

The physiology of frozen fingers

It was so cold that the trunks of living trees outside of our tents popped in the deepening cold of that December night.

Not as loud as a fire-cracker, but almost.

It was a few years ago, and three of us were camped in unheated tents a bit below timberline, while the toes were staying numb from that afternoon's skiing in with backpacks.

What could possibly be the logic for putting oneself into that environment, a week away from the shortest day of the year? (That honest question will be addressed later.)

To prevent such injury, what simple steps can be taken by skiers, snowboarders, snowmobilers, and other winter users? And as importantly, what does current medical research advise for field treatment of cold-related injured tissues?

It so happens that in December of 2019, the Wilderness Medical Society published their updated "Practice Guidelines for the Prevention and Treatment of Frostbite" (Guidelines). These also apply to the milder preliminary stage, termed frostnip.

Who may benefit from this information? Anyone may, from a family who is heading to Cerro Summit for an afternoon of sledding, to a few cross-country skiers steering for the top of Grand Mesa, to the many backcountry skiers around here who love a six or eight hour day on climbing skins in the San Juan mountains.

These published Guidelines have good advice beyond the basics of good clothing, layering, face mask in case of wind, and a windproof shell.

The prevention includes, of course, three often-overlooked steps. The first is: maintaining tissue blood flow. This can be promoted by routinely carrying a small insulated drink container of very hot water or tea. This should be saved until the end of a day's ski outing, in case emergency need develops.

Staying adequately hydrated with water that's not on the edge of freezing is important. A lightweight insulated soft cover for your water quart bottle can



Outdoors

By John T. Unger

keep your body from having to waste some of its heat during the warming of swallowed water.

The same is true for keeping that apple close to your trunk, so as to not have to bite into a cold, almost frozen lunch.

Avoiding the consumption of alcohol while in the cold environment will prevent the skin's vessels from expanding and

thereby losing core body heat to the surroundings. Also, avoid constrictive (too tight) ski boots, because they can prevent the heat-carrying blood from getting to the tips of the toes. Are the children having to wear hand-me-down boots that might be too tight?

The second of these three published prevention steps is: exercise. Rather than repetitive rides on a snowmachine to the top of the sledding hill, the grown-up may walk up to the top with the kids, pulling the sled.

The third step here is: protection from cold. Not just the smart move of having spare vermiculite hand-warmer packets (carrying more than you think you will need), but also a behavior-based technique is advised. That involves being sure to keep an eye on each other for any visual sign of whitened skin patch on the face or neck, or for evidence that digits are becoming numb. These two signs represent the very margin of developing frostbite.

So much for the "prevention" part of the new Guidelines. Next are some of the field treatments of frostbite, for a person who is over two hours away from professional care. That two hours can result from unpredicted high wind and snowstorm that complicates the return to the vehicle by chilling gloved fingers much more rapidly and by obscuring the planned trail of return.

If frostbite has occurred, the treatment involves first treating any hypothermia or serious trauma, then removing jewelry (such as a ring) from the involved digit. If there is no danger of refreezing the involved toe or finger on the trip back out, rapid rewarming can be done if a cabin or hut is available along the trail.

Rewarming in water for thirty minutes may be necessary; this should be done



Last Saturday afternoon above 12,000 feet elevation, a backcountry skier's shadow reveals that they removed their glove to pull off the climbing skin from the ski, so as to ski back downhill. (Special to the Montrose Daily Press/John T. Unger)

until the area becomes soft and pliable to the touch. Such water should be tested so as to not be hotter than the helper's hand can tolerate in a thirty second test.

Read the guidelines for recommendations on ibuprofen use at this stage. Interestingly, the Guidelines also advise topical aloe vera cream or gel, and of course elevating the affected limb if possible. Again, hydrating the person at this time is necessary.

Now it is time to address the aforementioned question of the "why" of purposefully spending days or nights outdoors in winter backcountry. Around here there

are more than a few hunters, mountain climbers, and snowsport adventurers who understand the reason which follows: such an outing offers 360 degree views of trackless mountain beauty. Plus camaraderie and a bit of adventure.

Even with the cold toes and fingers. *John T. Unger is a Diplomat of the American Chiropractic Board of Sports Physicians, with over twenty-five years of caring for families and athletes in Montrose. He still enjoys winter camping, though now using better preparation than in years past. Ideas for future columns are welcomed at sportsdocunger.com.*

Frostbite, frostnip and cold hands

I was outside throwing snowballs at passing cars when my grandmother started yelling at me to come inside. At first, I thought the reason I was in trouble was because of what I was doing, but I soon found out otherwise. You see, I had not yet developed my pitching arm, and even the passing cars, had no idea I was throwing at them.

