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ABSTRACT

This document consists of the six issues of the "Wilderness Medicine Newsletter" published during 1996. The newsletter addresses the treatment and prevention of medical emergencies in the wilderness and training resources. Issues typically include feature articles, interviews with doctors in the wilderness, conferences and training courses, additional resources, and general information relevant to medical services and outdoor activities. Feature articles in this volume cover cellular phone use by lost or injured parties; pros and cons of thermometer use in the wild; cold injuries; sock selection; eating disorders and responses of the wilderness leader; carbohydrate consumption for endurance; similarities between wilderness medicine and the practice of medicine in developing countries; "immersion foot"; tips on applying for wilderness leader positions; sprains and strains; backcountry water disinfection; choosing over-the-counter pain medication; an update on wilderness medicine training and certification; lightning injuries; the 1996 Mount Everest tragedy; motion sickness; preventing frostbite; and avalanche warning systems. (TD)

Wilderness Medicine Newsletter

FOR THE RECOGNITION, TREATMENT, AND PREVENTION OF WILDERNESS EMERGENCIES

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"HELLO, 911? . . ."

by Bryan Yeaton, NREMT-B

Dave Neely, a rescuer for the Appalachian Mountain Club (AMC) in Pinkham Notch, New Hampshire, tells the story: "Last summer, we got a call via a cellular phone, from a party on Boot Spur (three to four miles, and perhaps three-thousand vertical feet away). It was in the late afternoon. The group didn't think they were going to make it down by dark and asked us if we could send up rescuers with flashlights. We informed them that they were going to have to deal with the situation themselves. [There were several hours of daylight left-ed.]." Neely said that the leaders made it down before dark and were given flashlights to take back to the rest of the group. His question to them: "If you are going to carry one piece of battery-operated technology, why make it a cellular phone instead of a flashlight?"

More and more, rescue agencies are receiving direct reports via cellular phones from lost or injured parties. Only one cellular call for help came in to the AMC Search and Rescue in 1994, according to SAR Coordinator John Sanders; in 1995 there were eight— three of which were on Boot Spur. New Hampshire Fish and Game Lieutenant Rick Estes didn't have exact figures, but said his department is seeing an increase in cellular phones being used to call in emergencies from the woods.

For the rescue community, this increase raises a number of dilemmas. First, with the perfusion of cellular phones in society, easy communication is taken to be synonymous with easy access. Do cellular phones: a.) increase the number of frivolous rescue calls and, thus, potential danger to rescuers; and b.) cause wilderness users to take greater risks, with this electronic crutch in their pack? Also, could this communication form actually be more useful than the present reliance on radios? What are the benefits and drawbacks of this burgeoning technology?

Before discussing these questions in any detail, perhaps it would be useful to understand how cellular technology works. The following information is based on conversations with Bill Hastings, RF Engineer for Bell Atlantic/Nynex Mobile.

First, your cellular phone is basically a radio; it uses radio waves— compared to the shorter microwaves— to communicate with the nearest antenna. The reason you are able to have 2-way conversations— like a telephone— instead of the usual "one-at-a-time" of radios, is that the cell phone uses two different frequencies at the same time, known as a duplex system.

The "cell" is simply the area covered by each antenna, and it is linked to other cells by radio and land line systems. Your cellular call comes into the cell, and is either connected to a land line (the regular phone lines, either copper cable or fiber optic), or relayed by microwave to a central control area operated by the cellular company, and then transferred to the land line. The company that provides service (the carrier) owns or leases these cell sites (your "home" area), but may have agreements with other cellular carriers to provide extended coverage beyond your home. If you are travelling— say, driving your car— and you pass from one cell into another, computers automatically hand off your conversation, without any interruption in service. One difficulty rescue organizations have had is the inability to call back to a cellular phone outside of its home area. According to Hastings, this should be changing, as cellular carriers sign agreements with competitors to accept each other's users into their systems. However, phones can be programmed not to accept this "follow me" capability, which could be problematic for rescuers. Another option for SAR agencies, according to Hastings, is to figure out which cell the caller has reached and to access their phone through the local company that operates the cell. Optimally, SAR groups should have this information for their area in a response plan.

Although in operation the cellular phone behaves much like a conventional phone, there are some important differences. The cell phone can be significantly affected by atmospheric conditions and terrain. The average size of a cell varies for these reasons, according to Hastings, but is roughly circular and will usually average a radius of about six miles. He added that cells formerly were larger, but with more and

more carriers signing on, many cells have been powered down. Since the device uses the radio frequency range (RF) from 824 to 894 megahertz(MHz), the signal can be intercepted by some commercial equipment, but not legally, so privacy, although probable, is not guaranteed.

Not surprisingly, rescue leaders from organization across the country have similar concerns about the cell phones being carried in people's backpacks. The main concern is that, with easier access to communication, outdoor enthusiasts may perceive an emergency, but instead of relying on their own skills, will call to be rescued. Although not much data has been compiled yet, anecdotal evidence supports this. Lt. Estes of the New Hampshire Fish and Game Department, tells of a team being dispatched for a fractured ankle, a situation, he says, that was made to sound more serious when the call came in. According to Estes, the caller stated later, on scene, that "I wanted to make sure you guys were going to come." Says Estes, the attitude seems to be, "If it takes getting you nerved up, you'll come."

Tod Schimelpfenig, Risk Management Director for the National Outdoor Leadership School (NOLS), also finds that he is being called to more "questionable" situations. He and other NOLS staffers are often the ones who perform rescues for private parties in Wyoming's Wind River Range. With the heavy reliance on volunteers for SAR, Schimelpfenig feels that the potential extra load of superfluous calls could "put a strain on the volunteer system."

The frivolous calls also trouble John Sanders, who says most of the cellular calls received by the AMC are for "non-emergent problems: things they could solve themselves, or they're lost." In the past, said Sanders, people would call in from their homes, concerned about an overdue party, but the AMC would wait until the next day to send out searchers, if the party, according to Sanders, "could be reasonably expected to survive the night." He added, "They would spend the night out and learn a really good lesson: either they will be prepared next time, or they won't go hiking again."

Sanders said that when rescuers have voice contact with hikers who have potential problems (via the cellular phone), that— at least at present— they feel uncomfortable not responding. Says Lt. Estes: "What if they didn't have the phone? We have been saving people for years without it. I would hate to see it impede people's ability to help themselves." That the phone would be taken along as a replacement for backcountry skills and knowledge is a common concern among rescuers. Notes Schimelpfenig: "There is a different atmosphere now, with people not being as self-reliant as they once were."

Jed Williamson is President of the American Alpine Club and chair of the NOLS Risk Management Committee. He likens the phone to other tools used by outdoor recreationists, such as belay or prusik devices, and wonders how many could fashion a belay or prusik without the premade versions. "You still need the basic skills," he said. Williamson believes an incident ten years ago in the Northwest Territories predicted today's misuse of cellular technology. A party was trying to run from the head of the McKenzie River to the ocean. "On the second day," he said, "they got wet and cold, and used an airplane-type transceiver to call for help."

"The phone is an additional safety item," according to John Sanders: "It doesn't replace the 'ten essentials.' It gives people a sense of self-confidence they wouldn't otherwise have." Does this mean they will end up taking excess risk? "I don't think so," says Sanders, "but I know rescuers who do." Sanders doesn't feel that the present cellular calls for rescue are willful abuses— more likely just ignorance of the basics: "They just don't know," he says.

Another unique problem for SAR personnel with the proliferation of cellular phones in the backcountry, at least in the Northeast, is people's calling in initial information from a scene— perhaps from a different group— but leaving to continue their trip, taking the communication link along with them. Or passing by a scene, and later deciding there could have been a problem, and then calling in sketchy information. Incident Commanders will usually leave the latter situation alone but not without trepidation—why didn't the group in question request help? As for the former: "It's really frustrating," says Dave Neely. "We had an incident on Mount Madison this past summer [in the White Mountain National Forest], where an EMT hiking with her friend came across a man apparently in distress. As she took vital signs, another group came by and offered her the use of their cellular phone, which she used to call his condition down to us. "However," he said, "the group with the phone continued on toward the summit, taking the phone with them, so we had no way of determining the stability of the patient."

The result was that rescuers were dispatched from two different backcountry locations, while a litter team from Androscoggin Valley SAR was sent up from the valley. "When the teams converged," says Neely, "they found that the patient was moving well, tired and dehydrated, but otherwise fine." Neely feels that an "extra fifteen minutes" could have prevented much risk for the rescuers. "If you're going to offer the phone for assistance, you've got to be prepared to go all the way."

Interestingly, calls about ill or injured patients often come into rescue agencies, and not physicians or hospitals.

Tod Schimelpfenig has an extra reason to ponder the backcountry use of cellular phones: in addition to performing SAR, he is also responsible for safety and risk management in an organization that leads wilderness trips around the world. From this perspective, the cellular phone (or the standard radio) can be either a wilderness intrusion or a tool for rapid contact in a true emergency. In the NOLS Newsletter of April 1995, Schimelpfenig published NOLS' position on using cell phones and radios on their trips. It reads in part:

> Without physically compromising the wilderness, we have to provide our students and staff with essential safety equipment. At NOLS, cell phone and radio use may be inconsistent with our traditional ideas of wilderness, but our practices evolved when immediate communication to the outside world was not possible. It is our position that as technological advances make communication possible from the most remote regions. . . NOLS will make use of them.

In a phone interview, he added that, despite the policy, very few NOLS leaders are taking cell phones along. Much of the reason is logistical, "They are still not a reliable way to communicate," he said. "For example, in the Wind Rivers, there is absolutely no contact, although many of the trailheads are within range."

This could be changing. Motorola, a leading producer of cellular equipment, is rumored to be able to cover most of the planet by early in the next century. A new player may be the satellite. Although the startup cost is much higher ($2550 for satellite versus $0-$100 for cellular), the costs of running the system are comparable. At present, this equipment is bulky and may not be suitable for the backcountry; but, according to literature from American Mobile Satellite Corporation of Reston, Virginia, their SKYCELL system provides communication from "virtually anywhere in North America, including Alaska, Hawaii, and Puerto Rico. . ." It also includes service within 200 miles of surrounding coastal waters. Global Positioning Systems (GPS) and Personal Locator Beacons (PLB) also hold potential for backcountry location and communication, but with the same risks as with cellular phones. Schimelpfenig believes that within three-and-a-half years, he could be able to contact any program at any time. Nynex's Hastings emphasizes, however, that cellular carriers are first going to service the marketable ones, where they will not lose money. In other words, the trailhead will get service before the trail.

How have the NOLS leaders reacted to the cellular phone policy? "Five years ago," says Schimelpfenig, "there was some resistance to radios. I don't hear that any more. Now, people are demanding more from the technology."

Apart from the pragmatic concerns, there is another, less tangible issue: how ethical is it to toss a cell phone in your pack before tromping down the trail? For many SAR leaders, it is obviously a trend that will continue, "so we'd better get used to it," according to John Sanders.

For Jed Williamson, personal experience has demonstrated the inappropriateness— not of the technology, but of the way it is used. "I have come upon people in remote settings using the phone to have an argument with someone back home. If you want to have a wilderness experience," he says, "then have it. Don't use it to call your Aunt Matilda. Or if you do, get off the trail. Don't subject everyone else."

"The challenge," says Schimelpfenig, "is how to preserve the wilderness experience while carrying a [technological] device. It could be a great asset." Adds Neely: "Having the phone takes away from your need to evaluate the landscape to rely on your wits. When you leave the road behind, you are subject to more natural laws. It defeats the purpose to have too many safety valves."

While each rescuer has his or her personal reaction to cellular phones, those interviewed acknowledge cell phones' potential usefulness in a bona fide emergency. There are, however, limitations. John Sanders says: "Understand that reception is pretty spotty, and the phone may be useless for communication. As with any high-tech item, it is easy to break and harder to fix, especially in the field. So if you're going to bring one along, you need to know how to program it and how to fix it. Plus, you need to bring along extra batteries."

Rick Estes fears that "some folks may lean too much on their phone as their primary safety resource, and get into trouble when their expectations exceed its capabilities. The bottom line is that people still need to be responsible for themselves."

Jed Williamson also sees emergency potential for cell phones, but would like to ensure that people know when their use is warranted. "Cellular users have to be educated," he says. How? "Signs or pamphlets at the trailheads," for example. He also proposes a partnership between cellular manufacturers and carriers and organizations such as the National Forest Service, National Park Service, SOLO, and NOLS. Perhaps such information could be included with the equipment.

Maybe the most effective education, proposes Williamson, is to "make them pay when they have to be rescued. They are creating a hazard when they go out without adequate skills or clothing." Lt. Estes points out that, in New Hampshire, any backcountry user can be charged for the cost of their rescue under the Reckless Conduct Law, if the rescue is "deemed frivolous and unnecessary."

Despite the potential for saving time or giving direct access to medical information, rescuers would still rather rely on their own backcountry skills in an emergency, and not a cellular phone. Estes feels that, "If taking the phone is a matter of weight, I'd rather take survival gear with me." And Dave Neely adds, "If I were leading a group, I might consider it [phone] for liability reasons, but not on a personal trip."

Jed Williamson says he prefers the archaic map, compass, and survival gear as well. As for the cellular phone, he says: "I'm too old."

TOP TEN SUGGESTIONS FOR CELLULAR USERS IN THE BACKCOUNTRY

10. Know how to operate and reprogram your phone.

9. Bring extra, fully charged batteries.

8. Before you leave, have your cellular carrier program your phone for "follow me" roaming or its equivalent, so rescue agencies can call you back.

7. Bring the ten essentials and know how to use them.

6. Have the telephone numbers for the local hospital or clinic in addition to the local rescue agency (many of which are accessed through the State Police or County Sheriff).

5. Use the phone only in a true emergency, or where the patient will require litter evacuation. Broken wrists and sprained ankles are usually not examples and you may be told to deal with the situation yourself.

4. Remember that the phone is an aid, not a solution. It may not work when you need it most.

3. Be sensitive to the fact that you will encounter people in the backcountry who are seeking their own kind of "wilderness experience" and try not to intrude.

2. Take a Wilderness First Aid course and learn to manage the situation yourself. Self evacuation should be your first consideration.

1. Do not tax volunteer rescue organizations for non-emergency situations; the rescuers you divert may cost someone else's life.

THERMOMETERS IN THE WILD: PROS AND CONS

By Buck Tilton

Cold and shivering? Hot and sweaty? Normal? Your patient is often a puzzle you're trying to solve. And your patient's temperature ranks among the important pieces of information you'd like to have. But far more important to you is this: what changes, if any, are taking place in your patient's temperature over time? Thermometers, varying greatly in complexity and in cost, offer ways to monitor a patient's temperature. Even if the measurement is off a tad up or down, you can still keep track of changes. But is a thermometer a *wilderness* medical tool?

