

# FACT SHEET



FS No. 12-004-0621

## COLD WEATHER INJURIES

### What are Cold Weather Injuries (CWIs)?

Cold weather injuries (CWIs) occur when there is an imbalance of body temperature regulation, or where heat loss is greater than heat production in an area of the body (or the body core). There are four primary types of cold injuries: hypothermia, frostbite, nonfreezing cold injuries, and injuries related to cold exposure. **Tables 1-4** provide details on these injuries.<sup>1</sup>

### Why are CWIs a concern for the Army?

Soldiers have an increased likelihood to be exposed to cold weather during various Army training and operational activities in colder and/or wet climates. CWIs are preventable, yet if early signs and symptoms go unrecognized or preventive measures are not taken, these injuries can have immediate impacts to both individual health and mission success. In addition, having a CWI makes a person more susceptible to future cold injury, leading to future personal limitations and reduced force strength.



DVIDS-6541480, U.S. Army  
Photo by Scott T. Sturkol

### What factors increase risk of a CWI?

Military surveillance data finds that rates of cold injuries are higher among African Americans, women, Service members under 20 years, and the enlisted population, especially those recently acclimated to warmer climates.<sup>2</sup> However, anyone can become a CWI casualty in the right conditions. Additional risk factors are discussed below.<sup>1-7</sup>

#### ✦ **Prior cold injury or medical conditions**

Persons who have had a cold injury in the past, or who have certain existing medical conditions, are much more likely to develop a CWI within a shorter period of time. These risk factors also lead to more severe CWIs. For example, Raynaud's Disease is a disorder that causes blood vessel constriction in cold temperatures, resulting in reduced blood flow to the extremities (e.g., fingers and toes).<sup>6</sup> Conditions such as anemia, diabetes, sickle cell disease, hypotension, and atherosclerosis may also increase susceptibility to frostbite and other CWIs.<sup>1</sup> Leaders and Soldiers need to be aware of persons with these conditions.

#### ✦ **Medications**

Some medications impair blood vessel constriction increasing risk of CWI. These include but are not limited to benzodiazepines, tricyclic antidepressants, barbiturates, and general anesthetics.<sup>1,4,5</sup> Soldiers on these medications should let leaders and battle-buddies know if their medication puts them at increased risk.

#### ✦ **Alcohol and nicotine**

Alcohol imparts a sense of warmth, causes dilation of skin blood vessels, and increases heat loss to the environment. It may also impair the senses and judgment, making it difficult for a Soldier to detect signs and symptoms of a CWI. Tobacco use (through smoking or chewing) causes increased constriction of skin blood vessels, which increases the risk for frostbite.<sup>1,4,5</sup>

#### ✦ **Over- and Under-Activity**

Vigorous exercise/activity induces sweating, which leads to wet clothing and subsequent increased heat loss. Conversely, under-activity results in low heat production, which may lower the body's core temperature.<sup>1,4,5</sup>

#### ✦ **Tight clothing**

Close-fitting clothing reduces insulation and may restrict movement, resulting in heat loss. Clothing should be worn loosely and layered to allow adjustments as physical activity levels and environmental conditions change.<sup>1,4,5</sup>

#### ✦ **Dehydration**

Inadequate fluid intake affects the body's ability to sustain physical activity, which affects thermoregulation (i.e., the balance between heat production and loss). In cold environments, sensitivity to thirst declines, which can increase the risk of dehydration during strenuous activity, where fluid loss often exceeds intake.<sup>1,4,5</sup>

#### ✦ **Inadequate nutrition**

Underfeeding can cause low blood sugar (hypoglycemia), which impairs shivering; thus making it difficult to generate body heat. Low carbohydrates stores also limit the ability to maintain physical activity.

### How can CWIs be prevented?

Prevention begins with being aware of specific risk factors and actions for types of injuries (see next page). Leaders should be aware of personnel who have unique risk factors such as medical conditions or medications. Soldiers should inform leaders as well as their battle-buddies if they have any unique risks. Increase resilience to cold weather challenges by consuming a healthy diet, drinking plenty of fluids, maintaining fitness levels, and getting quality sleep each night. Dressing properly in a way to easily adjust (layers), and balancing the time and amount of activity spent in cold weather conditions will reduce risks.<sup>1,3,4,5</sup> Use the following list and monitor each other in the field to help prevent CWIs.

#### Clothing

- ❖ Wear uniform properly (layers worn loosely).
- ❖ Keep socks and clothes dry; use sock liners and foot powder.
- ❖ Remember the acronym **C-O-L-D**—
  - Keep it **CLEAN**.
  - Avoid **OVERHEATING**.
  - Wear clothing **LOOSE** and in **LAYERS**.
  - Keep clothing **DRY**.

#### Eyes

- ❖ Do not wait for signs of discomfort.
- ❖ Wear dark UV protective glasses.

#### Skin

- ❖ Keep your skin clean, covered, and dry.
- ❖ Use sunscreen and lip balm.
- ❖ Use gloves to handle all equipment and fuel products.
- ❖ Do not use face camouflage at temperatures below 32°F.

#### Hydration

- ❖ Drink warm liquids.
- ❖ Monitor urine color of first morning void.

#### Environment

- ❖ Use warming tents when needed.
- ❖ Monitor conditions, especially the wind chill index.
- ❖ Use anti-slip shoe gear if outside extensively.