"You are going to get frostbite on your fingers, making snowballs without any gloves. Land sakes boy, use the sense God gave you," she scolded.

To prove her point as to just how quickly exposed skin freezes when temperatures are below zero, she made a scientific demonstration. Grandma filled a pan with hot water and stepped outside on the concrete steps leading to the door. She tossed the hot water into the air and let it drop to the concrete.

The water did not freeze in mid-air, but did instantly turn to ice on the steps. It was a pretty impressive lesson for a kid, to see how fast hot water can turn into ice, and I never forgot it. I guess I forgot it once, because in later years I did get frostbite on my fingertips during a hunting trip, but since then, I have tried to remember the lesson.

Frostbite is most common on the ears, toes, fingers, nose and chin. Because it starts with numbness, you may fail to notice it coming on. In most instances, someone with you will notice the symptoms on you long before you notice.

Frostnip is the first stage of frostbite. The skin will be pale or red and become numb. Frostnip is most common on the cheeks, ears and nose. The victim may begin to feel a prickling sensation in the affected areas.

During frostnip, the skin is still pliable. This is the major difference between the nip and the bite; the skin is not yet frozen. If you gently rewarm the affected areas, there will be no permanent damage to the tissue. Frostnip serves as a warning that things are about to get worse if the problem is not addressed.

What comes next is frostbite, which is



Tips from the Posse

By Mark Rackay

divided into two categories, superficial and severe or deep. Each of these is divided into 2 degrees, but to determine which degree often requires imaging in a hospital. For our purposes, we will just use superficial and severe.

The next stage is called superficial frostbite. This is when the reddened skin begins to turn white, yellow, or pale. While the

skin may still feel soft, some ice crystals are actually beginning to form in the tissue. The skin may feel warm, which is a warning sign of a serious condition. Warming the skin at this stage may make it appear mottled, blue or purple. A blister, with a milky fluid usually appears 24 hours after rewarming the skin.

The final stage is called severe or deep frostbite. This occurs when all the layers of the skin are affected. You may experience numbness and lose all sensation of cold, pain or discomfort in the affected area. Your joints and muscles may no longer function. Large, blood-filled blisters will form 24 hours after rewarming. Afterward, the area will turn black, hard, and mummify as the tissue dies. This will take somewhere between 20 and 45 days.

A person may have multiple — or all — of the types of frostbite on different areas of the body. Careful medical attention, and field care is important to preserve as much tissue as possible.

If you suspect you are experiencing superficial frostbite, protect your skin from further exposure. Never rub the affected area and never rub snow on frostbitten skin. Get out of the cold and remove wet clothing as soon as possible. In the field, place a warm body part against the frostbitten area. Protect that area from refreezing.

Severe or deep frostbite requires a more active rewarming. Soak hands or feet in warm water, between 98 and 108 degrees F. Never use direct heat such as a stove, heat lamp, fireplace or heat pad. Do not walk on frostbitten feet or toes, as this will further damage the skin.

If there is any danger of refreezing the affected area, especially in multi-day excursions, do not rewarm. It is better to walk on frozen feet than to allow them to refreeze. And above all else, get medical attention as quickly as possible. Also watch for fever or any new or unexplained symptoms.

Be aware of the possibility of hypothermia, a condition where your body loses heat faster than it can be produced. This can rapidly become a life-threatening situation. Some symptoms of hypothermia can include intense or uncontrolled shivering, slurred speech, drowsiness and loss of coordination.

It is much better to prevent frostbite rather than to have to treat it. Try not to wear clothing that is not appropriate for the conditions. Clothes that are too tight or do not protect against getting wet should be avoided. It is probably a good idea to not make snowballs with bare hands.

You also don't want to stay outside too long. The risk increases substantially when the temperature falls below 5 degrees F, or when there is even a light wind at low temperatures. Frostbite can occur on exposed skin in as little as 30 minutes in a wind chill of minus 15 degrees. You should also avoid touching

ice, cold packs or metal with exposed skin.

I learned a couple lessons on that cold winter evening from my grandmother, but the real lesson came later, when my grandfather got home. When he arrived home from work, it was black dark outside, as no porch light was on. Expecting nothing more than a warm fire, quiet dinner, and a glass of some sort of adult beverage, he padded his way to the steps.

Upon his meeting the bottom step, the one coated in a layer of ice from the earlier scientific demonstration, he went high heels over tin cups, spewing forth a wave of profanity (including some new words I had not heard before). I was, of course, the usual suspect, but my grandmother took the rap. And no, I do not throw snowballs at cars anymore.

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On a day like this, just being outside to shovel the driveway, you can get frostbite. Take care to cover all exposed skin. (Special to the Montrose Daily Press/Mark Rackay)