Six places on a human body provide access to temperature: skin, mouth (oral cavity), armpit (axilla), rectum, eardrum (tympanic membrane) and esophagus.

Most of you would agree that what you'd ideally like to know is your patient's "core" temperature. But what exactly does that mean? Parts of the human body differ in "core" temperature, and those temperatures will vary as stress varies. The brain typically lives at a higher temperature than the heart. In a patient suffering from the cold stress of hypothermia, axillary, oral, rectal, even tympanic thermometers may register temperatures *lower* than the patient's core temperature. In a heat-stressed patient who has been exercising vigorously, the rectal temp may be substantially *higher* than the core, due to the heat generated by muscular activity in that region of the body. Even a very expensive, very accurate thermometer may not tell the information you'd most like to have.

Failure to properly use a thermometer, which is more likely in a wilderness environment (dark, wind, rain, and more), can make it difficult even to monitor with relative accuracy the changes in temperature over time. If you push a rectal thermometer into a mass of doo, you'll record the temperature of the doo. Thermometers not held firm and still in a patient's mouth or armpit will record temperatures lower than true. In both cases, your next measurement may show a significant but inaccurate change.

SKIN

Although monitoring the patient's forehead with the back of your hand obviously gives you no accurate measurement, it does allow you to detect big changes in skin heat and skin moisture. You can detect generally if your patient is attempting to shed excess heat (hot and sweaty) or store all the heat possible (cold and dry). Useful info!

MOUTH

Oral thermometers provide the easiest access to an actual measurement. Your patient does not have to expose any body parts to the environment, and most patients are comfortable having the thermometer in place. Standard glass thermometers have found a home in many wilderness first aid kits, but they do break easily. Exposure to excesses of heat or cold can alter the accuracy of a standard glass thermometer, and cheap ones can lose their accuracy over time even under controlled conditions. Electronic thermometers are more durable and probably more accurate, but they only work as long as the battery does. It is often suggested, sometimes strongly, that your thermometer should be one that reads low temperatures, sometimes called a "hypothermia" thermometer, because many standard instruments will not register in the hypothermia range. Friends of mine who wish to remain anonymous say this: "It's just plain silly to attempt to get an accurate measurement of temperature in a hypothermia patient in the field when so many more indicators will be present." Thermometers can be helpful in determining an elevated temperature in, say, a patient with a fever. The thermometer, if you do use it, needs to be held in the mouth for three to five minutes. Your best

bet is to periodically check the reading until you find two consecutive readings of the same temperature.

ARMPIT

The same glass thermometers used in the mouth can be used in the armpit, with the same pros and cons mentioned above. The thermometer may need to be left in place for up to 10 minutes. Axially temperatures, in the wilderness especially, are at best a poor guess at "core" temperature. "Why do axilla temperatures," writes Robert E. Burr, FACP, FACEP, medical advisor, US Army Research Institute of Environmental Medicine, "still appear as a subject of discussion? This technique has been discredited for years and has no place in the evaluation of an environmental casualty." I feel that way, too, but Dr. Burr said it better than I could.

RECTUM

Anywhere you can stick a regular glass thermometer, you can stick a "rectal" thermometer, and vice versa. Glass rectals are typically made of thicker material, which means you'll have to leave it in a bit longer to get an accurate measurement. Digital thermometers with long flexible probes work well for taking a rectal temperature. And, other than the heat-stressed patient mentioned earlier, you should get a fairly accurate estimate of "core" temperature with a rectal measurement. As you can easily imagine, a substantial amount of your patient will get exposed to the environment. And most patients will be made uncomfortable by the procedure. If you take a rectal measurement, the thermometer need only go in two to four inches. Many wilderness care providers swear by rectal measurements, and many swear *at* them.

EARDRUM

Soaring into several hundreds of dollars to purchase, tympanic thermometers must be aimed directly at the eardrum to work precisely. Used thus, they are fast and accurate, giving a reading that should be close to a rectal measurement, but one that may vary quite a bit from an oral check. But most tympanic thermometers will simply not work outdoors. Their ability to function is altered by the radical range of ambient air temperatures faced by the wilderness care provider. At least one manufacturer, Exergen Corporation (Newton, MA), offers a tympanic thermometer that they claim has been designed for use in wilderness environments. If it works, it could give you the most accurate measurement of temperatures in the hypothermic or hyperthermic range. But Dr. Burr comments: "Our experience and opinion from the experience and opinion of others has been that tympanic thermometry is unreliable."

ESOPHAGUS

Esophageal thermometers, when in place, lie near the heart, and must be inserted in a way similar to the insertion of a nasogastric tube, although you will find some of these thermometers are smaller and easier to insert than an NG tube. Placed accurately, this thermometer should give you the most accurate measurement of "core" temp possible. Inaccurately placed, they can be off several degrees. Once again, I know of no one who has used an esophageal thermometer in the wild outdoors.

So, should you be carrying and using a thermometer in the wilderness? Maybe yes. Maybe no. These thoughts and considerations will, hopefully, help you make that decision.

REFERENCE: "Temperature, Thermometers and Temperature Monitors," preliminary proprietary materials, copyright 1995 by the Wilderness EMS Institute.

WHO'S WHO IN WILDERNESS MEDICINE: MURRAY HAMLET, DVM

By Ted Walsh

Dr. Hamlet manages research plans and operations at the Army Cold Weather Research Laboratory in Natick, Mass. and has earned a reputation as the definitive authority on cold-injury and the treatment of cold-injury. He earned his position after eight years active service in the United States Army stationed mostly in arctic and sub-arctic environments. Upon his discharge (honorable), he was then asked to stay on as a civilian specialist for the military. Dr. Hamlet's medical training is as a veterinarian. Although this may seem unusual, the reality is that an understanding of comparative animal anatomy and physiology has led to the most insightful understanding of human anatomy and physiology.

Whether the topic is Raynaud's, frostbite, or hypothermia, Murray is the man people go to for the last word, a fact that too many lawyers are already aware of.

WMN: How did you eventually mesh Veterinary Medicine with research in cold injuries?

Dr. Hamlet: Well actually we have to go way back to answer that, in fact to high school. I was interested in birds and, in particular, the air-sacks in birds. There were some interesting theories as to the purpose of air-sacks but the jury was still out as to their actual function. As I say, I became interested and started a science project looking into their purpose. Along the way I became convinced that the primary function of these air-sacks was thermo-regulatory. My project ended up entered in competition in the National Science fair. Basically ever since I have been involved with heating and cooling systems in animals and humans.

WMN: Did your project win anything in the National Science Fair?

Dr.Hamlet: I came in second.

WMN: Why did the Army send you to Alaska?

Dr. Hamlet: They needed someone to look after the lab animals for their cold weather lab there.

WMN: Is that also how you got directly involved with Cold Injury research?

Dr. Hamlet: That's pretty much it. The Army cold weather specialist was a bit cantankerous. He needed an assistant. We got along O.K. When he retired the Army came to me and said, "You're the only one we've got now that knows about this stuff. You're in charge".

WMN: Ten years ago you were involved with the evaluation of what happened in the Mt. Hood disaster, and you have been involved with several investigations that the military has done on training deaths due to cold. You have also been called as an expert witness in several cases involving deaths or injuries that occurred on trips run by outdoor programs. What lessons, if any, can be learned from these tragedies?

Dr. Hamlet: I think the basic one is being able to recognize when there is a problem. About the only thing that all the different tragedies you mention have in common is that in virtually all cases there was a mistake made, a misjudgment, or an equipment failure, and nobody dealt with the problem. Now another mistake occurs and compounds the first. It is almost never one false move that does you in, but a series of false moves.

WMN: What do you recommend outdoor programs and wilderness- oriented organizations do to avoid this pattern of behavior?

Dr. Hamlet: Well, obviously, good solid training for the people leading trips is key, but I also hope the people employing those leaders are careful about who they choose to lead their trips basing their choice on some sort of track record. It is up to the leader to be the one who says, "Hey, hold up. We've got a problem."

WMN: What do you consider your most significant contribution to wilderness medicine?

Dr. Hamlet: I think if I can educate even a few people to learn from the mistakes made by others that have lead to avoidable injuries, then I've done something worthwhile.

WMN: Can people write to you with questions?

Dr. Hamlet: Sure. They need to contact me at:

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THE JOY OF SOCKS
or
"SOCKS IS MORE THAN A CAT"

by Murray Hamlet, DVM

For many of us, socks are things we can use, after a day or two of wear, to clear out any tent or cabin; or, if we live in the White House, a furry critter to feed at night. Often, we may feel compelled to incinerate them after our foray into the woods. Actually, our socks— or sock system— is integral with our boots and vital to the well-being of our feet. As our feet are our transportation in the backcountry, the sock choice we make can mean the difference between a pleasant or a miserable trip, and in certain circumstances can lead to a litter evacuation.

Socks serve these primary functions: to insulate the foot from heat and cold; to move moisture away from the foot and, thus, keep it dry; to prevent the "shear forces" which cause blisters; and protecting the foot by keeping it a distance from the boot material, known as "stand off."

The different materials from which they are manufactured give socks a variety of properties, some beneficial, some neutral, and some even detrimental. Wool has excellent "stand off" and moisture absorbency, but dries slowly. Nylon is good for strength and form, but can be too hot; often, nylon is woven with wool to add strength. Polypropylene is strong and has well-known moisture transfer properties, known as "wicking." Polyester, too, is a good wicker. Acrylic, on the other hand (or foot), breaks down too easily. Orlon is too soft, reducing the stand off space. Cotton— the most popular choice in socks— is usually the worst choice for hiking, as it is too hydrophilic (water-absorbent), and causes the most blister-producing friction.

Blister prevention is perhaps the most important function of our socks. When dry, socks prevent shearing, the friction between the foot and the sock. However, as the sock gets wet, this force increases and causes the spreading of connective tissue. To protect itself, the body pads the area with a secretion of water underneath the skin, which we call a blister.

Another cause of blisters is excessive heel lift; as the laces over the arch loosen with walking, there is effectively more room in the boot, allowing the heel to lift with each step. The foot can slide backward in the boot, causing pressure and friction in the forward part, resulting in blisters on the ball of the foot. Also, as the heel is lifted past the transverse folds above it, the Achilles tendon will abrade and blister as well.

Heel lift can be prevented by "differential lacing;" lace the boots tightly for four or five eyelets and tie, then lace the remaining eyelets more loosely to accommodate for calf expansion. With the forefoot laced down, the heel should not lift. Boots too long or large can also cause heel lift, where socks "walk down" your leg into the boot. Try a 1/16 or 1/8-inch Poron insole to remedy this problem.

Boots and socks work together to provide proper fit, so a good-quality, well-fitted system is critical. When you try on boots, make sure you are wearing the same sock system you will wear when hiking (or skiing, or climbing), including insoles. Also, wear a weighted pack, as the weight will simulate the extra spread of your foot when you are carrying a full pack. Measure both the length and width of your feet, and take into account that the midsole in quality leather boots will shorten slightly with wear (which is what causes boots to get the classic "rocker" shape). Try the boots on unlaced with your toes jammed into the toe cap; there should be about 1/2 inch of space behind the heel. Similarly, with the heel against the heel counter, there should be a 1/2 inch between the end of the longest toe and the end of the toe box. Lace up the first five eyelets, and walk around to check for heel lift. If the boots cannot be comfortably tightened to prevent heel lift, try the next smaller size. Make sure your toes have plenty of space to wiggle: cramped toes equal blistered toes.

The two-sock system allows your footwear the best opportunity to do their job. Start with a thin, tightly-knit polypropylene or polyester sock (such as Coolmax), about 14 inches high, next to the skin. The liner should have a minimum of nylon. Avoid cotton, orlon, and acrylic.

The outer sock should have a high concentration of wool— 50% or higher— perhaps blended with polyester or polypropylene. A bit of nylon will add to strength and structure, especially in the upper calf. Socks should be densely knit, either a smooth, flat weave (like a Dachstein) or napped (where one side is flat and the other looks fluffy). The smooth side should be next to the skin, which helps the water transference; ironically, this is opposite of the way most socks are sold...

To test for density, stretch the material over your finger and rub. If you can see your finger through the material, it is too loosely knit. Press the material onto a hard surface with your thumb; it should not mat down, but should maintain a 1/8 to 1/4-inch thickness. Also, try the rub test when the material is wet (probably at home, unless you have very progressive retailers). It should hold up the same as when dry. You will probably notice that most rag socks are too loosely knit. A "fish mouth" closure at the toe, if you can find it, will fit better.

As with boots, socks should be broken in; wet the sock and pull the toe seam out flat, or pound it out flat on a soda bottle. Wash in Woolite® and fluff in a cool dryer.

Often a last minute, hastily-chosen item, socks are a critical component of our backcountry transportation system. A little thought and effort beforehand can prevent discomfort and make your backcountry trip something to remember for more than your blisters.

BACK ISSUES AVAILABLE

Back issues of the Wilderness Medicine Newsletter are available. Please specify issue(s) and send your request to P.O. Box 3150, Conway, NH 03818

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Wilderness Medicine Newsletter

FOR THE RECOGNITION, TREATMENT, AND PREVENTION OF WILDERNESS EMERGENCIES

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EATING DISORDERS AND THE WILDERNESS TRIP LEADER:

Backcountry Thoughts on a Frontcountry Perspective

by Rebecca S. Newton, WEMT-B

Eating disorders are complex problems that often risk going unrecognized during the early stages in which they may be successfully addressed. They have become so prevalent in our culture during the last ten years or so that most everyone has at least heard of anorexia and bulimia in passing conversation, and many of us are close to someone who has struggled profoundly with concerns of eating and body image. Since eating disorders are not commonly recognized as potential backcountry emergencies, they are often neglected in training curricula for trip leaders; but, since they respect no division between backcountry and frontcountry, they can become a problem during an expedition of any length.

While this article specifically speaks to wilderness trip leaders, I believe that its discussion will be relevant for outdoor educators of all types and for travellers who lead groups in any region of the country or of the world— for anyone who works or plays in a remote setting where proper nutrition truly poses a constant safety issue.

The primary goal of this article is to increase awareness about eating disorders: to help wilderness trip leaders recognize potential problems among students, to understand their grave medical and psychological implications, to learn some factors that may contribute to their development, and to consider what steps toward prevention and recovery may be taken in the field. Beyond the scope of this article, my hope is that opening discussion of the issues at stake will encourage you, as a trip leader, to go out and learn more about eating disorders on your own— to discuss eating concerns openly with your students, to share stories with your colleagues, to consult hospital staff or professional therapists for answers to questions that your discussions raise.

