

Common Winter Injuries

Introduction

In addition to the typical injuries that can occur when traveling in the backcountry, there are certain other common occurring winter-related injuries that one might face. Among these are cold injuries (chilblains, immersion injuries, frost bite and hypothermia), UV injuries (sunburn and snow blindness), and dehydration. CO poisoning may also occur in confined spaces where combustion heaters are present. Some of these conditions may become severe and even result in death. It is best to take measures to prevent these from happening and if they do occur to treat them as soon as possible to prevent worsening. Having knowledge of signs and symptoms and the using of the buddy system are important means to maintaining your health in the backcountry. The following is a brief synopsis of each

Non-Freezing Injuries

These include chilblains, immersion injuries and hypothermia. Each is described in below

- **Chilblains** (pemio) occurs after prolonged or intermittent exposure to low (non-freezing) temperatures and high humidity.

Symptoms:

An inflammation of the skin characterized initially by pallor then following rewarming by itchy or painful swellings that can lead to open sores if left untreated. It usually appears on the smaller toes, but can also occur on the fingers, face and nose and a pressure bearing area like a bunion. While painful, causes little or no permanent damage.

- **Immersion Injuries** result from prolonged exposure (generally twelve or more hours at 50 – 70 °F water) or less at colder temperatures. Trench foot is the most commonly recognized immersion injury.

Symptoms:

Initial symptoms are a sensation of pins and needles, tingling, or numbness followed by pain. The skin initially appears wet, soggy, white, and shriveled, but with prolonged exposure the skin will take on a red and then a bluish or black discoloration. Feet will become cold, swollen, and have a waxy appearance. Walking becomes difficult and the feet feel heavy and numb. In advanced cases, blisters and open sores appear, which can lead to fungal infections (also known as 'jungle rot'). The nerves and muscles sustain the main damage, but gangrene can occur. If left untreated and in some extreme cases, the flesh dies and it may become necessary to have the foot or leg amputated. If treated properly and quickly, complete recovery is normal, but recovery is marked by severe short-term pain as feeling returns.

Prevention:

The best prevention is to keep your feet and hands dry. Carry extra socks and gloves/mittens with you in a waterproof packet. You can dry wet socks against your torso (back or chest). Wash your feet and put on dry socks daily.

People who have poor circulation, an inadequate diet, or an allergic response to low temperatures may be more vulnerable to these injuries.

- **Hypothermia** is the lowering of the body's core temperature at a rate faster than the body can maintain it at the normal level of 98.6°F. Causes of hypothermia may be general exposure or the sudden wetting of the body by falling into a lake or spraying with fuel or other liquids. Victims

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of hypothermia are often (1) elderly people with inadequate food, clothing, or heating; (2) babies sleeping in cold bedrooms; (3) people who remain outdoors for long periods – field technicians, the homeless, hikers, hunters, etc.; and (4) people who drink alcohol or use illicit drugs. Victims may also include people with predisposing health conditions such as cardiovascular disease, diabetes, and hypertension, people that take certain medication (check with your healthcare provider and ask if any medicines you are taking affect you while working in cold environments), and people in poor physical condition or who have a poor diet.

Symptoms:

The initial symptom of hypothermia is shivering. A continued decrease in the core temperature can lead to progressive deterioration in cerebral, musculoskeletal and cardiac functions. The three degrees of hypothermia defined by core temperature are:

Mild hypothermia is characterized by violent shivering, followed by cessation of muscular activity, disorientation and disinterest in surroundings. Core temperature is between 86.5 - 95°F.

Moderate hypothermia is defined by a core body temperature between 89.59 and 78.8°F. Cardiac irregularities will occur at ~ 86°F with corneal reflexes becoming absent below 82.4°.

Severe hypothermia occurs at core temperatures $\leq 78.79^\circ\text{F}$. Ventricular fibrillation is a serious risk at temperatures below 80.60° and the victim may appear to be dead. However, there have been successful resuscitations of people whose core temperature was 64°, therefore the saying, “No one is dead until s/he is warm and dead.”

