Riku* hadn’t felt his toes for days. His experience climbing in the Japanese Alps had made him feel well prepared for the rigors of Denali, but when a fierce storm pinned his party down for several days above 14,000 feet, he began to doubt if anyone could be ready for such a challenging environment.

The Alaskan wind ripped by at over 130 kilometers per hour (80 mph). The temperature stayed well below zero. Food and fuel dwindled, and then they ran out altogether. The whiteout and wind lasted for six days before they relented and permitted his retreat down the mountain.

Everyone in the party was cold, dehydrated and hungry, and everyone felt lucky to be alive. When Riku arrived at 14,000 Camp, a park service nurse examined his feet and saw that his toes were covered by dark purple bruises. They felt cold to the touch, and they were completely numb. Riku had frostbite.

As we teach at the Wilderness Medicine Institute (WMI) of NOLS, frostbite is, very simply, the freezing of body tissues. Our bodies circulate blood to keep warm and, when we get cold, we shunt warm blood away from our extremities and toward our vital organs in our cores. That’s why frostbite presents most commonly in fingers and toes: They are tiny peninsulas with very little blood flow to prevent freezing. Wearing poor (or no) gloves and tight or uninsulated boots only makes the situation worse.

Superficial frostbite looks dull and waxy, and it feels numb and tingly. Only the surface tissue, the epidermis, is frozen.

The best things you can do are to rapidly warm the frozen skin and then prevent it from refreezing. Put frostbitten fingertips under your armpits, or under your friend’s armpits, and they should thaw within minutes. For numb and tingly toes, strip off your boots and socks and place the naked soles of your feet up against your friend’s exposed abdomen. Never rub frozen tissues! Within 10 minutes, if your fingers and toes feel warm and normal, you can be confident that you experienced only mild frostbite. You should heal well and without complication.

Deep frostbite is another story altogether. When deeper tissues are frozen, healing becomes difficult or impossible. Deep frostbite may present in darker colors, like purple or even black. Damage occurs to dermal structures and perhaps muscle, fat and bone.

Deep frostbite’s healing greatly depends on 2 things: Your speed at getting to a hospital, and your speed of rewarming. Both should be as fast as possible. Rewarming should be accomplished by a circulating warm water bath at 99-102 degrees, which is difficult at best if you’re camping or hiking.

Be aware that thawing deep frostbite will result in incredible pain, as well as possible swelling and blistering. Ibuprofen should be given to help manage the inflammation, and aloe vera gel will help protect and heal sensitive thawed skin as you travel to the hospital. Again, never rub frostbitten tissue! Hospital treatment within 24 hours is critical, and even that cannot save some frozen limbs. Amputation may be required for severely frostbitten tissue.

In the end, Riku was lucky. His frostbite was not severe enough to warrant a heli-evac off the mountain, and he skied and walked down to 7,000 Camp before flying back to Talkeetna on a ski plane. Even though his frostbite showed dark colors, his injury was mild and he recovered without losing any of his toes.

Cold-weather outdoor activities, especially mountaineering, demand adequate preparation and skill. Choose appropriate equipment to keep warm for whatever you plan to do, stay found, and bring enough food and water so that you can keep your body core warm the whole time.

Riku may have prepared well for his climb, but mountain weather can destroy even the soundest of plans. Remember as a guideline: a warm body core plus good boots and gloves equals protection from frostbite.
Interested in expanding your outdoor education? Look for WMI wilderness first aid classes (some are offered at REI stores) in your area.

*The name has been changed to protect the privacy of this person.*

Above: Blisters like this can occur after re-warming a deep frostbite injury. The blisters indicate some damage below the epidermis, but the tissues are not completely dead.

Above: Fingertips that remain dark and unblistered after thawing are probably irreversibly damaged. Some amputation is likely.