One final cautionary note before we delve further into definitions and discussion: I will be making some broad generalizations in an attempt to outline common signs and components of eating disorders. These generalizations, while necessary in order to help trip leaders learn how to recognize and to be aware of danger signs, should not overshadow the single universal truth of eating disorders: The experience of each individual is unique, with its own origins, manifestation, perpetuating factors, and medical and psychological complications. No matter how much you learn about eating disorders, keep in mind that when you deal with a struggling student, that student deserves to meet you in a space free of assumptions and judgement. Don't listen just to the eating disorder; listen to the individual. He or she has an amazing— and amazingly difficult— story to share.

FRONTCOUNTRY INTRODUCTIONS: A GROUNDING IN FACTS AND FIGURES

AT-RISK POPULATIONS

Eating disorders and their complications comprise a steadily growing threat to the health of individuals in Western nations. According to David Herzog, Director of the Harvard Eating Disorder Center, an estimated 5.5 million people within the current US population will suffer from a clinical eating disorder at some point in their lives.

The population most commonly affected by eating disorders— and, accordingly, about whom the most is heard and written regarding eating concerns and body image— is that of women in their teens and twenties. In fact, ninety percent of eating disorder patients are female. Still, a significant ten percent are male; no group of individuals is immune to the factors that are thought to precipitate eating disorders.

While a much greater number of women than men suffer from clinical eating disorders, both sexes are indeed at risk for developing disordered eating— although the underlying reasons that men develop such problems are often markedly different from the factors that provoke the disorders in women. Several specific groups in which eating disorders are frequently noted include:

1. *Young middle- to upper-class women.* This is still the most visible group, as well as the population most targeted by current outreach efforts.
2. *Athletes, including women and men alike.* Those participating in sports that emphasize body weight or body shape (e.g., wrestling, rowing, running, skating, gymnastics, dancing) are particularly susceptible.
3. *Men or women with a personal or a family history of substance abuse.* For these individuals, the eating disorder often springs from a general impulse-control problem.
4. *Homosexual men.* A recently identified at-risk group, perhaps arising out of an elevated concern for body image similar to that cited among young women.
5. *Middle-aged and older women striving to maintain a "youthful" figure.* Often these are women who have carried preoccupations of body image from their youth into later years and who may be unknowingly encouraging disordered eating and unhealthy body images in their own children. Problems in this category have been documented even in women into their eighties refusing food at nursing homes.
6. *Young children.* Some children who observe older siblings', friends', or parents' unhealthy attitudes toward food and distorted body images or who absorb media messages that thinner is better begin to show patterns of disordered eating at a frightening early age. Children who are under stress due to parents' poor relations with each other are also believed to be prone to eating disorders.

ORIGINS IN PSYCHOLOGY AND SOCIETY

Disordered eating should be viewed not so much as an isolated affliction, but rather as one symptom of other concerns. An eating disorder is often a maladaptive attempt to communicate a larger problem, a silent cry for help, the manifestation of a pattern of underlying psychological tendencies. Contributing to imbalanced associations with food may be an anxiety disorder, a relationship of codependency, or a lack of self-esteem, self-confidence, and self-efficacy. Traumatic events involving the family, such as abuse or alcoholism, are common experiences to find in the history of an eating-disordered individual.

Within our larger society, current media images are classically cited as harmful to young women's self-perceptions, and are clear contributors to the perpetuation of unhealthy body images in many cases. Popular media images tend to emphasize thinness as a virtue equitable with femininity. The "waif" look has been proposed as a backlash of power through which women, who are increasingly coming to fill what have been considered traditionally "male" roles, are encouraged to maintain an air of childhood in order to appear less threatening. Societal encouragements toward thinness as a measure of beauty combined with a persistent Western association between thinness and a strong work ethic have made eating disorders almost contagious. Members of a college running team, for example, may encourage poor nutrition in each other; newer team members, admiring the successes of more experienced team members, may come to believe that eating only salads can translate into glorious athletic success. Here, self-deprivation becomes a new level of competition between team members, and this asceticism is seen as the highest form of discipline.

Despite its risks, an eating disorder is sometimes perceived as a solution to the individual who finds himself or herself beginning to fall into its patterns. For the woman who constantly struggles with memories and fear lingering from an abusive relationship, the origins of anorexia— which removes her menstrual periods and nearly all the fat from her body— may rest in the belief that if she succeeds in retaining an appearance of smallness and sexual immaturity no one will want to touch her. For the man who needs to keep his body in constant check for weigh-ins before his wrestling matches, the diuretics and purging of bulimia may seem the miracle combination that helps him drop those last few pounds each competition morning.

Outside of specific traumatic origins or demands of competition, the discipline required to maintain an eating disorder may fill a broader need for control felt by an individual; if she cannot control all the events in her life, at least she can feign control of her eating and her own body. For the person with an overwhelming scope and number of concerns, having an eating disorder seems to narrow the focus of worry, as the eating disorder's management comes to demand every last reserve of energy and attention. Eating disorders can be so hard to overcome precisely because they serve such important psychological functions in people's lives. Their resolution is far more difficult than simply stopping the actions that define the disorders would appear to be, far more complicated than just ceasing to throw up after every meal or starting to eat normally.

CLINICAL DEFINITIONS & COMMON SIGNS

The clinical pathology of eating disorders is broken into two commonly recognized disorders: anorexia nervosa and bulimia nervosa. Other less recognized components of disordered eating include compulsive overeating, compulsive exercise, and bulimiarexia. While the problems endured by many individuals struggling with eating disorders represent combinations of several of these pathways, the distinctions drawn between disorders do serve to facilitate basic education and to open initial discussion.

Anorexia nervosa essentially reflects a mode of self-starvation; the individual suffering from acute anorexia looks decidedly unhealthy, even emaciated. The anorexic tends to focus on a single aspect of his body that he considers imperfect and cannot see objectively that the rest of his body has become dangerously thin. Anorexia is clinically identified by severely deficient food intake patterns that lead to drastic weight loss, specifically to reduction below 85% of ideal body weight. Mood swings, preoccupation with food, insomnia, a constant sensation of coldness, and excessive exercise are classic marks of anorexia. Some clear signs and symptoms linked to the disorder include dry skin and hair, dehydration, lightheadedness, and persistent general weakness coupled with bursts of frenzied activity.

While the anorexic literally looks like he is starving to death, the bulimic may be underweight, normal weight, or even overweight. Bulimia is classically defined by its binge/purge

cycles, in which a person first overeats and then vomits or uses laxatives to rid herself of the food quickly. The purging component of bulimia may also include abuse of diuretics, enemas, insulin, or thyroid medication.

Since none of the methods of purging employed by bulimics prevents absorption of calories by the body, and since all are extremely taxing physically, the bulimic often appears more simply exhausted than dangerously thin. Many bulimics exhibit weight fluctuations, intensely critical views of their own bodies, and a tendency toward depression. Ironically, though, the bulimic who does not yet believe that she has lost control of her eating habits may seem almost too cheerful on a routine basis— with a smile she will quickly assure you that everything is wonderful in her life and will turn the conversation toward you instead. Some physical signs of bulimia that the untrained eye may notice include brittle nails, dry and scratched skin on the surface of the hands (especially around the knuckles), dry and stringy hair, and raw gums from excessive toothbrushing. The stress placed on her face and neck by repeated vomiting may also cause swollen cheeks and parotid glands, a chronic sore throat, and difficulty swallowing.

The bulimic will frequently disappear after eating to purge and to brush her teeth, and will become increasingly anxious when she cannot be alone following meals. She may act surprised and awkward if you happen to meet her in what she thinks is a rarely-used bathroom, or, in the case of the backcountry, a secluded spot away from the group. One Outward Bound instructor, reflecting on the story of the first bulimic student that she met on a trip, recalls that "this young woman kept disappearing after meals and we didn't know why...We asked her about this and of course she just said she'd gone off to look at the woods or to see if she could find something or to go to the bathroom."

The bulimic student may also demonstrate noticeable preoccupation with group food issues. Again of the student mentioned above, her instructor remembers that "she was very uptight around food— always concerned about who was going to carry it, who was going to cook it, how much there was going to be." Mealtimes, as important cooperative social components of most backcountry trips, may pose a particular threat to the eating disordered student.

The problem with the disorders on backcountry expeditions, notes one National Outdoor Leadership School (NOLS) leader, is that "eating's a big deal, cooking's a big deal. It's a social scene and we spend a lot of time doing it; it becomes a large focus— as it is on any camping trip." A student may become increasingly uncomfortable with her concerns about food as mealtimes and snack breaks come to dictate the structure of her day on the trail, or she may try to seize control of the social setting surrounding food by keeping constant tabs on how much others are eating and by assuming a role as cook and caretaker of the food. It is important to remember that mealtimes, which most of your group may perceive as restful and relaxing breaks from the stresses of backcountry travel, may be the most stressful points of the day for one of your students.

While the typical anorexic doesn't believe that she has a problem, the typical bulimic realizes on some level that she has lost control of her actions, and she is ashamed of what she is doing to herself. The purpose behind the bulimic's actions, and even the signs of her problem, may be very hard to recognize precisely because bulimia has taught her to be such an expert at hiding. She has become so good at concealing her problem that no one else suspects what she is doing to herself. As bulimia creates a constant struggle for privacy and a nagging concern with embarrassment, issues of shame and of secrecy come to be intimately entwined with the disorder.

THE ROLES AND RESPONSIBILITIES OF THE TRIP LEADER

RECOGNITION OF A PROBLEM

The most important contribution that you can make toward recovery from an eating disorder is initial recognition of the disorder. But the most important action that you can take when you do recognize an eating disorder in a student is to realize that the problem is bigger than you can handle alone— and bigger than your student can handle alone as well.

While it is crucial to caution that there is no one magical sign that will point to the eating-disordered trip participant, several issues— in addition to the warning signs and predisposing factors discussed above— should be considered in the backcountry. People with eating disorders tend to be high-achievers and perfectionists, as do many outdoor enthusiasts and athletes who set high standards for themselves. The student's drive to travel through the backcountry— what brought him to your group— may arise out of the appeal of wilderness living's elements of survival and self-denial. For another student, the eating disorder may serve as the only constant that she perceives herself to possess as she enters into this new environment and into relationships with unfamiliar people. In this sense, the eating disorder may serve as a source of security during a backcountry trip.

In recognizing the magnitude of the problem, then, you must also realize that recovery from an eating disorder is a long process. An estimated 70 to 80% of bulimia patients markedly improve within a few years, while anorexia more commonly poses chronic nutrition and health problems and approaches a mortality rate of 3 to 5%, again according to David Herzog. Although recovery is possible, it cannot be achieved in the field.

CONTINUING MEDICAL EDUCATION

If the problem cannot be cured in the field, why, then, should you be concerned beyond simple recognition of a problem? Eating disorders may cause any of a number of physical problems that should be understood by the responsible and medically-knowledgeable trip leader. A basic awareness of these medical complications can offer you a sense of perspective regarding the seriousness of eating disorders, and can provide the background necessary to understand the scope of the effects brought about by unhealthy eating patterns.

Death from an eating disorder is most often sudden, with little or no warning. The cause of death from complications of an eating disorder is usually cardiac: a lack of potassium may lead to cardiac arrhythmia, or muscle weakness may lead to heart failure. Although these complications are usually

unsuspected before sudden cardiac death, muscle cramps may occasionally signal a potassium deficiency before the deficiency has become so severe as to cause a lethal arrhythmia.

Anorexics and bulimics are prone to a host of cardiovascular problems aside from sudden death, including bradycardia, cardiomyopathy, congestive heart failure, hypotension (with systolic pressure as low as 70 mm Hg), mitral valve prolapse, and peripheral cyanosis. Gastrointestinal disorders such as constipation, diarrhea, pancreatitis, and esophageal or gastric dilation or rupture may often lead to amenorrhea, which in turn leads to calcium loss from bones and signs of premature osteoporosis; stress fractures are common, especially in athletes. In younger people, delayed bone maturation and reduced stature may be a further consequence of unhealthy eating habits. Other possible complications include hair loss, cavities, loss of tooth enamel, anemia, low white blood cell count, and seizures.

SOFT SKILLS AND THE OFFER FOR DISCUSSION

An understanding of the great range of backgrounds and complications of eating disorders is crucial for trip leaders, who are frequently placed in roles in which they may encounter students with such problems. But if recovery cannot be achieved in the field, what *can* you do?

Again, the most important role of the backcountry trip leader lies in the recognition of disordered or unhealthy eating habits. Early recognition and intervention can make a difference in the eventual success of treatment. This is precisely why trip leaders need to be informed about the myriad of issues surrounding disordered eating.

In fostering a safe environment to address the problem, the most effective attitude that you can take is one of openness to discussion, demonstrating a commitment to be present and attentive in listening to students' concerns. Soft skills are of the essence. A major psychological complication of eating disorders involves the secrecy and silence that surround them; people simply don't talk about eating disorders. Do your part to help break this cycle, while respecting the student's right to privacy. The soft skills of wilderness medical care can help to remove the shame and denial that have hampered open discussion of eating concerns in the past. While it will help immensely to be informed, do not hesitate to reach out to a student for fear of not knowing everything possible about the specifics of eating disorders. Sensitivity and a few good questions will demonstrate attentiveness and concern— which, in the end, is the best that a trip leader can offer the eating-disordered student in the field.

A student going through an eating disorder can really benefit from your support as a listener and as a means to the next step in getting help. While you cannot force a student to change her unhealthy habits, you can approach her with a genuine concern. The most helpful words you can offer will avoid making assumptions or judgements about your student; well-meaning efforts phrased as "you have a problem" or "you are too thin" are less likely to be heard than first-person statements of concern such as "I'm worried about you and I think that your health may be in danger" or "I'm scared of what you're doing to yourself and I would like to help you get some help."

Be conscious of your own personal boundaries, of the limits of your ability to intervene, if you find yourself trying to help a student who is struggling with an eating disorder. Do you have some personal experience or opinion that is causing her problem to affect you to the point where you cannot be a helpful resource? If you have struggled with eating concerns and body image yourself in the past or have been close to someone who has been through an eating disorder, you may compromise your own mental health if you allow yourself to become too involved in helping your student. Regardless of your own limits, remember that you can offer neither professional therapy nor definitive medical care, and your student needs both of these if there is to be clear hope for recovery.

Recovery is a long and complex process. In order for recovery to be successful, the student must first acknowledge that a problem exists. This is much more difficult than it may sound to those unaccustomed to dealing with eating concerns, and is often the biggest hurdle in the process of recovery. In order for psychological counseling to be effective, a medically stable patient must be ready to confront the problem. Only when the student is in a strengthened body can therapy begin with a hope for reaching some of the underlying psychological help. Your encouragement to seek care after leaving the trip may be the first contact that helps him begin to realize that he doesn't need to tackle this problem alone. There is help to be found; he needs it, and he deserves it.