**Table 1. Hypothermia**

A condition of abnormally low core body temperature (below 95°F); occurs when cold conditions are severe, windy, clothing is wet, or during periods of inactivity; may also occur in warm climates during extended water exposure or immersion.

- **Symptoms:** Initial stages: shivering, dizziness, irritability, confusion, slurred speech, stumbling. Severe stages: stops shivering, desire to lie down/sleep, faint heartbeat and breathing, unconsciousness.
- **Treatment:** Prevent further cold exposure; drink warm, sweet liquids if conscious; rewarm with body-to-body contact or in warmed sleeping bag; give CPR (if needed); evacuate immediately (if severe).

**Table 2. Frostbite**

Freezing or crystallization of tissues; exposure time can be minutes or instantaneous if skin is exposed to extreme cold or high winds; the extremities (fingers, toes, ears, nose) are affected first.



Photo from TB MED 508, 2005

- **Symptoms:** Skin feels cold, stiff, or woody; turns to gray or waxy-white color; numbness, tingling, or stinging sensation; blisters; absent/restricted joint movement; discoloration similar to superficial frostbite; hard underlying tissue; purple or blackened skin.
- **Treatment:** Remove from cold and prevent further heat loss; remove constricting clothing and jewelry; rewarm affected area evenly with body heat until pain returns; do not rewarm if injury could refreeze during evacuation or victim must walk for treatment; do not massage affected area or rub with snow; evacuate for medical treatment.

**Table 3. Nonfreezing cold injuries**

**Chilblains:**

A condition that occurs in cold, wet conditions due to prolonged exposure of bare skin; commonly affected areas include ears, nose, fingers, and toes.

- **Symptoms:** Skin is initially pale and colorless; worsens to achy sensation then numbness; becomes red, swollen, hot, itchy, and tender upon rewarming; blistering occurs in severe cases.
- **Treatment:** Prevent further exposure; wash and dry area gently; rewarm with body heat; do not rub or massage; use dry sterile dressing; seek medical aid.

**Trench/Immersion Foot:**

Results from prolonged exposure to water at temperatures below 50°F; high risk during wet weather, wet areas, or when sweat accumulates in boots or gloves.



Photo from TB MED 508, 2005

- **Symptoms:** Skin initially appears wet, white, and shriveled; sensations of pins and needles, tingling, numbness, and then pain; discoloration (red, bluish, or black); becomes cold, swollen, and waxy; may develop blisters, open weeping, or bleeding; flesh dies in extreme cases.
- **Prevention:** Keep feet dry; change socks and apply foot powder at least every 8 hours or whenever wet; do not use blousing bands; bring extra boots to the field.

**Table 4. Other conditions and injuries related to cold exposure**

**Dehydration:**

While not an injury per se, an excessive loss of body fluids can slow or prevent normal body functions; this may increase chances of frostbite and hypothermia.

- **Symptoms:** Dark urine, irritability, dry mouth/tongue/throat, increased heartbeat, dizziness, stomach cramping or vomiting, mental sluggishness, unconsciousness.
- **Treatment:** Drink water or warm liquids\*; rest; do not eat snow. \*Even warm coffee is good – the amount of diuresis caused by the caffeine is less than the amount of fluid consumed; therefore, these drinks are not excessively “dehydrating.”<sup>9-10</sup>

**Sunburn:**

Burning of the skin due to overexposure to sun/ UV light; in high altitude, the thinner air allows more of the sun’s rays to penetrate the atmosphere and reflect light off the snow.

- **Symptoms:** Chills, fever, redness, slight swelling (1<sup>st</sup> degree), pain, and blistering (2<sup>nd</sup> degree).
- **Treatment:** Apply soothing skin creams (mild cases); seek medical attention (severe cases); take aspirin for pain.

**Carbon Monoxide Poisoning:**

Occurs when oxygen in the body is replaced by carbon monoxide; a colorless, odorless gas that can build from inadequate ventilation from engines, stoves, and heaters.

- **Symptoms:** Drowsiness, headaches, ringing in ears, bright red lips/eyelids, nausea, unconsciousness, possibly death.
- **Treatment:** Move to fresh air immediately; provide mouth-to-mouth resuscitation if victim is not breathing; seek medical aid promptly.

**Snow Blindness:**

Inflammation and sensitivity of eyes caused by overexposure to UV rays of sun reflected by snow or ice.

- **Symptoms:** Gritty feeling in eyes, redness and tearing, pain during eye movement, headache.
- **Treatment:** Remove from sunlight; blindfold eyes/cover with cool, wet bandages; seek medical attention.

**Slips, Trips, and Falls:**

The presence of ice and snow has been shown to significantly increase likelihood of fall injuries, which most often include fractures and sprains/strains to lower extremities (ankles, feet, legs) as well as wrists and arms.

- **Symptoms:** After a fall (contact with ground or an object) or even a near fall resulting in a twist—pain may be sharp and immediate (acute), or pain, soreness, and/or swelling (e.g., to ankle, wrist) can increase within hours or up to 1-2 days after incident.
- **Treatment:** Seek medical advice for pain limiting movement.

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**More:** Medical Aspects of Harsh Environments, Volume 1 (2001): <https://www.medcoe.army.mil/borden-tb-med-aspects-harsh-environ-vol1>