discussed below.

Sunburn

While the sun may not be as intense during the winter than the summer, the reflective effects of the snow can result in an extreme sunburn. Use a sunscreen (SPF 45) on exposed skin, with attention paid to the underside of your chin.

Acute Mountain Sickness

Acute Mountain Sickness (AMS) is caused primarily by a lack of oxygen. Atmospheric pressure is reduced at higher elevations resulting in a decrease in available oxygen. Until the body acclimates to the reduced oxygen levels, AMS is a very real possibility for everyone, including those never before affected. It is estimated that AMS affects 15 to 17 percent of the people who climb to 8,000 feet or higher, but it can occur at lower elevations. Symptoms include headaches, fatigue, shortness of breath, disturbed sleep and sometimes nausea, and vomiting. For mild cases rest may be sufficient, but more severe cases require getting the patient to a lower elevation. AMS is of special concern for snow camping because you could quickly travel to a high elevation and begin heavy exertion almost immediately. Without the time to acclimate, you are very vulnerable, and need to be alert to the symptoms in yourself and in your buddies. There is no absolute method for avoiding AMS, but being fit and hydrated is believed to offer the best benefit.

High-Altitude Pulmonary and Cerebral Edema

If not cared for properly, AMS can lead to high-altitude pulmonary edema where fluid is collected in the lungs. Occurring at elevations as low as 8,000 feet, it is less frequent than AMS, but left unattended can result in death. Symptoms, which include shortness of breath and an irritating cough that produces frothy, blood -tinged sputum usually develop after 36 to 72 hours at elevation.

At elevations as low as 9,000 feet the even more severe condition of high-altitude cerebral edema can occur, where the central nervous system is affected and parts of the brain become waterlogged. Characterized by mental confusion, hallucinations and drunken-like walking, high-altitude cerebral edema often develops within 36 hours after arrival at high altitude. With either condition, afflicted hikers must descend to a lower elevation and should seek medical attention.

Snow Blindness

Cause: Snow blindness is caused by the sun's ultraviolet B rays which are reflected by the snow, and it is severely painful. Thin cloud layers allow the transmission of this wavelength, while filtering out infrared (heat) rays of the sun. Thus, it is possible on a rather cool overcast day to become sunburned or snow blind.

Prevention: Properly approved (ANSI) sunglasses will block 99.8% of the ultraviolet B wavelength.

Signs and Symptoms: Snow blindness is a self limiting affliction. The loss of vision is a result of the victim being unable to open their eyes due to the terrible pain, usually described as feeling like red-hot poker were massaging the eye sockets.

Treatment: Treatment is to rest the eyes with a soft covering over them blocking out all light, and the application of cold packs as needed for pain relief.



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Frost Nip

Frost nip, or light frostbite, can be readily treated in the field if recognized early. When detected, use a chemical hand warmer or cup your hands and breathe upon the affected parts to effect total re-warming. Under identical exposure conditions, some people are more prone to this than others.

Frostbite

Cause: Frostbite is a localized form of hypothermia where the areas of the poorest circulation (the fingers and toes) and the most exposed areas (face and ears) undergo cooling which may lead to tissue freezing and tissue loss. Traditionally, several degrees of frostbite are recognized, but the treatment for all is the same and the actual degree of severity will not be known until after the patient has been treated by a trained medical professional and the amount of damage identified.

Prevention:

- Recognition of early signs and symptoms with frequent checks and warming of areas.
- Proper fitting boots and gloves.
- Dry boots and gloves.
- Face and ear covers.

Signs and Symptoms:

- Sensation of cold in affected area(s).
- Paleness of affected area(s).
- Pain - this may be minimal or absent.
- Whiteness and firmness of tissue, if frozen.

Treatment:

- Terminate exposure. Get warm.
- Rapid re-warming in hot water (about 105 degrees Fahrenheit). When superficial frostbite is suspected, thaw immediately so that it does not become a more serious deep frostbite.
 - Warm the hands by withdrawing them into the parka through the sleeves and putting them into the armpits.
 - Feet should be thawed against a companion or cupped in your own hands in a sleeping bag, or otherwise insulated environment.
 - DO NOT RUB potentially damaged tissue.
- Protect re-warmed tissue to prevent refreezing.
- Maintain hydration.
- Evacuate if there is potential tissue loss.
- Do not re-warm frozen feet if the victim must walk during evacuation.

Hypothermia

Cause: Hypothermia is a decrease in the core temperature of the body. It occurs when the amount of heat being lost to the environment exceeds that being produced by the body. Most hypothermia cases occur when the air temperature is between 30 degrees and 50 degrees F.

Prevention:

- Understand the physiology of the body in cold conditions.
- Be alert to weather changes and changes in your level of exertion.
- Recognize early signs of hypothermia in yourself and others in your group.
- Maintain adequate hydration.
- Eat food high in calories.
- Have proper clothing and layers for changing conditions.



Signs and Symptoms of hypothermia:

The following table provides symptoms as the body freezes.