Other signs and symptoms of hypothermia include

- Drowsiness or Fatigue
- Uncontrolled Shivering
- Slow, vague or slurred speech
- Clumsy movements
- Irritable, irrational or confused behavior
- Cool bluish skin appearance
- Sleepiness, apathy and indifference
- Slowed pulse and breathing
- Intense cooling of the extremities

Treatment:

- Call for help, do not leave them alone
- Get the victim out of the cold or into an area protected from the elements.
- Treat the victim gently, because rough handling could cause cardiac arrest
- Add insulation such as blankets, newspapers, beneath and around the victim
- Build a fire
- Keep the victim in a flat (horizontal) position.
- If more than an hour from medical assistance, begin to rewarm the entire body, starting with the trunk (core) area first.¹ If there are means available, rewarm the person by first immersing the trunk area only² in warm (100 to 110°F) water is the best treatment.

¹ There are two dangers in treating hypothermia--rewarming too rapidly and "after drop." Rewarming too rapidly can cause the victim to have circulatory problems, resulting in heart failure. "After drop" is the sharp body core temperature drop that occurs when taking the victim from the warm water. Concentrating on warming the core area and stimulating peripheral circulation will lessen the effects of after drop..

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- One of the quickest ways to get heat to the inner core is to administer warm water enemas. Such an action, however, may not be possible in a survival situation.
- Another method is to wrap the victim in a warmed sleeping bag with another person who is already warm. Both should be naked³.
- If the person is conscious, give hot, sweetened fluids. One of the best sources of calories is honey or dextrose; if unavailable, use sugar, cocoa, or a similar soluble sweetener. DO NOT force an unconscious person to drink. Never administer alcoholic beverages.
- **Untreated, Hypothermia can lead to Frost bite and Death.**

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- **Frost bite** is the freezing of the deep layers of the skin and tissue caused by exposure to cold, either through the air or through a chemical exposure, like to dry ice (frozen CO₂) or highly compressed gasses. Under extreme conditions frostbite can happen in seconds. The cheeks, ears and nose are the areas of the body most prone to frostbite. Factors such as wind chill, alcohol consumption, altitude, being wet or damp and length of cold exposure will affect the on set and severity of a frostbite injury. In addition while frostbite injuries can happen to anyone under the right conditions, the elderly, the young, people with circulation disorders, and those from tropical climates have a higher risk factor and individuals who have suffered previous cold injuries are at high risk of frostbite recurring in the same location.

Symptoms:

There are three degrees of frostbite severity:

- *First degree* (frost nip): Numbed skin that has turned white in color and may feel stiff to the touch, but the tissue under is still warm and soft. There is very little chance of blistering, infection or permanent scarring as long as it is treated properly. Frost nip is common in people who live in cold locations or those who spend a lot of time outdoors in the winter
- *Second degree* (superficial) frostbite: The skin will be white or blue and feel hard and frozen, although the tissue underneath is still undamaged. Blistering is likely. This is a serious medical condition that needs to be treated by a trained medical professional in order to prevent severe or permanent injuries from occurring.
- *Third degree* (deep) frostbite: The skin is white, blotchy and/or blue and the tissue underneath is hard and cold to the touch. Blistering will happen. Third degree frostbite is a life threatening injury, which needs to be treated by a trained medical professional. Because the tissue underneath has been damaged, in severe cases amputation may be required to prevent severe infection.

Treatment

- Remove victim to a warm place immediately
- Remove constrictive clothing to improve circulation
- Place dry sterile gauze between affected toes and fingers to keep them dry and from sticking together

² Rewarming the total body in a warm water bath should be done only in a hospital environment because of the increased risk of cardiac arrest and rewarming shock

³ The individual placed in the sleeping bag with victim could also become a hypothermia victim if left in the bag too long.

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- If you are more than an hour from a medical facility, attempt to rewarm the victim, but do not warm the affected parts if there is a chance of them freezing again
- Water used for rewarming should be between 102 and 106°F. Rewarming usually takes 20 – 40 minutes. Never rub or massage the affected area. Do not rub with ice or snow.
- Once normal feeling, movement and skin color is maintained, dry and wrap affected area.
- Expect swelling, blistering and tenderness

What can be done to avoid frostbite and hypothermia?