PREVENTION AND THE PLACE OF THE ROLE MODEL

Even with an understanding of the complicated nature of eating disorders, frustration lingers— you are not a therapist, and the open ear that you can lend so often may feel like such an insignificant offering. While you can do a great deal of good in just talking openly with students who have eating and body image concerns, there may be a more proactive role that you can take to help encourage strong bodies and healthy eating habits in your students. In discussions about energy levels and body image with your students as well as in your own day-to-day attitude, you can uphold wilderness medicine's most effective treatment: prevention.

The perception of food as fuel— food not as the enemy but as a functional need of the human body— is an important outlook to encourage in students. You can strive to emphasize healthy eating rather than weight and calories. In nutrition seminars or discussion, depending upon the structure of the trip experience, questions of the role of different kinds of food can be addressed. Why are fats crucial? What diverse roles do carbohydrates, proteins, and vitamins play in helping the body to meet energy requirements and to maintain its daily activities? What kinds of intake demands are placed upon the body by sustained periods of high exertion, such as those undertaken by backcountry travellers? The discussions you initiate can help discourage formation of distorted body images by young students at crucial points in their development.

Another important function that you can fill is one of a role model. Many students on organized backcountry trip programs

are adolescents at a crucial age in their development of self-perception and body image. You can send a valuable message in your level of comfort with your own body; you can set a good example by accepting yourself in your current physical form and by projecting the knowledge that you do not have to be perfect in order to be outstanding and admirable.

You, as the trip leader, have the opportunity to strive to fashion the trip itself as a safe space to be imperfect. You can foster an environment within which questions of self-image can be addressed, encouraging your students to search for internal points of reference rather than to absorb the opinions and advice of others unthinkingly. Furthermore, you can be someone at this crucial developmental point who responds to the student as an individual and as a whole person, rather than identifying her within a single, narrow characteristic— as "so pretty" or "so smart."

If you have an encounter with a troubled student that leaves you troubled, you need to find a way to make yourself feel better. Believe this for yourself just as you would assure your student that he deserves help in getting through his difficult time. After the experience, find someone to talk to about your experience, to "debrief"— a sympathetic friend or colleague, or perhaps a counselor whose job it is to deal with eating disorders on a routine basis. Take some time to write about your experience in a journal. Or resolve your unanswered questions by reading to learn more about the problem that you have just helped tackle.

MAKING DECISIONS FOR THE BACKCOUNTRY: SCREENING AND EVACUATION

Some organized outdoor programs such as NOLS and Outward Bound have developed sensitive and elaborate screening procedures to address the issues of eating disorders for applicants with a history of such concerns before these students begin a course. One NOLS administrator explains their policy: "We ask a lot of questions about the history of it, the frequency of episodes— Have they ever been treated by a professional for it? Are they still being treated by a professional? Have they ever been hospitalized? Then we spend some time talking about the effects of stress, what's in the NOLS diet, and our eating and cooking habits— and whether they have considered those and their potential impacts." Still, inevitably, students with eating disorders that have not yet been diagnosed continue to appear on courses to the surprise of their instructors.

In contemplating evacuation, any student in whom you suspect an acute eating disorder should be considered to be in extreme danger. The most important question for the trip leader to evaluate, however, is "How immediate is this danger?" Ultimately, all eating disorders have the potential to become life-threatening, in both physiological and psychological aspects. While the patterns of eating disorders place great physical stress on the body, psychological threat is caught up in the cycles of control and loss of control that many eating disorders represent. An eating disorder in its beginning stages may be its own positive reinforcement, and can quickly escalate into a full-blown obsession that demands all of a person's time and energy. Seeing no way out of an eating disorder— and, at the same time, seeing no way out of the related problems that are perpetuating the disorder— an individual may become so depressed that she finds a potential solution in the idea of suicide.

The most immediate risk that the eating disordered student poses on a backcountry trip is one to group safety. One Outward Bound instructor describes the drain that an eating-disordered student placed on her group, noting that she was "physically too weak to participate and hypothermic all the time...We had to give her constant attention." A NOLS instructor corroborates, noting that he's known a few students who've been brought out of the field, usually because "they aren't eating so they can't keep their energy levels up and they're unable to stay warm." Furthermore, he goes on to emphasize the trip leader's need to defer medical and psychological treatment to other authorities: "If there's active bingeing and purging going on, and our staff find out about it, my sense is that the student will be removed from the field for at least professional evaluation before continuing— it just gets out of our realm of being able to make a decision."

Another Outward Bound instructor, in an incident related by a colleague, had to make difficult judgements in deciding to evacuate a student from her semester sailing course several years ago. Determining that the evacuation was truly necessary "was just a matter of looking at eating patterns and noticing her weakness. She was physically weaker [than the rest of the group]— she just couldn't withstand the rigors of the pulling boat." In the end, the decision to evacuate this student was derived from her inability to sustain the energy levels necessary to contribute to a safe and cooperative environment for all the students and instructors involved.

Although your evaluation of the problems caused by an eating disorder may find the risk to be immediate in one very real sense, this is one case in which a calm approach will be a far greater asset than will a hasty and anxious response to the situation. The decision to evacuate should be based on issues of safety— safety of the student, safety of the group as a whole, and safety of the staff. The medical and psychological needs of the student are greater than the group and the instructors can provide, while her presence may be too draining for the staff to balance with the rest of the trip and may detract from the positive experience of other members of the group. If the student is not maintaining the necessary calories to continue safely upon the trip, then the situation needs to change for the good of all involved.

The instructor who related the story of the sailing trip also mentioned that she had talked to the student some time after the evacuation and that "she said it was the best thing...that they booted her off the course because she ended up getting some more intensive therapy and had actually gotten control of her eating since then. She was incredibly upset the day she was asked to leave but knew it was the right thing. She told the instructors afterward that it was the right thing, and thanked them."

Eating disorders are difficult issues because there are no clear solutions, no universal formula to be followed toward recovery. Despite its many complexities, when armed with a solid knowledge of the factors involved and of the safety issues at stake trip leaders can and do make reasonable

judgements about the meaning of the eating disorder to their group as a whole. The trip leader's "right" response to an eating disorder is elusive and changeable, resting somewhere within the balance between the interests of the eating disordered student and the needs of the rest of the group— but, most of all, it is always sensitive and informed.

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* Further catalogues and lists of readings available by calling 1-800-756-7533.

THE STUFF OF ENDURANCE

By Buck Tilton

As the hike starts those places where you store excitement are stuffed as full as your pack. And so are those places where you store glycogen, the first fuel your body burns for endurance. Glycogen was once the food you ate, derived from carbohydrates and strung now, like pearls, into chains of glucose molecules. Built from your diet of the last 24 hours or so, glycogen waits, packed into the cells of your muscles and liver, ready to provide energy. What you have eaten prior to the hike, and your level of physical fitness, determine how long you will endure.

DIET AND DOING

Energy production takes place within each of your muscle cells. For the first 20 to 30 minutes of your hike, stored muscle glycogen provides almost your entire source of energy, with the addition of a little glucose from your blood which has been released from the stores in your liver. But the drain on your glycogen starts to tell. Hormone levels in your blood change, insulin lowering and epinephrine rising, and stored fats begin to play an increasing role in providing energy. At the 90-minute mark for the average backpacker, fats and blood glucose have become a major supplier of endurance. With two hours behind you, glycogen has almost been used up. Fortunately, your fat supply is virtually inexhaustible. Unfortunately, fats won't burn unless carbohydrates are present, and continued exercise depends on your muscles taking glucose from your blood. You must take on more carbos or you start to poop out.

Replenishing carbos is most effective with a drink containing a six to seven percent concentration of carbohydrates (e.g. Gatorade, Exceed, Sytomax). Choose the drink that tastes best to you. Within minutes glucose will be spilling into your bloodstream. Higher concentrations are absorbed more sluggishly, sometimes causing an upset stomach. For optimum endurance, drinks should be taken in small swallows consistently throughout periods of exercise at a rate of about a liter per hour. Start sipping around 30 minutes into your hike to avoid carbo depletion.

If you don't like carbo-replacement drinks, endurance can be maintained with energy bars (e.g. PowerBars, Exceed Sport Bars). They'll take 30 to 60 minutes to go into action, and they must be followed with the same drinking regimen using plain water. Even if you're using drinks for carbohydrates, you should still start munching something about 90 minutes into your exercise, to ensure your blood glucose stays high enough to prevent exhaustion. When energy stores are exhausted, they take a long time to rebuild, up to a day.

Carbohydrates can be replaced with regular old food (such as breads and sweets) and water, but they just aren't as efficient. Besides, energy bars are lightweight and compact, with a lot of calories, and little garbage to pack out.

Another reason exists for keeping your carbo intake adequate. After two hours of strenuous backpacking without taking the time to replenish carbohydrates, your brain, which feeds almost entirely off blood glucose, may begin to complain with headaches and dizziness. Your ability to think things through carefully will rapidly diminish. You may find yourself in serious trouble.

To maintain energy stores within your muscles the normal American diet of approximately 46 percent carbohydrates is not enough. "A diet containing 70 percent carbohydrate is recommended when you're exercising hard, " writes Ellen Coleman in her book *Eating for Endurance*. Ms. Coleman suggest balancing you diet from the four food groups — dairy, protein, fruit-vegetable, and grain — then doubling your intake of fruits-vegetables and tripling your intake of grains to achieve a high carbo diet. Primary carbohydrate sources are cereals, breads, pastas, muffins, pancakes, rolls, rice and other grain products, fruits and vegetables.

Carbohydrate loading, achieving maximum glycogen storage, is a combination of diet and exercise that endurance athletes

sometimes use (see Ms. Coleman's book for complete details.) But, since exercise stimulates high muscle glycogen storage, you can't load more carbos unless you're involved in endurance training.

TRAINING

For food to be burned into energy, oxygen must be present in each cell. The harder you work, the more oxygen you use. But you, and everyone else, will reach a place during exercise beyond which your ability to utilize oxygen will not increase, even should the intensity of your exercise continue to rise. When you are using oxygen at you maximum capacity, you have reached an exercise plateau of 100 percent aerobic capacity. You can only function at maximum for about five minutes. Then you've reached another poop-out point.

Training for endurance will increase your ability to utilize oxygen. That, in practical terms, means you'll be able to cover the same distance on the trail with less effort, or a greater distance with the same effort.

"We define endurance exercise," writes Coleman, "as exercising for three to five days per week, for 20 to 60 minutes, at 50 to 80 percent...of aerobic capacity...(or 60 to 90 percent of maximum heart rate)." Find your maximum heart rate by subtracting your age from 220. On this training regimen, you can maximize your aerobic capacity in six months to two years, depending on the intensity of your exercise and your genetic predisposition.

HYDRATION

"Water," says Ms. Coleman, "is the most commonly overlooked endurance aid." Even very mild dehydration produces a loss of efficiency. Before heading out along the trail, drink a half-liter of cold water. Cold fluids empty from the stomach quicker and cool the engine, preparing it for the heat stress of the exercise to come. Then keep up the consistent drinking — plain water or energy drink — at the liter per hour rate.

WHO'S WHO IN WILDERNESS MEDICINE AN INTERVIEW WITH DR. BILL HERRING

By Lucy Hopkin

Dr. Bill Herring is an orthopedic surgeon based out of Boone, North Carolina. On top of his busy schedule practicing medicine in the controlled environment of the clinic, Dr. Herring has also been involved with medicine in developing countries. On the Board of Advisors and Safety Committee for the North Carolina Outward Bound Schools, Dr. Herring is an active member of the Mountain Alliance Group in Boone and has 15 years experience as team sports physician for Appalachian State University. Dr. Herring has done a significant amount of wilderness medical training for organizations like Appalachian State University, Wilderness Medical Associates, NASAR, and SOLO.

WMN: In which developing countries were you involved with the teaching of medicine?

Dr. Herring: Zaire, Haiti, Nepal, and Honduras.

WMN: Was this work in association with any particular group, or was this work done independently?

Dr. Herring: Different groups. Some of it was working in missions with the Presbyterian Church. The two trips to Honduras were with the Episcopal Church in North Carolina.

WMN: It has been said that practicing medicine in these developing countries is like practicing in the wilderness. How would you describe the similarities of these two environments?

Dr. Herring: I think third world medicine is similar to wilderness medicine in two primary regards. The number one reason is that often there is significant delay in getting definitive treatment. And the second reason is that, you usually have to improvise when you are practicing medicine in third world countries. Improvisation is frequently an element in that situation just as it is with wilderness medicine. So, those are the two biggest things that come to mind— the delay in definitive treatment and improvisations. This is simply because you don't have the things available to you that you would have in our medical culture.

WMN: You're an orthopedic surgeon. What would you say is the most common backcountry orthopedic emergency that you see?

Dr. Herring: Probably the most common significant injury would fall under the category of shoulder dislocations. In general, however, the most common orthopedic injuries that I see in the backcountry setting would be knee and ankle sprains.

WMN: When learning shoulder dislocation reduction, many students voice concerns about doing further injury or damage. How safe is it for Wilderness First Responders or Wilderness EMT's to be attempting to shoulder relocations in the backcountry?

Dr. Herring: I think if they have had proper training, as well as a basic understanding of what they are doing, that it is a safe procedure.

WMN: What would be an example of a complication a provider might run into?

Dr. Herring: Complications would occur if somebody disregarded: number one, the patient's complaints of increased pain when you started the reduction, and, number two, if somebody continued to forcefully manipulate a joint, say a shoulder, in the face of a feeling a mechanical block. The danger in this instance would be possible or potential nerve

and vascular damage primarily. But if people are educated, do the procedure properly, and realize what the constraints are, then there really should be very little chance of further damage.

WMN: Prevention is really emphasized in wilderness medical training. Is there one thing that you can say about prevention that may minimize some of the injuries that come in from the backcountry?

Dr. Herring: I think probably the first thing that would come to mind would be being well prepared for whatever the backcountry venture might be. That might be mental preparedness to deal with whatever the activity is, whatever the setting is, or it might deal with equipment preparedness. I think being prepared for what the adventure is would probably be the key to injury prevention.

WMN: What do you consider your greatest contribution to the field of wilderness medicine?

Dr. Herring: I hope that my contribution is being able to share with people a way to more safely enjoy the wilderness environment. I can't think of anything that I would call a major contribution.

WMN: I don't know, education doesn't come cheap! You've certainly touched a heck of a lot of people through all the teaching you've done.

Dr. Herring: Well, I think education is important and I do feel like I've been able to contribute in that area through the years in the various programs with which I've worked. I think I have touched many folks that spend a lot of time in various wilderness endeavors. But as far as saying what a major contribution has been, I couldn't do that.

WMN: If we were to find Dr. Herring out in the backcountry, what would he be doing?