Body Temp.	Symptoms	Body Temp.	Symptoms
98.6 degrees - 95.0 degrees F	Intense and uncontrolled shivering. Inability to perform complex tasks. Poor coordination. Slowing of pace, fatigue. Squeezed nail stays white for more than 2 seconds	87.8 - 85.2F	Irrational behavior, drifts into stupor, pulse and respirations slowed. Blueness of skin. Dilation of pupils. Weak or irregular pulse.
95.0 - 91.4F	Violent shivering persists. Difficulty in speaking, sluggish thinking, stumbling, poor judgment, amnesia begins to appear.	85.1 - 78.8 F	Unconsciousness; does not respond to spoken word; most reflexes cease to function
91.4 - 87.8F	Shivering decreases; replaced by muscular rigidity and erratic, jerky movements. Thinking not clear, hallucination, incoherence	Below 78.8 F	Failure of cardiac and respiratory control centers in brain; apparent death

Treatment:

- Terminate exposure. Get warm.
- DO NOT ALLOW mild hypothermia to progress to severe hypothermia. Re-warming may be impossible in a wilderness situation.
- Decrease heat loss:
 - Replace wet clothing with dry.
 - Put on more clothing, gloves, hat, wind proof jacket and pants.
 - Get out of the wind and into shelter.
- Build a fire.
- Increase heat production.
 - Exercise muscles (except for Acute Hypothermia).
 - Eat carbohydrates, high caloric foods.
 - Drink warm liquids.
- Make plans for evacuation of the victim.
- If one person falls ill to hypothermia it is very possible other members of the group are also afflicted. Check the condition of all members.

Types of Hypothermia

There are two types of Hypothermia. **Chronic Hypothermia** is the slow onset of hypothermia due to exposure to cold temperatures. **Acute or Immersion Hypothermia** is the rapid onset of hypothermia, often due to immersion in cold water.

Chronic Hypothermia

The slow progression of chronic hypothermia makes it preventable. The most critical aspect to remember is to stay dry. Snow that enters your boots or clothing layers needs to be removed before it has a chance to melt. During periods of heavy exertion clothing needs to be removed to reduce perspiration, then upon stopping replaced to prevent chilling. Keeping yourself properly fueled with food and staying hydrated are also major keys to prevention.



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Acute Hypothermia

In general, anytime the air temperature is less than zero degrees Fahrenheit or immersion in mountain water occurs, conditions favor acute hypothermia. In these conditions, an individual's temperature can be so reduced that it is potentially life threatening. These people may have an almost normal core temperature initially, but one that is destined to drop dramatically as their body equalizes their heat store from their core to their very cold exterior. They should not be allowed to move around as this will increase the blood flow to their cold skin, resulting in a lowering of their core temperature even after removal from the water. They should also not be simply wrapped without any outside sources of heat, as their core may still cool to a lethal level.

The ideal treatment is hospitalization and rapid re-warming by placing the patient in hot water. In the field this will not be possible, so get the victim into a shelter and/or build a fire and huddle the victim with two rescuers wrapped in sleeping bags. It is imperative that outside sources of heat are provided to the victim. Use chemical heat packs from your emergency kit, along with water bottles filled with hot water. Care should be taken not to burn the victim. Wrapping the heat pack and water bottles in a dry sock is a wise precaution. This type of treatment should also be employed for more severe cases of chronic hypothermia.

Nutrition

Energy Requirements

For backpacking and other strenuous activities it is estimated that an individual requires 3,000 to 4,000 calories per day. Winter treks can require another 1,000 calories per day. To put this in perspective, a typical one cup serving of a dehydrated backpacking meal provides about 250 calories. Therefore, you would need about 16 to 24 servings in a day to provide your energy requirements. It is critical that you properly fuel your body to maintain your energy and to stay warm. Eat up. Your diet during summer or winter backpacking should be nutritionally balanced with about 50% carbohydrates, 25% protein, and 25% fats.

Carbohydrates

Carbohydrates are almost pure energy. They come from foods like grains, fruits, nuts and candy. The sugar in dried fruit or candy provides a very quick burst of energy, but is short lived. Grains, such as oatmeal or other cereals are longer lasting. During cold weather continuous stoking up on carbohydrates is important. Experienced outdoorsmen eat their lunch "from breakfast to dinner" to insure a continuous supply of ready energy.

A candy bar might be just what you need to warm you up in the middle of the night, or to get you out of your snow cave at the start of the day.

Protein

Protein is somewhat difficult to digest and does not provide "instant" energy. Proteins are found in meats and dairy products, and also in nuts and legumes. Proteins are necessary for body building and repair and should be consumed in small amounts during the day then concentrated in the evening meal.

Fats

Fats produce energy that is consumed by the body over a comparatively long period. Because the digestion of fats is not easy, foods with fats should be spaced in small quantities throughout the day to prevent overloading the digestive system during periods of high exertion. The largest quantity of fats should be at dinner, with smaller quantities for breakfast. At 9 calories per gram, fat has over twice the energy of proteins or carbohydrates, which have 4 calories per gram.



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A small amount of high fat foods, like nuts, eaten at bedtime will keep your body “stoked” with energy during the cold night. Nuts also contain protein that will aid muscle repair.

Fluids

Fluids are an integral part of your nutrition, and you need to make a special effort to insure you are adequately hydrated. Dehydration results in poor circulation to the extremities causing them to feel cold and possibly freeze. Avoid drinks with caffeine, including some hot chocolates and teas, as they are diuretics. Hot Gatorade, Jell-O, or lemonade are good substitutes. During heavy exertion you should drink about one liter of fluid per hour. Always remember . . . “clear and copious” urine is a very good thing.