- Recognize the environmental (field location) conditions that could lead to cold-induced illnesses and injuries.
- Know the signs and symptoms and what to do if someone is affected.
- Educate everyone on the project about cold-induced illnesses and injuries.
- Select clothing to protect against cold, wet, and windy conditions. Remember, cold injury may be exacerbated by damp/sweaty clothing, especially cotton which absorbs the wetness, keeping it close to the body.
- Carry extra clothing to change into should you become wet.
- Layer clothing in order to be able to adjust to changing environmental temperatures.
- Wear a hat and gloves, in addition to underwear that will keep water away from the skin (polypropylene).
- Take frequent short breaks in warm dry shelters to allow the body to warm up. Avoid exhaustion or fatigue because energy is needed to keep muscles warm.
- Perform work during the warmest part of the day.
- Use the buddy system
- Drink warm, sweet beverages (sugar water, sports-type drinks). Avoid drinks with caffeine (coffee, tea, or hot chocolate) or alcohol.
- Eat warm, high-calorie foods like hot pasta dishes.

Slips on Ice and Snow

Walking on snow or ice is especially treacherous, therefore selecting and wearing proper footwear is essential. A pair of well insulated boots with good rubber treads is a must for walking during or after a winter storm. Keeping a pair of rubber over-shoes with good treads which fit over your street shoes is a good idea during the winter months. Take short steps and walk at a slower pace in order to react quickly to a change of traction. Special equipment, such as skis, snowshoes or crampons may be necessary in order to more safely negotiate the snow pack and/or ice. Strap on ice spikes or shoe chains have limited applicability, but may be useful in certain situations. Proper winter footwear should be noted on the project hazard assessment and mitigation plan (HAMP).

Another winter hazard associated with ice is falling through to the water below. See http://www.dri.edu/images/stories/editors/ehs/ehsdocs/Field_Operations_on_Ice_2006.pdf for more information.

Sunburn

With each 1,000 feet of altitude gain, UV intensity increases by 5%. The burning effect of UV radiation is compounded by the reflection off snow or ice covered areas, therefore exposed skin can become sunburned even when the air temperature is below freezing. The skin of the lips, nostrils, and eyelids is especially sensitive to UV exposure as are the eyes (the later effect can result in snow blindness). It is important to liberally apply sunscreen with at least an SPF of 30 to all areas of exposed skin and to protect the eyes with sunglasses or goggles. Prolonged exposure to UV can result in permanent eye damage. It is not recommended to use sunscreen above the eyes as it may run into the eyes if you sweat. Instead, wear a UV proof hat with a wide brim to protect the forehead.

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Symptoms:

The symptoms of sunburn are well recognized, but may not occur until hours after the over-exposure. Reddening of the skin, followed by elevated skin temperature and irritation are signs of mild sunburn. Sufficient exposure can result in a very painful burn. The peak effects generally occur 12-24 hours after the over exposure.

If blisters appear, this presents a more serious burn, and if untreated massive fluid loss (dehydration), electrolyte imbalance, and infection can occur. Severe sunburn can cause shock and even death if enough of the skin is affected and it is left untreated.

Other common symptoms include:

- Chills
- Fever
- Nausea or vomiting or both
- Flu like symptoms
- Blistering (a very fine blister not immediately noticeable to very large water-filled blisters with red, tender, raw skin underneath)
- Skin loss 4-7 days after initial burn

The symptoms of snow blindness manifest as a sensation of sand in the eyes, pain that increases with eyeball movement, red and teary eyes, and a headache that intensifies with continued exposure to light. Like any sunburn, these effects don't appear until hours after exposure.

Prevention:

Prevention of sunburned skin is best achieved by wearing long sleeved shirts, long pants, a wide brimmed hat and applying sunscreen of at least 30 SPF liberally and frequently to exposed skin. Prevention of snow blindness can be achieved by wearing wraparound sunglasses or glacier glasses, which have darker lenses, greater visible light filtration, and side covers. Both these preventative actions should be taken even in overcast conditions. If you lose your glasses, emergency "goggles" can be fabricated by cutting two horizontal slits in a piece of duct tape folded back onto itself to form a mask. Alternately cut slits in a piece of cardboard, thin wood, tree bark, or other available material. Putting soot or 'eyeblick' under your eyes will help reduce shine and glare.

Treatment:

Relief of the discomfort with medications such as aspirin, ibuprofen, and naproxen are useful, especially when started early.