Dr. Herring: Golly, that takes in a broad spectrum of things! Depending on the season I enjoy kayaking and mountain biking, rock climbing, backpacking, and skiing— cross country as well as downhill. I enjoy all those things. It's pretty much a seasonal thing depending on the time of the year. I would be hard put to pick a favorite but if I had to, it would probably be kayaking.

WMN: Would it be okay if readers contacted you if they had any further questions?

Dr. Herring: Sure, that would be fine. Please send any letters to: Dr. Bill Herring
194 Doctors Drive
Boone, North Carolina 28607

SOURCES OF WILDERNESS MEDICAL TRAINING

For information on upcoming courses, including dates and locations, please contact the following schools:

SOLO, Wilderness & Emergency Medicine
603-447-6711

Wilderness Medicine Institute
970-641-3572

Many other groups offer training, feel free to ask for names of other established organizations.

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FOR THE RECOGNITION, TREATMENT, AND PREVENTION OF WILDERNESS EMERGENCIES

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IMMERSION FOOT

by Tod Schimelpfening,
NOLS Rocky Mountain School Director

Immersion foot results from prolonged exposure to wet, cold conditions— conditions which many outdoor recreationists avoid. But military operations rarely have the luxury of choosing their weather conditions, and like National Outdoor Leadership School (NOLS) expeditions, may live and work for days in weather conducive to the development of immersion injury. Understandably, therefore, much of what we know about non-freezing cold injury— immersion foot or trench foot— comes from the military. In World War I— when the term trench foot was coined— the British Army alone experienced 29,000 immersion foot casualties in the winter of 1915-16, while frostbite and immersion foot casualties for U.S. forces in Europe in WW II totaled 90,000. This article, written for wilderness leaders, shares NOLS' experience with immersion foot.

What is immersion foot?

Immersion foot is a local, non-freezing injury that occurs in cold, wet conditions, usually in temperatures of 30-40 F. It happens even in the tropics as a result of conductive heat loss from immersion in cold water. The injury occurs when blood vessels constrict in response to heat loss, reducing blood flow to the extremity and depriving cells of oxygen and nutrients. The ensuing injury may range from a few weeks of sore feet to permanent muscle and nerve damage. In some cases, victims experience months of pain and disability and even amputation.

Severe immersion foot produces a wet gangrene which is difficult to treat and may require early aggressive surgery. Frostbite, in contrast, can result in dry gangrene, easier to treat medically although still serious.

Trenchfoot is a combination of immersion foot with mechanical trauma. Often the term is used interchangeably with immersion foot.

Before we clearly identified the phenomena of cold non-freezing injury, NOLS Instructors knew that our feet, after a month of postholing in the wet spring snows of the Rocky Mountains, would inevitably be numb and painful. Soaking wet leather boots and socks are a clear risk. We've seen immersion injury in cooler climates from sweat-dampened socks. We've experienced immersion foot in plastic boots, neoprene socks and other vapor barrier systems, as well as with supergaiters and gore-tex boots. It happens on winter ski trips and in the desert.

At NOLS, signs and symptoms tend to occur while people are on hiking or skiing expeditions, but may also develop if the extremity (s) is immobile and exposed to a cool, damp environment for an extended period of time— for example, in a lifeboat or with paddlers sitting all day in kayaks on cold river trips. This same injury also occurs to fingers from wet mittens— what I call "immersion or dachstein hand."

We used to think that at least 12 hours of exposure to cold, wet conditions was necessary to produce the injury. You will still hear this figure quoted, and it's probably true in most cases. Our experience however, tells us that it can happen much quicker, over a long, wet, cold hiking day for example, or in a multi-hour river crossing. Murray Hamlet, an expert on non-freezing cold injury, says the minimum exposure is as little as three hours, although he thinks it takes 12 hours to have a serious injury. These episodes of short onset immersion foot could be due to individual susceptibility, or could be the culminating event of long-term exposure. There are times when our diligence prevents immersion foot, although we will have chronically cool and constricted feet. But as little as an afternoon's lapsed attention can undo our best efforts.

Assessment of Immersion Foot

***"Classic" Signs and Symptoms**

Immersion foot is usually described in a worst case scenario: the extremity appears cold, swollen and mottled. Cyanosis is usually present. Tactile sensitivity is reduced, as is capillary refill time. The foot may look shiny. The patient

may describe the foot as feeling wooden. When the extremity warms, the skin becomes warm, dry and red. The pulse is bounding. The injury is painful. The injured area may itch, tingle and exhibit increased sensitivity to cold, which may possibly be a permanent sensitivity. The recovery period can last weeks. Nerve damage may be permanent. The development of blisters, ulcers, and gangrene is possible.

***Common Signs and Symptoms**

All these "classic" signs and symptoms are true. However, we most often see subtle forms of non-freezing cold injury that do not necessarily look mottled, gray, or waxy, nor do we always experience poor capillary refill, or altered skin color and temperature. All we may see are cool pale extremities, numbness or tingling and mild swelling. We may see mottled areas, often on the underside of the foot. Only rarely are our cases serious enough for the patient to describe wooden-like feet or a cotton-wool sensation, to experience edema and blistering, or to be unable to walk. Pain is unusual in the field, more common after blood flow has returned to the extremity. Pain onset may be delayed by 24 hours, and may not even fully develop for several days. People may also complain of itching after rewarming.

I've seen several people whose immersion feet were warm, dry, and pink with good capillary refill time. Numb toes were the chief complaint of one, painful feet of another. We scratch our heads and wonder if this is a cold injury, "numb toe" from boot pressure, or simply a case of sore feet in a person new to walking long distances. Murray Hamlet says we should be suspicious about any numbness, tingling, or pain in our feet when we are in cool conditions. I agree with him. Nerves are most susceptible to injury from reduced blood flow. Many of the long-term effects of immersion foot are due to damaged nerves in our feet: Pain, numbness, chronic tingling and itching.

The patient may not notice the constricted condition of their feet until they are warmed after the trip. We've learned to advise people returning from prolonged wet and cold conditions to avoid long, hot showers or baths. The rapid warming can surprise the unwary with swollen, painful, and red feet.

Treatment for Immersion Foot

Warm an immersion foot slowly at room temperature. In serious cases swelling, pain, and blister formation will prevent walking. In most cases the extremity will only be sore. Avoid walking on injured feet and elevate the feet to reduce the swelling. Bed rest, along with avoiding trauma, is often necessary until the injury heals. Ibuprofen is recommended because of its anti-inflammatory properties. Aspirin and acetaminophen may also help.

It has been our experience, which has been shared by military experts, that non-freezing cold injuries can produce pain resistant to the strongest of medicine. Patients cannot walk, wear shoes, or even accept the pressure of a bedsheet on their feet. Their feet look normal, but they have pain that defies medication.

Prevention

Immersion foot can be dismissed as a disease of the past by those who think modern equipment provides protection, but the recent experience of the British and Argentine armies in the Falklands demonstrates that this is not the case. The British used 42 different boot/sock combinations and none proved effective in this cold, wet climate. It was only their behavior and leadership that kept them from having immersion foot amputations, although the condition affected many of the troops. The Argentines on the other hand, with poor leadership and untrained troops, suffered 274 amputations.

Our experience is that in prolonged cold, wet conditions some degree of immersion foot is inevitable. A recent military study noted an incidence of one in ten during wet cold conditions. The best footwear/gaiter system can be of little help. It is the daily interaction between the equipment, outdoor skills, and habits of vigilance and assessment that are essential in controlling this incidence rate. What follows are suggestions from NOLS instructors that we have accumulated over the years.

***There is no new thing under the sun...**

In WWI the British reduced immersion foot casualties from 29,000 to 400 per winter by using techniques (without making significant footwear changes) that we still follow today: create good boot fit with heavy wool socks; keep the body warm; remove socks and dry and massage the feet twice a day; do not sleep in wet footwear; dry wet socks against your skin; keep your feet out of water or mud as much as possible; watch carefully and react promptly if you experience numbness or tingling; keep footwear loose to allow for circulation.

***Dry your socks...**

Drying socks is a continual activity on wilderness trips. During the day we stick wet socks into our shirts to dry them against the skin, and, likewise at night, drape them over our chest and belly in our sleeping bags. We'll hang them in the sun and dry them over a fire. Keep one pair of dry socks in a dry place such as in a sleeping bag or a small plastic bag.

***Sleep with warm, dry feet...**

Sleeping in dry feet is very helpful, but there is a false impression that this offers complete protection. People coping with multi-day, wet, cold conditions have developed immersion foot by hiking for a single day in wet socks. A single night of sleeping in cool wet socks has undone weeks of vigilant attention. Not only should we go to bed with warm dry feet, they need to stay that way all night long.

***Look at your feet...**

We suggest leaders check in with participants regularly and consider periodic visual inspection. Warming cool feet on a companion's belly, or stopping to change socks in the middle of the day should be routine tasks, not impositions. When the conditions are ideal for trench foot to occur, you may need to key into susceptible people aggressively. Many suggest twice

daily visual checks, changes to dry socks, and foot massages to help circulation. Visual checking must be part of the routine. A verbal confirmation is insufficient. Messages sent to the brain are faulty due to nerve damage. If during the day you experience damp socks or feet that are feeling sweaty, air your feet and change into dry socks.

***In camp...**

When you get to camp, get out of your wet boots immediately. Change into a pair of dry socks and begin to actively dry your wet or damp socks. Warm your feet promptly. Don't wait until bedtime.

***Foot powder...**

Foot powder does not seem to be helpful in preventing immersion injury, although for some, its use is as a discipline in conjunction with changing socks. People with a tendency toward athlete's feet (fungal foot infections) have found medicated foot powders helpful.

***Role model good habits...**

Role modeling of good foot care by leaders on the trail and in camp is essential. The image of a cold injury to many outdoor enthusiasts is often frostbite, and they are less informed on the subtleties of cold non-freezing injuries. Novices often assume some degree of cooling is unavoidable and acceptable and inadvertently cross a line from extremity cooling to a cold injury. If participants see leaders aggressively dealing with their feet, they are more likely to do the same.

I talked with three backpackers last summer who got their immersion foot by tolerating cold, moist feet during long days on the trail. Over time, this tolerance grew into immersion foot, despite the fact that they claimed to sleep with warm dry feet. All three were surprised and denied any precipitating signs or symptoms. All thought they could get by letting their feet be cool during the day and warming them at night: unfortunately, they were caught by the subtle onset of this nasty, insidious injury.

***If your core is not warm your feet will be cold...**

Poor nutrition, dehydration, wet socks, inadequate clothing, and the constriction of the blood flow by the shoes, socks, gaiters, or tight clothing are all predisposing factors.

***Equipment...**

Plastic boots and supergaitors are improvements over leather boots. Rubber galoshes, while unfashionable, have proven inexpensive, simple and helpful in keeping footwear dry. A NOLS instructor coping with last deep summer's snowpack said, "I would advise people take booties, insoles, and galoshes. Camp shoes in galoshes are just not warm enough when living on snow 24-hours a day."

Have multiple pairs of socks, two pair on your feet and at least two spare pairs. More than six pairs is not a bad idea, but we have found novices with multiple pairs avoiding drying and stashing wet socks in their packs. I had a student who avoided drying socks for weeks by trading candy bars and even cash for dry socks. Commendable outcome, dubious methods.

***Instill awareness...**

Immersion foot is subtle and insidious. We have to stress prevention in the absence of noticeable signs and symptoms—a challenging task— but we pull it off with altitude illness and hypothermia.

When initially speaking with novices, ask if their feet tend to sweat, tend to be cold, or hard to keep warm. People whose feet sweat excessively may be more apt to develop trench foot. Wet socks increase conductive heat loss.

***The evacuation decision**

The evacuation decision for immersion foot is not black and white, so I'll make a few comments to help us navigate the gray areas. In some cases evacuation will be clear from a medical perspective: inability to walk,signs of serious cold injury such as cyanosis or symptoms such as numb cold feet or complaints of pain (which may not be relieved with our pain medications). We step into the gray when we suspect we have intervened early and signs and symptoms are mild. We now have to consider factors that are less medical, more in the realm of expedition leadership: the trip route, anticipated weather conditions, ease or difficulty of evacuation later in the trip and the patient's outdoor skills. I don't want to give the impression that all cases need to be evacuated; this is likely, but not universally true. If we can keep the feet warm and dry, the patient can stay in the field, but, they have to be able to care for themselves with unswerving diligence. There can be no further lapses in attention or technique.

Closing thoughts

Common threads in many NOLS immersion foot scenarios are people who tolerate cold feet, wait too long before intervening, and who are surprised when they discover they have been injured. Having had serious frostbite, my attitude is if your feet are not definitely warm, you're doing something wrong. People may believe they have to tolerate some level of cold extremities as an unavoidable consequence of camping. While there is some truth to this, a novice lacks the experience to know how much they can tolerate before an injury occurs and even an expert can be fooled. I'm one of those people who rationalized delaying rewarming by saying, "My feet are cold but they are not *that* cold." I was wrong.

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TRIP LEADER'S PRIMER

By Bryan Yeaton, WEMT

Well, the snow has finally melted, flowers are poking their ruffled collars out of the soil, leaves are stretching out of the trees, and every student in every school has been gripped by the fever— spring is here, and it is time to get outside!

To much of the outdoor community, this means opportunity: i.e. jobs. One of the most common reasons for people to become certified in Wilderness Medicine is to lead excursions into the backwoods or backwaters. Adults or kids, underprivileged or overprivileged, glacier or desert, woods or water, high altitude or below the sea: all lend a different twist to what you may experience as a Wilderness trip leader. If you are getting ready to lead trips this summer, or if you are looking toward getting into a leadership position, you should be aware of what the organizations who run these trips expect from the people they hire.

Ray Auger, Director of High School Programs for the Student Conservation Association (SCA), hires leaders to take high school students into National Parks and National Forests to build or repair trails. Auger looks for, "Experience: a high proficiency in outdoor travel and living, plus the ability to motivate teens." Auger may put up to ninety leaders in the field in any summer season who are "responsible for the safety and well-being of students, often in remote settings."

Allyson Krzyzaniak of The Biking Expedition in Henniker, New Hampshire, also seeks applicants who know what to expect. "We get around 150 resumes for 15 positions every year. We advertise very specifically that we are looking for previous experience with adolescents." Krzyzaniak says that many of the "experiences" included by applicants aren't relevant to the position. "Some don't really understand what the position is about, she says; "We are very honest about what we need. The market is more competitive, and we have to expect more responsibility and skills."

Auger also sees many applications targeted through the "scatter approach." He says, "Applicants have to know the organization and the position to which they are applying. Our needs are very specific— outdoor skills, working with kids, working with tools, organizational skills. It is obvious from a resume if you are applying to us specifically or applying to many types of outdoor organizations. Our application for the SCA is very detailed; by the time someone fills it out completely, he or she knows whether or not they are appropriate for the job."

