



Patient Information

Fending Off Frostbite

Your body works constantly to regulate its core temperature. In cold weather, the blood vessels constrict, or become narrow, which reduces the flow of blood to your extremities, nose, and ears and conserves heat for the vital organs. This process, called *vasoconstriction* (vay-zo-kun-**strick**-shun), works well to keep the inner organs warm and functioning. But if you don't get out of the cold quickly, your outermost body parts may begin to freeze, causing tissue to be injured or to die—a condition known as frostbite.

Frostbite occurs after skin exposure to temperatures below 28° F. This process can take minutes or hours, depending on how cold it is and how long you're exposed. Frostbite can result in long-term nerve damage, muscle weakness, arthritis, fallen arches, or stiff toes. Persistent blisters or calluses, excessive sweating, and faulty nail growth also are experienced commonly after frostbite. Scarred tissue may even be predisposed to cancer.

While military personnel and cold weather sports participants make up the majority of frostbite cases, everyone should take care in cold weather.

How do I know if I'm at risk?

Elders, young children, and blacks seem to face a higher risk of frostbite—as do adults who are thin or frail, inactive, or malnourished.

Drinking caffeinated beverages or smoking narrows blood vessels, further restricting blood flow to the extremities. Although alcohol causes blood vessels to open wider, creating a temporary feeling of warmth, this actually increases the body's heat loss. Alcohol also may impair judgment, making it hard to recognize and act on the early symptoms of frostbite. A poor diet, inadequate fluid intake, and exhaustion also can slow reaction time as well as reduce blood flow and limit the body's ability to produce heat.

Your risk of frostbite rises if you are at a high altitude, under stress, in high winds, immersed in water, or wearing clothing that's wet or tight—or if you have a medical condition such as diabetes, hypothyroidism, arteriosclerosis, Alzheimer's disease, or a previous burn or cold injury.

What are the warning signs?

The signs of frostbite vary, depending on how badly the tissue is injured. If after exposure to cold your skin starts to itch, burn, or redden and then becomes firm, white or bluish, and numb, suspect frostbite and call 911 or go to the nearest hospital emergency department.

The frostbitten area may peel or blister anywhere from four hours to six days after injury. If the blisters fill with blood, the frostbite is likely severe—meaning that not only skin but also muscles, tendons, blood vessels, nerves, and even bone may have



been injured. In such cases, the area may feel hard or “wooden” or be immobile, the skin may turn deep purple or red, and gangrene—soft tissue death—may result. When gangrene occurs, a hard, black layer forms over healthy tissue, and muscle function may be diminished or permanently lost. It may be necessary to remove dead skin surgically or to amputate.

What tests do I need?

While frostbite is diagnosed primarily by the way it looks, your doctor may perform tests to check your circulation. These include microwave *thermography* (ther-mog-ruh-fee), a laser Doppler flow meter, and *angiography* (an-gee-ahg-ruh-fee).

How can I avoid the problem?

Being prepared for cold weather is the best way to prevent frostbite. When with a group, use the buddy system, regularly checking each other for signs of frostbite. If alone, do frequent self checks. Wear several layers of warm, loose fitting clothing. Protect your ears, face, hands, and feet against wind and moisture. Keep gloves, mittens, and socks as dry as possible, and change them frequently in wet, cold weather. Wear insulated boots that fit properly. Eat and drink frequently, avoiding alcohol and caffeine, so your body can keep producing heat. Be alert for itching, burning, or numbing sensations throughout your body. Warming body surfaces as they start to freeze may prevent permanent damage.

How is it treated?

The goal of frostbite treatment is to restore circulation and minimize tissue damage

through cautious rewarming. Frostnip (the partial freezing of the skin's outer layers) might be treated by cupping a warm hand over a frostnipped ear or nose or by placing a frostnipped hand beneath the armpit. But in cases of true frostbite, improper rewarming is more likely to cause than to prevent further tissue damage. If professional emergency aid isn't available—or if refreezing could occur—don't thaw out the frozen extremity. Instead, gently clean and dry it, and wrap it in sterile gauze until it can be thawed safely.

During rewarming, the frostbitten area is immersed for 25 to 40 minutes in water that's between 104° F and 108° F. Since frostbite may damage nerves or cause numbness, it's important to test the water's temperature before immersion.

Avoid dry heat sources, such as fires or heaters, and such folk remedies as massaging the affected area or packing it in snow. You'll know the area is thawed when it's pliable and its color and sensation have returned.

Leave blisters intact to prevent infection. Keep the previously frostbitten area clean, dry, and warm, and elevate it to prevent swelling. Avoid putting any kind of pressure on the area.

Antibiotics may be prescribed to prevent infection. A tetanus vaccine or booster shot may be administered. After rewarming, the affected area may swell or ache. This pain often is relieved by over-the-counter medicine. When surgery is considered, it may be delayed for months to allow the hardened black layer of dead tissue to shed so that skin may be evaluated. ●