For mild sunburn

- Apply cool compresses with equal parts of milk and water. (You may also use cold compresses with Burrow solution, available from drugstores.) Gently wring out the cloth and apply to the sunburned area for 15-20 minutes. Change or refresh the cloth and solution every 2-3 hours.
- Commercially available aloe-based lotions may help.
- Cool (not ice cold) baths may help. Avoid additives to bath water such as bubble bath because these products may produce sensitivity reactions. Avoid scrubbing the skin or shaving the skin. Use soft towels to gently dry yourself. Don't rub. Use a light, fragrance-free skin moisturizer.
- Avoid lotions that contain topical anesthetic medications due to the high incidence of sensitization/allergies to the active ingredient.

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- Stay out of the sun while you are sunburned.
- Drink plenty of non-alcoholic fluids.

For blistering (severe) sunburn seek immediate medical attention. Symptoms of severe pain, severe blistering, headache (not managed by over the counter analgesics), confusion, severe nausea or vomiting, fainting or an acute problem with another medical condition warrant professional medical assessment and treatment.

For snow blindness

- Remove contact lenses and avoid rubbing your eyes.
- Apply cool, wet compresses to help ease the burn, or take an oral pain medication like ibuprofen.
- Cover both eyes with half-inch-thick pads of soft cloth or gauze bandages to protect them from light and prevent irritation from eyelid movement.
- Check the injury at half-day intervals. When you can keep your eyes open comfortably, remove the dressing. Wear sunglasses whenever you are outside until your symptoms disappear completely.
- It's best to let your eyes heal before continuing your trip, but if conditions won't allow for extra days, your hiking partner should lead you slowly down the trail.

Dehydration

Even during cold weather you are losing body moisture. In addition, exposure to the cold increases urine output (cold diuresis). You must drink water to replace this loss of fluid.

Symptoms:

Thirst is not a good indicator of dehydration. If you are thirsty it is too late. Drink plenty of water before you leave for your field trip and keep consuming it throughout the field project. One way to determine dehydration in the winter is to check the color of your urine on snow. If your urine makes the snow dark yellow, you are becoming dehydrated and need to replace body fluids. If it makes the snow light yellow to no color, your body fluids have a more normal balance.

Prevention:

Stay hydrated. Drink plenty of non-alcoholic beverages, during waking hours even if not thirsty. Because caffeine is a diuretic, limit consumption of caffeinated beverages before and during an extended field trip.

Treatment:

Drinking fluids is usually sufficient for mild dehydration. Drinking smaller amounts over a longer period of time is better than downing a large amount of fluid at one time. Electrolyte solutions, available at pharmacies, can be useful. Sport drinks contain a lot of sugar and should not be the only replacement fluid. For moderate to severe dehydration, IV fluid replacement and hospitalization may be required.

Carbon Monoxide (CO) Poisoning

CO poisoning can easily occur when using propane heaters, gasoline generators, when stranded in a car or when letting your vehicle warm up in garage or other confined space. It is also possible to generate dangerous CO levels when using charcoal or wood fires to heat or cook in an area with poor ventilation.

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Symptoms:

Initially there is usually a feeling of tightness across the forehead, followed by a headache and pounding heart. As CO poisoning progresses, the victim's face becomes extremely red. Weariness, dizziness, and mental changes may also occur. If the carbon monoxide concentrations are high, the victim may pass out before feeling any symptoms.

If the victim was severely exposed to carbon monoxide, symptoms may occur days to weeks later, even if the victim seems to have fully recovered from the initial exposure. Delayed symptoms may include blurry vision or loss of sight, dizziness, profound emotional changes and even mental changes (depression).

Prevention:

To guard against carbon monoxide poisoning ensure the following:

- Never sit in vehicles for long periods with the engine running and windows closed.
- Never sleep in or near vehicles with the engine running.
- Never operate engines in a closed garage without exhaust ventilation.
- Check to be sure there are no leaks in your vehicle exhaust system.
- Avoid the use of **unvented heaters** and charcoal grills in closed areas. Avoid lodging in a room or house heated by charcoal.
- If in doubt as to the heating system, open a window for ventilation.
- Avoid sleeping directly on the floor.
- Make sure heaters are set at the proper combustion ratio and heating system is leak free.
- Ensure points of ventilation in wilderness survival shelters (such as snow caves) are properly placed in relationship to the heat source and kept open

Treatment:

- Remove victim from contaminated area into fresh air. Loosen clothing.
- Give artificial respiration or CPR, as appropriate.
- If oxygen is available, give it to the victim by using a face mask.
- Seek medical attention immediately.
- Keep victim resting.