At Thompson Island Outward Bound Education Center, Program Director of Operations Bill Aughton stresses not only hard skills, but motivation as well. He says, "We certainly require some identification of hard skills- if you are going to lead 5.9 rock climbs or Class V canoeing, you need to be able to do it. But we also look for real enthusiasm; this is what you go out and do for fun, not just to satisfy a job."

Enthusiasm is less tangible than skills or experience, but dealing with participants in remote areas requires many unmeasurable talents. Program directors acknowledge both the importance of intangibles, and the difficulty of discerning them from resumes and interviews. Marcy Berkowitz of The Road Less Travelled, a Chicago-based organization, says that her company looks for "the sound of the genuine." She adds, "We want to find people who aren't in this for their own ends, but to enable kids to grow, to find their own successes."

At the SCA, Ray Auger uses scenarios to tell if applicants are "woodsy or wanna-be's." "We want to get some idea of how people will react in a given situation; it is black-fly season in Vermont, it has been raining and the tents leak. The crew is ready to mutiny. What do you do? There are many creative solutions to the problem, but no right answer."

According to Krzyzaniak, good leaders have the ability to listen and to communicate, and they genuinely care about all of the members of the group, including themselves." "Anyone," she adds, "can rock climb. To be effective as a leader, you need a combination of things, especially communication skills."

For Berkowitz, a leader must be "very clear-headed, especially under pressure: able to handle any situation which comes along." Berkowitz says her company looks for high energy, along with excellent organizational skills. Ray Auger agrees.

"Our leaders," says Auger, "are responsible for all the logistics- food, tools, work projects, transportation,and budget. We need to know if they can handle these complexities in an organized fashion. Have they managed budgets before? Plus, we are looking for low-key, easy-going personalities, people who are appropriate in their language and behaviors, who will comply with our policies and protocols."

Berkowitz agrees: "Our leaders have the same values as our programs."

As the risk assessment and management facets of wilderness programs becomes more important and more scrutinized, program managers are demanding more training in wilderness medicine from their potential leaders. All of the organizations interviewed for this article require wilderness medical training, as opposed to "street-oriented" first aid."

Wilderness medicine is "incredibly important" at The Road Less Travelled, according to Berkowitz. "For twenty participants, we have four leaders— a 5:1 ratio— with a minimum of two leaders being at least Wilderness First Responder (WFR) or Emergency Medical Technician (EMT or WEMT). In reality, 80 percent of our leaders hold these certifications.

The stakes are increasing. According to Ray Auger, "Up until this year, we have required a minimum of Wilderness First Aid (WFA) [most often a 16-hour course]; by 1997 that minimum will be WFR [an 80-hour course]. More and more, says Auger, "the SCA prefers leaders to come in with the training. "We sometimes will offer these courses, but would rather have them certified before they get here."

Bill Aughton views wilderness medicine from several perspectives. A former pararescuer for the British military, he has also worked with Mountain Rescue Service in North Conway, New Hampshire and co-founded International Mountain Equipment. Before coming to Outward Bound, he instructed wilderness medicine for Stonehearth Open Learning Opportunities (SOLO), and most recently directed Search and Rescue Operations for the Appalachian Mountain Club. Aughton has strong feelings about the wilderness aspect of medical training: "There is a savvy needed for practicing medicine outdoors; it is much more than just medicine. All the rescue gear in the world won't do you any good if you or your patient gets cold." He continues, "I would much rather take lots of food and clothing and water than lots of gear, and I used to sell gear."

Aughton points to a case on Mount Washington, the highest peak in the Northeast, renowned for its wicked weather. "There was a rescue in the Ammonoosuc Ravine [on the west side of the mountain]," he explains. "The local ambulance crew responded; it was just chucking down rain and they had no appropriate gear. Fortunately, the carry only took about an hour, or there would have been a far more serious problem with lots of patients."

"I would rather," he concludes, "have a good WFA in the backcountry than a street EMT with no outdoor skills. Wilderness medicine teaches you to improvise from what you have, and not to rely on specialized equipment."

For people looking to leading trips, gaining all this experience and training can seem daunting. The people who do the hiring acknowledge that there are dues to be paid.

"Most of our leaders," says Marcy Berkowitz, "are teachers or have worked with kids in camps. They have gained experience through personal trips, as well as programs such as NOLS [National Outdoor Leadership School] or Outward Bound."

Krzyzaniak says that well-qualified leaders are hard to find. "We can teach you how to fix a bike in four or five days; we can't, in that time, teach you how to work with kids," she says. "We like to see leadership experience: NOLS, Outward Bound, or a college outing club. Although we offer some training, those leaders who come to us with their certifications have already demonstrated commitment."

Ray Auger adds, "Our program is very specialized; a summer camp for 12-year old's is very different from leading a backcountry trails program. We also require the ability to work safely with tools; not necessarily just trail tools: carpentry and farming can be applicable skills as well."

Many organizations support- and offer- an apprenticeship before trying to assume a full leadership role. "There aren't enough good, experienced folks," according to Bill Aughton. He likes the experience gained from watching a mentor: "There is no substitute for training under someone with more experience. But," he cautions, "be ready to work for poor pay for one or two years." Thompson Island offers both internships and assistantships.

The SCA also has a method for leader candidates to gain more relevant experience. "We will pair a new leader with one who has run several programs," says Ray Auger, "then, in a year or two, they may be ready to run their own programs."

Many supervisors speak of having plenty of applicants, but relatively few with all the right stuff. Says Krzyzaniak, "With each certification we require— WFR, CPR, water safety— we narrow the field of applicants. Then you have to add in skills such as communication and facilitation."

In the end, it is impossible to predict how an individual will react to a situation in the field. The decision to hire or not may come down to intangibles. "All trips may seem similar on the surface, but can be very different," says Marcy Berkowitz. "The key is to find a good match between the individual and the organization; for us, that's someone who is concerned about the individuals and the group."

"At The Biking Expedition, we look for flexibility and honesty," says Krzyzaniak. "Does the leader have a set way of dealing with situations, or is she or he adaptable? From the interview we can inform a general impression, then call the references for verification."

Bill Aughton looks for "confidence and self-assurance. We can teach people a lot of things, but we don't know how to teach judgement. At Outward Bound we lean heavily on experience, someone who has shown enthusiasm and dedication to a skill. The things you teach people at Outward Bound should be the same things you do for fun."

As the owner of a company, Allyson Krzyzaniak knows the leaders she puts in the field reflect on her and her organization. "All the work we do," she says, "means nothing if we don't have good leaders. The market is more competitive; companies are paying more money for good leaders, they have to expect more responsibility and skills."

YOU CAN'T LIVE ON BREAD ALONE

By Jen Semon, NREMT-I

Nutrition means different things to different people, but what it all comes down to is providing energy to fuel the furnace that powers us up mountains, down rivers, and through the woods. Food provides the fuel to feed the series of

biochemical reactions that allow us to do the things we do. So, how does it work? Well, it's really quite simple. At a very basic biochemical level, glucose burned in the presence of oxygen creates energy. (How's that for the Krebs cycle in 10 words or less?) To most effectively function we need a diet with the proper proportions of carbohydrates, fats, and protein.

Carbohydrates, the principle energy source, are defined as simple or complex. Simple carbohydrates are sugars: glucose, fructose, and sucrose. All these sugars require very little work by our bodies to give us a quick boost of high energy. The problem with these "quick-fix" energy sources is that they don't last long and often bring our energy levels lower than where we started. Complex carbohydrates, starches which are made up of long chains of simple sugars, are found in grains and vegetables (especially root veggies). Since these break down slowly, they provide a longer burning fuel source that will keep us going for greater periods of time. Any extra glucose from the breakdown of carbs is converted into a more complex molecule, glycogen, and stored in the liver and muscle tissue in anticipation of future energy needs. A balanced diet should include about 60% carbs.

Another source of energy, fats are essential to the production of steroid hormones, cell membranes and vitamins A, D, and E while dietary fats have been implicated in increased risk of heart disease and cancer (and this may be true if eaten in large quantities), fats are an essential part of our diet when used in moderation. Fats provide over twice the calories per gram as either carbohydrates or protein, which makes them an efficient source of energy in the backcountry - especially in the winter when it takes more calories to keep our internal fires burning. Fats should account for 25% of a healthy diet and can be found in dairy products, nuts, and meats.

Protein is second only to water in its abundance in the human body. It is not, however, a primary energy source. We need 15% protein in our diet to support the growth of new tissue and to rebuild the proteins broken down during exercise. Proteins are made up of combinations of 22 different amino acids; eight of which, called essential amino acids, must be provided by our diet. Fish, meat, eggs, and dairy contain all eight of the essential amino acids, while grains and vegetables by themselves do not. So, if we just eat grains and vegetables, we have to mix and match to provide a complete protein. Beans and rice are a good example of two incomplete proteins which, when served together, provide a complete protein source.

Obviously our total intake must meet our body's need for energy, and our body's energy requirement depends on the type of activity we choose. Being a couch potato requires far fewer calories than a winter ascent of a favorite summit. The specific numbers change depending on the person and the activity, but the general guidelines remain the same: 60% carbohydrates, 25% fats and 15% protein is the formula to enable a healthy body to take us where we want to go.

If we don't provide the proper amount of fuel for our bodies, there may be consequences to pay further down the road - the most obvious of which is not having the energy stores to keep us going. We've all experienced the misery of a 5000 calorie hike with a 2000 calorie food supply. Our "get up and go" gets up and goes and we're left feeling lethargic, weak, and cranky. Fortunately, bodies can compensate for this lack of calories by utilizing alternate fuel sources - glycogen from the liver and fats from storage. (This is what we're trying to do when we exercise to aid in losing weight.) Long term, however, it becomes harder for our bodies to create feast from famine and we are forced to breakdown more important body tissues such as muscle to access proteins as an additional energy source. The resultant loss of muscle mass clearly causes a decrease in performance. Long-term deficiency in diet can lead to weakened immune system, hormonal changes, electrolyte imbalance, anemia, and inability to extract the essential nutrients we need from the food we eat. While not immediately evident, these changes can affect our body's ability to function later in life. In order to maximize efficiency in the short term and stay healthy and active in the long term, a proper diet is essential.

WHO'S WHO IN WILDERNESS MEDICINE? AN INTERVIEW WITH ROBERT ROSE, M.D.

BY FRANK HUBBELL, DO

With each issue of the *Wilderness Medicine Newsletter*, we try to present an individual who has made a significant contribution to Wilderness Medical Care. That contribution may be in the form of teaching, research, rescue, or patient care. This month I would like to introduce you to Robert Rose, MD, an extraordinary visionary and provider of medical care in areas of the world lacking access to modern medicine.

WMN: How did you get involved in wilderness medicine?

Dr. Rose: I have always been an avid outdoorsman and adventure traveler. While I was at medical school, I attended a talk by a doc who had been practicing medicine in a remote area of Tanzania. Later, when I realized I had some uncommitted time before beginning internship, I contacted the doc and ended up spending six weeks in the shadow of Mount Kilimanjaro providing health care in an isolated, medically underserved community.

WMN: Have you had other experiences of this nature?

Dr. Rose: After internship I went in Family Practice but ended up in Emergency Medicine which brought me to an emergency department in the White Mountains of New Hampshire. I became involved with ACTS - Americans Caring, Teaching, and Sharing - a group dedicated to bringing health care to rural Honduras. Over a period of 10 years ACTS established and staffed several clinics which are pretty self-sufficient now.

WMN: What are the greatest challenges you face in these settings?

Dr. Rose: Practicing medicine in remote areas without modern diagnostic tools and equipment is really difficult and the difficulty is compounded by working with the complexities of another culture. There is no 911— no specialists, you're it.

WMN: What projects are you currently involved with?

Dr. Rose: I recently formed a not-for-profit organization called GEOMED whose mission is to assist medically underserved countries in developing a sustainable grassroots healthcare system. Learning that in El Salvador's capital, San Salvador, a group of people call the city dump home, we have teamed up with a local project to not only help provide health care and basic education, but also to develop light industries and improve the overall standard of living. This model has been deemed successful and is being exported to several other communities in El Salvador.

WMN: What lies in GEOMED's future?

Dr. Rose: Interest in GEOMED is growing and we are looking for other projects. Because GEOMED is an organization run by volunteers and the projects are staffed by volunteers, we are in the process of determining the qualifications for these volunteers and have concluded that there is a need for a training program. This fall GEOMED will be offering an eight-week program here in the White Mountains to prepare future GEOMEDICs for a seven-month work commitment in the rural areas of El Salvador.

WMN: What will a GEOMEDIC's training consist of?

Dr. Rose: The GEOMEDIC Program will include EMT/WEMT certification, training in followship/leadership, team-building, logistics, basic skills of water and sanitation engineering, tropical medicine, as well as cultural, social, and language skills. GEOMEDICs will then be placed with several other GEOMEDICs in various health care settings around El Salvador for seven months. At these sites they will work with El Salvadoran health care providers to develop and provide sustainable grassroots health care services. As part of the process, they will also provide education for the individuals in the community on the basics of health care, like proper wound care to prevent infection, how to properly manage a village's water supply to minimize diseases spread by water, child care, etc.

WMN: How can someone become a GEOMEDIC?

Dr. Rose: Anyone interested in becoming involved with GEOMED's programs can contact me for more information. The response for applications for the GEOMEDIC program and positions has been very good. The fall program is full with 18 individuals ready to take the Geomedic program and head off to El Salvador for seven months. If you would like more information about GEOMED please feel free to write Rob at:

GEOMED
198 Kearsarge
North Conway, New Hampshire 03860

SAR*SCENE '96* - ATLANTIC CANADA

SAR*SCENE '96* - Atlantic Canada is a search and rescue workshop aimed at providing a forum for Canadian search and rescue personnel to voice concerns, share ideas, and build strong communication bonds in the field of search and rescue. Approximately 350 participants are expected from air, land and marine organizations across Canada (Department of National Defense, Royal Canadian Mounted Police, Environment Canada, Canadian Coast Guard, Parks Canada, Provincial and Municipal Governments, as well as volunteer organizations). International search and rescue organizations will also be represented.

Tentative topics for this year's workshop include:

- ✓ Critical Incident Stress Management
- ✓ Search and Rescue and the Media
- ✓ Mountain Rescue
- ✓ Ground Search and Rescue
- ✓ Search and Rescue Volunteers
- ✓ Search Masters
- ✓ and other topics of general interest

SAR*SCENE* '96 - Atlantic Canada will be held from October 16-19, 96 at the Holiday Inn Dartmouth, Nova Scotia. A registration fee will be charged, which includes a lunch with the exhibitors, an awards dinner, two social events and proceedings. Information packages are available from the Secretariat at tel.: 1-800-727-9414 or (613) 996-3733 or fax (613) 966-3746.

Hotel reservations must be made separately at the Holiday Inn Dartmouth. Call (902) 463-1100 or fax (902) 464-1227. Refer to SAR*SCENE '96* to get a special conference rate.

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Sept. 11-19 Outward Bound, MD (800-341-1744)
Sept. 27-Oct. 6 Outward Bound, FL (904-224-2752)
Oct. 5-13 Northwest Passage, IL (708-256-4409)
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WMN

Wilderness Medicine Newsletter

FOR THE RECOGNITION, TREATMENT, AND PREVENTION OF WILDERNESS EMERGENCIES

JULY/AUGUST 1996 ISSN-1059-6518 VOLUME 7, NUMBER 4

THE MUSCULOSKELETAL SYSTEM PART I SPRAIN & STRAINS

by Franklin Hubbell, DO

The human brain is the master controller of our bodies. It is the pilot, navigator, and guide. The musculoskeletal system is the vehicle that the brain drives as it navigates through life. As with any mode of transportation, it is the vehicle that has a tendency to take the wear and tear, *not* the driver.

The musculoskeletal system has two distinct parts that work together: the skeleton and the musculature. The skeletal system affords us protection from the external environment and the rigid support required for movement. Its bones are the storage site for calcium reserves, required by the muscles for contraction and by the nerves for communication. Its bone marrow is the production site for the cellular components of blood—red blood cells, white blood cells, and platelets. The muscles provide the power of locomotion, while muscular contraction creates a source of heat production. Together the muscles and the bones determine how we look— cosmesis.

The musculoskeletal system consists of bones, cartilage, muscles, tendons, and ligaments. The bones supply a flexible or jointed support structure, a framework that gives the system rigidity and provides protection to internal organs. The bones articulate with each other at the joints.

The articular surfaces (the ends of the bones) are protected by cartilage, a material that is very resistant to wear and tear. The joints are lined with a layer of tissue, a synovial lining, that produces a lubricant. The lubricant is a very slippery substance called synovial fluid, that, like the articular cartilage, helps to limit the wear and tear on the joints.

Joints are held together in close opposition by ligaments. Ligaments are composed of a very tough, sinuous material that spans joints to prevent them from coming apart. It is the ligaments that establish the range of motion for a specific joint.

Locomotion, power, and strength are all supplied by muscles. All motion is created by the contraction of a muscle. Because muscles can only pull, they are set up in opposing pairs so that we can move forwards and backwards, push and pull. A muscle is anchored to a bone at its "origin", but in order for it to create motion or do work it needs to span a joint.

Before a muscle spans a joint it narrows down to a cord-like structure called a tendon. Tendons cross the joint and anchor to the bone on the other side at an insertion point. Because tendons are essentially cables that move back and forth as a muscle contracts and relaxes, they are enclosed in a protective sheath, lined with a synovial lining to provide lubrication. As a muscle contracts it shortens, pulling on the tendon that spans a joint and causing that bone to move, flex, or extend on the other side of the joint.

The last structures to understand are bursae. Bursae are sacks, filled with synovial fluid, that are between the tendons and the joints beneath them. Again, they prevent premature wear and tear on the joint surfaces when the tendons slide back and forth across joints as the muscles contract and relax.

Definitions of terms used in describing injuries to the musculoskeletal system:

Arthritis: Is an inflammatory response that occurs to the articular surfaces of joints from wear and tear or from an underlying disease state, causing localized pain and swelling to the joint and possible destructive changes to the joint.

Bursitis: Is an inflammation and swelling of the bursa sac from direct trauma, overuse, or infection, resulting in pain, tenderness, and swelling of the affected bursa.

Dislocation: Occurs when the articular surfaces of a joint are forced out of proper alignment resulting in pain, tenderness, swelling, loss of movement, and deformity of the affected joint.

Fracture: Occurs when a bone is broken, usually because of direct trauma, resulting in pain, tenderness, swelling, loss of movement, discoloration, and possibly deformity of the affected bone.

Sprain: Occurs when a joint is hyper-extended causing overstretching and injury to the supporting ligaments of that joint. Results in pain, swelling, possibly discoloration, and loss of movement of the affected joint.

Strain: Occurs when a muscle is overused or overextended causing microscopic tears in the body of the muscle resulting in pain, tenderness, swelling, and possibly discoloration in the affected muscle.

Tendonitis: Inflammation and swelling of a tendon caused by repetitive overuse of a particular tendon, resulting in pain, tenderness, swelling, and crepitation (a squeaky sound and feeling when the tendon is used) of the affected tendon.

The injuries defined above have certain commonalities: they all can cause pain, tenderness, swelling, and decreased range of motion. In an effort to better understand how to differentiate, diagnose, prevent, and treat these injuries, we can divide them into four groups. Each group has its own etiology or cause, diagnosis criteria, and treatment modalities.

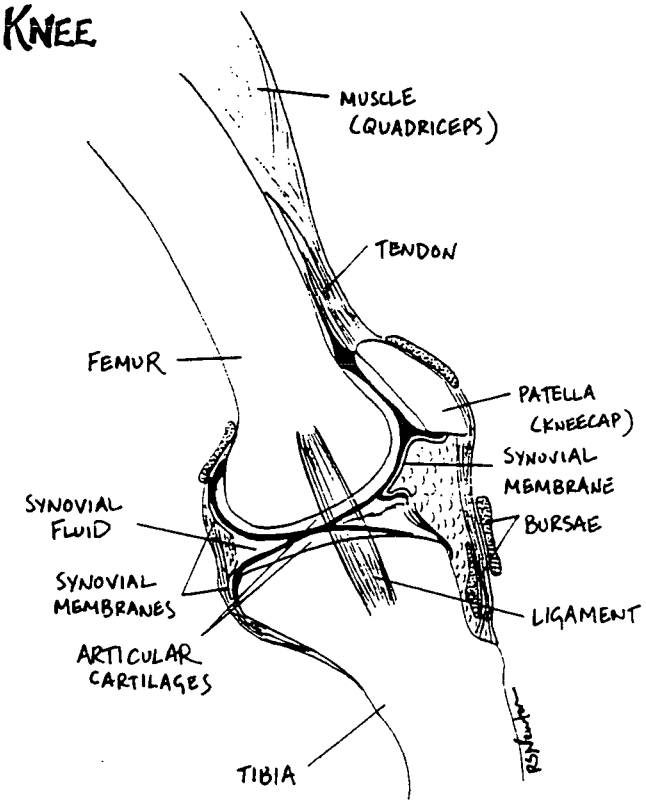
1. Chronic or overuse ailments ("itis"es such as arthritis, bursitis, and tendonitis) are inflammatory conditions.
2. Acute sprains and strains result from minor trauma.
3. Acute dislocations result from more significant trauma.
4. Fractures result from severe trauma.

Over the next several issues of the newsletter we will address each of these conditions. In this newsletter we will begin with the injuries that occur most commonly: sprains and strains.

SPRAINS & STRAINS

Without a doubt, one of the most common injuries at work, at home, or at play is a sprained ankle. Because a sprained ankle is an injury that most of us have suffered at one time or another, it makes a good example of how a joint becomes injured.

A sprain to a joint occurs when the joint is forced beyond its normal range of motion, causing the supportive structures (the ligaments) to be overstretched and partially or completely torn. Any joint in the human body can suffer a sprain, but the ankle is most common because it is constantly at risk. A simple misstep going down stairs or stepping off a curb or a simple slip on a muddy trail can cause instant overextension and ligament damage.



When a sprain occurs, the supporting ligaments of that joint have been damaged. The result is either a partial tear in the fibers of the ligament or a complete tear through the ligament. The torn ligament bleeds and provokes an inflammatory response, both of which contribute to swelling.

The key to success in managing a sprain is to control the swelling; the less an injury swells the faster it will heal. To control swelling, you have to be able to control bleeding. The internal bleeding is controlled by RICE: rest, ice, compression, and elevation.

REST: As soon as possible, you should make the person comfortable sitting or lying to take the weight off the ankle and put it at rest.

ICE: Cool the area down with a wet towel or t-shirt or an ice pack.

COMPRESSION: Wrap the ankle with an ace bandage to apply counter-pressure to the bleeding areas in the ligaments.

ELEVATION: Elevate the affected foot/ankle above the level of the heart to reduce the pressure at the "bleeders".

Sprained ligaments will tend to bleed for up to 72 hours. Therefore it is appropriate to RICE the wounded joint off and on for 72 hours. The mistake that is commonly made is to apply heat or to soak it in a warm bath; this causes dilation of the blood vessels, increasing bleeding and swelling in the affected area. After 3 days, once the injury has stabilized, heat is then the treatment of choice to increase circulation for its healing benefits.

Strains, on the other hand, are injuries to the muscles, where the muscle has been overloaded or overused. The

treatment plan is the same; the less the area swells the faster it will heal.

The trick to understanding these injuries is realizing that the difference between a sprain and a strain is usually academic, because you rarely suffer one without suffering the other. Typically we simply refer to the injury as a sprain or a sprain/strain. Fortunately, we do not have to distinguish between the two because the treatment modality is the same.

Along with RICE, gentle, passive range of motion exercise can help, and taking any non-steroidal anti-inflammatory drug (NSAID) such as naprosyn, aspirin, ibuprofen, etc. may help to alleviate the pain and reduce the swelling. When using NSAIDs make sure that the individual is not allergic to aspirin, is not asthmatic, and does not have a history of gastritis or ulcers.

The most important thing about sprains and strains is that the vast majority of them are preventable by using the proper equipment for the sport, being in shape for the task at hand, and knowing your limits.

An Ounce of Prevention:

- The best way to prevent ankle injuries while hiking is to wear properly fitting hiking boots that support the ankle well.
- The best way to prevent knee injuries is to exercise regularly to keep the leg muscles, especially the quadriceps, in shape.
- The best way to prevent back strain and brachial plexus injuries to the shoulder is to wear a properly fitting pack with a waist belt that is packed properly, keeping the majority of the weight low around your waist. Never carry more than 90 pounds; that is the absolute upper limit of weight that the human back can tolerate without putting it at great risk for injury.

BACKCOUNTRY WATER DISINFECTION

by Rebecca S. Newton, WEMT-B

When you want to rid your water of disease-causing organisms, your tried-and-true options are three: death by heat (boiling), death by chemical (halogenation), or exclusion by mechanical means (filtering). Whichever method you choose, it must be relatively user-friendly if it is to be used consistently and conscientiously. The ideal system is simple, lightweight, quick, and convenient; most of all, it is reliable, or all other factors become useless. While the need to disinfect water comes primarily from the drive to have clean drinking water, only water of drinking quality should be used for cleaning wounds, brushing teeth, washing, and other such activities as well.

In US forests and wild lands, *Giardia lamblia* and *Giardia intestinalis* are often the primary pests targeted for elimination by water purification systems. Distributed worldwide, *Giardia* is a microscopic protozoan (5-21 microns in size), carried in its cyst form in mammal feces. In this form, it is quite hardy, and can survive two to three months in near-freezing water. When the cyst is passed on to another mammal and enters its GI tract, the organism takes advantage of this warm internal environment to enter its active trophozoite phase. Here, it attaches to the wall of the small intestine, causing the intestinal distress common to this disease. Typical symptoms include recurrent and persistent diarrhea, "sulfur burps", indigestion, and abdominal cramping. The incubation period is one to three weeks, and diagnosis is difficult due to the wide variation in symptoms and the high incidence of asymptomatic infection. Humans are a major carrier of *Giardia*, as are many species of wild and domestic animals. To help prevent the spread of this organism, do not dig your cathole or wash close to water sources, and maintain high standards for camp hygiene and water disinfection.

HEAT/BOILING

The most reliable means of water disinfection is, arguably, the simplest. While a five- to ten-minute boil will kill all life forms, a rolling boil is sufficient to disinfect water— that is, to kill all disease-causing life forms. Increasing altitude does decrease the boiling point of water; at 19,000 feet, for example, water boils at 178°F. This, however, is not a consideration in disinfecting water, as a few minutes at 140°F will kill *Giardia*, and a few minutes at 150°F will kill viruses and disease-producing bacteria. The fact then stands that by the time water has been brought to a rolling boil, it is safe to drink, even at altitudes up to at least 19,000 feet.

Boiling requires little precision and uses resources that many backpackers are already carrying on their trips for cooking— a heat source and a container. Extra fuel needs to be carried if a stove is the heat source of choice; extra wood needs to be found if a fire is the heat source used. A stove is recommended to conserve scarce firewood and to avoid the unsightly scarring created by firepits. The primary drawback to heat as a source of disinfection is that it requires time and effort, calling for patience that hikers may not have at the time that they need more water. The equipment needed (stove, pot, and fuel) also adds a great deal of unnecessary weight to a pack if it is not serving a dual purpose— that is, if it is not already being carried for cooking.

HALOGENATION

Chemical disinfection systems, typically employing the halogens chlorine or iodine, are favored by many backpackers. These systems are lightweight, readily available, and relatively inexpensive. Prepackaged tablets or crystals are easy to use, but several considerations must be taken into account when calculating the amount of a given chemical needed to disinfect water. These considerations involve dosage— the amount of chemical to be added— and contact time— the amount of time

that must pass after the chemical is added before the water is safe to drink. Water temperature, pH levels, and organic content all influence the dosage and contact time needed for disinfection. While temperature and pH level are difficult to influence in the field, it is always a good idea to reduce the amount of debris in your water before adding halogens. A bandana or a coffee filter will serve as a useful makeshift filter, or a commercial filter may be used. After a preliminary filtering, directions from the halogen system's manufacturer should be followed carefully and conservatively.

Halogenation kills bacteria, protozoan cysts, and diarrhea-causing viruses. While most bacteria tend to be very sensitive to halogenation, *Giardia* and viruses require longer contact time or larger doses of the chemical. As a general rule, chemical dosage can be halved if contact time is doubled, and cold water requires a longer contact time than warm. Chlorine is particularly sensitive to pH levels, organic matter, and pollutants, and, as chlorine compounds tend to be unstable, chlorine is generally unreliable for wilderness travel. For those with thyroid disease or a known allergy to iodine, however, chlorine may be the only chemical option. Superchlorination is reliable, but must be followed by dechlorination with hydrogen peroxide— a caustic agent with which care must be used— to make water acceptable to drink. Iodine is more reliable than chlorine, as it is less sensitive to pH levels and contaminants, and it has a less unpleasant taste. Drink mixes may be used to improve the taste of water after chemical treatment, but care must be taken not to add them until after treatment is completed, as they can bind with the halogen and interfere with disinfection.

Several distinct disadvantages to chemical treatment remain. Halogenation often requires even more patience in waiting for efforts to take effect than does boiling. The user must be conscientious to assure that the chemical contacts all the water in the container— even the threads around the mouth of the bottle, if appropriate. Even more serious is the problem that the bothersome *Cryptosporidium* is highly resistant to chemical disinfection. Contact time required to kill *Cryptosporidium* with a 1 ppm solution of chlorine is 160 hours— far greater than the length of many backcountry trips! Reliable means of eliminating this organism remain limited to boiling or filtering with a device that has a pore size of less than one micron.

FILTRATION

The key to using a filter safely is knowing its capabilities and limitations. Does your filter have the necessary components to eliminate viruses and protozoa, or does it simply rid your water of bacteria? While a filter that removes *Giardia* and bacteria may be all that is necessary for travel in the US, a more complex system may be desirable for overseas travel. Some filters include an iodine resin that eliminates all disease-causing organisms, while others do not even have pores small enough to eliminate all bacteria.

The greatest advantages to using a filter are that models are available that can kill all disease-producing organisms, and the most up-to-date models tend to be reliable, compact, and lightweight. A filter is convenient; no pretreatment preparations are necessary, and water can often be drunk immediately after pumping. Filtering eliminates the need to wait for cooling after boiling or for the effects of halogenation to take place.

As with every system, though, drawbacks to using filters remain. The best filters may be quite expensive, while less expensive models may be heavy and bulky. Prices range from roughly $30 to over $200. Replacement parts may cost as much as the original investment. Filters may need to be combined with chemicals in order to be fully effective against disease-causing organisms. Pumping water through a filter takes time and physical effort, and the user must be cautious not to let any untreated portion of the filter touch the components that deliver the treated water. Finally, any mechanical system is fallible, and a filter may have a defect or acquire damage that goes undetected yet renders the system unsafe.

PREVENTION: HEALTH AND HYGIENE TIPS

As always, the best way to deal with infection from contaminated water sources and related illness is prevention. In the spirit of prevention, the following is a list of suggestions that can help keep your camping and travelling safe and healthy:

* Always disinfect drinking water, no matter how clear and clean it appears
* Wash hands frequently with soap and warm water, especially before cooking or eating
* Do not share utensils or water bottles
* Do not use chipped or rough bowls or utensils— they encourage bacterial growth
* Rinse cooking gear well to remove soap residue that may cause diarrhea
* Boil cooking utensils daily
* Pour foods from bags whenever possible— do not reach in
* Rinse (with drinking-quality water) or peel fruits and vegetables before eating
* When travelling abroad, keep in mind that if the water source is questionable, the ice is too

Water treatment can feel like a nuisance— whether it's because you're in a hurry to climb the peak before thunderheads roll in or because you feel as if you're the only creature who's ever discovered the remote and pristine corner of the planet in which you sit, picnicking beside a clear stream. Struggling to protect yourself from problems you can't see can feel futile. But it takes only one infection to ruin a backcountry trip, and to make the several weeks to several months following your trip miserable. So find the method of water disinfection that fits your travel style best— and be faithful to it. It will reward you in ways you'll be glad not to know.

References and sources for further reading:

- Rick Bennett. "Waterborne Diseases and Disinfection Techniques" (workshop #2 and #5) in notes from the Sixth Annual Winter Wilderness Medicine Conference, presented by the Wilderness Medical Society. Big Sky, Montana: February 10-16, 1996.
- Tod Schimelpfenig and Linda Lindsey. *NOLS Wilderness First Aid.* Lander, WY: National Outdoor Leadership School/Stackpole Books, 1991.
- Buck Tilton and Rick Bennett. *Camping Healthy: Hygiene for the Outdoors.* Merrillville, IN: ICS Books, 1995.
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THE MEDICINE CHEST: PAIN PILL PARADE

by David Baughan, MD

"There are so many pain medicines advertised in the media nowadays. Are there any real differences between them?"

If you walk down the aisle in any supermarket or drug store where the non-prescription (over-the-counter or OTC) pain medications are shelved, you will see a dizzying selection to choose from. If you open a magazine or watch an hour of television, it is hard to avoid advertisements expounding the virtues of popping a certain pain pill in preference to all others. If you read labels, though, you will discover that all the different brands have one of five pain-relieving ingredients - aspirin, acetaminophen (Tylenol, various other brands), ibuprofen (Advil, Motrin IB, etc.), naproxen (Aleve), or ketoprofen (Orudis).

For pain relief, there is no consistent advantage of one over any of the others. If you had 100 people with headaches or sore muscles and first gave them aspirin, next time acetaminophen, then ibuprofen, and for the fifth occasion, naproxen, then asked them, "Which one worked best?" — you would get as much agreement as the typical New Hampshire town meeting. The 100 people would be split into fairly even groups of five. And each group would be sure the other four groups were crazy or lying.

There are differences between them, but the differences are not in strength or effectiveness. They all work about the same to bring fevers down. A few preparations add some caffeine or antihistamines that may or may not help someone feel better for other reasons (keep awake or put to sleep). But the key differences are in their side effects on inflammation, blood clotting and side effects.

If pain is accompanied by warmth, swelling or redness (such as in arthritis or tendonitis), there are usually chemical reactions occurring that cause inflammation. Aspirin, ibuprofen, ketoprofen, and naproxen all reduce inflammation; acetaminophen does not have as much anti-inflammatory effect. Taking these medications on a regular schedule helps control inflammation better than taking them only when the pain is severe.

Aspirin, and to a lesser extent, ibuprofen and naproxen, interfere with the blood's clotting ability. This may be a positive effect to help prevent heart attacks or strokes; it could be life-threatening, though, if someone has a bleeding ulcer. Acetaminophen does not affect blood clotting.

The most common side effect of aspirin, ibuprofen, ketoprofen, and naproxen is to cause heartburn. These medicines can all cause ulcers in some people. They also run a risk of kidney damage in high doses in a few people. Acetaminophen does not irritate the stomach. It, however, can harm the liver if a person has liver disease or takes too high a dose repeatedly.

All of these medicines can interact with other medicines a person takes. It is best to review with your health provider what non-prescription medicines are safe to take with your prescription medicines. No medicine is without risk; consider other ways to relieve pain — rest, a massage, an ice pack, meditation, a change of work pattern or lifestyle. Use these medicines, like all medicines, with respect, and don't be swayed by the enchantments of Madison Avenue.

CONFERENCE UPDATE

1996 National Collegiate EMS Foundation Conference
Hosted by Rensselaer Polytechnic Institute Ambulance
October 11-14, 1996
RPI, Troy, New York
To register call: Henry Dunham at 518-279-4312

SAR*SCENE* '96 Atlantic Canada
October 16-19, 1996
Nova Scotia, Canada
To register call: 800-727-9414 or 613-996-3733

Wilderness Risk Managers Conference
Hosted by NOLS and Outward Bound
October 24-26, 1996
Sunday River, Maine
To register call: Drew Leemon, NOLS at 307-332-1256 or Lewis Glenn, Outward Bound USA at 914-424-4000

Wilderness Medical Society
1997 Winter Meeting on Winter Sports and Expedition Medicine
February 1-5, 1997
Steamboat Springs, Colorado
To register call: 317-631-1745

FROM THE EDITOR:
An Update on Wilderness Medicine Training

Standardization, Accreditation, Risk Management— these are the buzz words of the 90s when it comes to outdoor education and adventure programming. Integral to each of

these concepts is the training of staff, trip leaders, and guides, at every level in the many different fields of expertise necessary for employment. Somewhere, either disclosed in the interview or hidden among the verbiage of a job description, is a reference to appropriate medical training. Ironically, in this litigious society, medical training is the one area where there continues to be great ambiguity. Still today, the spirit of the industry is "let the buyer beware." What does this then mean to the consumer— the expedition leader, the raft guide, the camp counselor and, ultimately, the injured patient? It means you need to know what questions to ask....

Given the environs where most outdoor education and adventure programs take place, the current trend is toward wilderness medical training, and rightly so. For years people all across the country have identified the fact that standard first aid and safety programs like those designed by the American Red Cross and the National Safety Council filled a very specific need in the urban environments, but when the attempt was made to transfer them into the backcountry, they fell short. Increasingly over the past ten years the *de facto* standard used by hiring organizations has been to either require or provide training specifically in wilderness medicine to compensate for the deficits of these urban medicine programs.

So what is wilderness medicine and why the comment "let the buyer beware?" First of all, keep in mind that prehospital emergency medicine as we know it today is a fairly young field. Wilderness emergency medicine as a subspecialty of prehospital emergency medicine has been evolving in this country since the early 1970s. At its beginnings, the number of schools offering these programs could be counted on one hand. Today, on the other hand, the number of individuals who, having taken a wilderness medicine course, feel they are now qualified to offer their own certification program is increasing. This becomes a problem for consumers in that they have no way of knowing if the wilderness medical program in which they've enrolled is credible; if there is any kind of medical oversight and direction by a physician or board of physicians; if there is an avenue for recertification; or if the certification will be recognized and accepted by the outdoor organizations who are doing the hiring.

Over the years, organizations in the United States such as SOLO, Wilderness Medical Associates, and Wilderness Medicine Institute, have earned a reputation for high quality training by offering the *de facto* industry standard programs, fighting the recognition/acceptance battles with the individual states and national organizations, backing up their certifications, and demonstrating the staying power to stand by their credentials through thick or thin. When students walk away from these programs with their certification cards, little more is later needed in the way of verification of the training that they have received.

Brought to light by a group of concerned outdoor organization heads at the 1994 Wilderness Risk Managers Conference in Conway, Washington, there has been a tremendous proliferation of wilderness medicine certifications— so many, in fact, that these organization heads didn't know whose certifications to accept. Concerns revolved around whose courses included what curriculum components and where to look for verification of credibility and quality assurance.

As a response to these concerns, many of the providers of wilderness medical training agreed that a movement toward standardization was imperative and that its success depended upon the leadership of the larger, more established wilderness medicine schools. At the time there was perceived to be a great crevasse separating the program efforts among what many dubbed "the Big Three"— SOLO, WMA, and WMI. Collectively, for the good of the industry, the three agreed to put differences aside, to sit down with neutral representation (first thought to be an Outdoor Recreation Coalition of America {ORCA} representative, later decided to be a Wilderness Medical Society representative), and work to that end.

In February 1995, a working group called the National Association of Wilderness Medicine Educators (NAWME) gathered with the intention of establishing a not-for-profit prehospital body of educators. NAWME's primary goals were to come to agreement on a minimum standard for the Wilderness First Responder curriculum to work on an accreditation process for wilderness medicine training agencies, and to look at the bigger issues of quality assurance, instructor credentials, and recertification issues.

By August 1995, the Wilderness Medical Society (a national membership organization of physicians and other healthcare professionals specializing in wilderness medicine) offered to be the leaders in the curriculum project in lieu of NAWME. Their major concern was that training organizations such as SOLO, WMA, and WMI had such a vested economic interest, that they were unable to represent the "little voices." The counter-concern from the NAWME group and a significant number of other "younger" providers was that the Wilderness Medical Society would collect the curricula from these various organizations, synthesize them, and then offer their own WMS-approved course— the end result of which no organization wanted to be a part. After receiving written assurance from the Wilderness Medical Society president in February 1996 (which obviously does not bind the decisions of future boards) that the WMS had no intention of offering training programs or certification, NAWME was dissolved and the task of standardizing a WFR curriculum was turned over to a subcommittee of WMS, the Prehospital Emergency Training Standards and Accreditation Committee (PETSAC).

To date, the Wilderness First Responder curriculum, standardization process continues through PETSAC. Organizations from all over the United States and Canada are participating at various stages, but we're not there yet. By the end of the year, a solid draft should be complete and discussion will need to be turned to what part of the process will ensue. Questions such as whether or not other training programs should be tackled in the same fashion and how the

standardized curriculum will be monitored need to be answered. In the meantime, knowing that the efforts are underway, there need to be some stop gap measures to assist individuals in selecting a credible program. In order to help the "buyer beware," the following is a list of some questions to ask *before* enrolling in a wilderness medical training program of any sort:

1. Who currently recognizes your certification? (Call those organizations to verify.)
2. Who oversees the medical curriculum? (There should be a physician or board of physicians versed in wilderness medical protocols.)
3. What kind of credentials do your instructors have? (They should have a background in education, medicine, and the outdoors and be certified at an appropriate level.)
4. What other wilderness medical training agencies will recertify your certification? (Call those organizations to verify.)
5. For how long is the certification valid? (Two to three years is standard— longer is open to argument.)
6. In what documents does the curriculum have its genesis? (ASTM and DOT tend to be considered adequate places to start, whereas standard American Red Cross and National Safety Council first aid curricula are considered to be inadequate.)
7. What kind of quality assurance program is there for new and veteran instructors?

In the end, rest assured that there are "legitimate" sources of wilderness medical training available in the United States and Canada. Although anyone can put out a sign and print certification cards, the wilderness medicine training organizations that are willing to participate in efforts to benefit the overall good of the industry and to further the understanding of wilderness medicine education will have the necessary components to provide a lasting, recognized, and quality program. *Those organizations who continue to actively participate in the standardization process are summarized in the table below.* Individuals who are interested in learning more about the standardization process or have questions or concerns should direct letters to the training organizations' representative to PETSAC: Holly Weber, Editor, *Wilderness Medicine Newsletter*, PO Box 3150, Conway, NH 03818.

American Alpine Institute/Wilderness FACTS - Bellingham, Washington
Creative Wilderness Experiences - Hainesport, New Jersey
Donelan - Berkeley, California
First Lead - Telluride, Colorado
Front Range Institute of Safety - Fort Collins, Colorado
Maine Bound - Orono, Maine
National Outdoor Leadership School - Lander, Wyoming
Columbia College Search and Rescue - Saratoga, California
Slipstream Adventures - Victoria, British Columbia
SOLO - Conway, New Hampshire
Wilderness Health Care - Honolulu, Hawaii
Wilderness Medical Associates - Bryant Pond, Maine
Wilderness Medical Society - Indianapolis, Indiana
Wilderness Medicine Institute - Pitkin, Colorado
Wilderness Medicine Outfitters - Elizabeth, Colorado

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Dec. 30 - Jan. 24 Conway, NH (603-447-6711)

Wilderness First Responder
Aug. 29 - Sept. 6 HIOBS, ME (800-341-1744)
Sept. 11-19 Outward Bound, MD (800-341-1744)
Sept. 27- Oct. 6 Outward Bound, FL (904-224-2752)
Oct. 5-13 Northwest Passage, IL (708-256-4409)
Oct. 11-19 HIOBS, ME (800-341-1744)
Oct. 21 - Nov. 1 AMC, NH (603-466-2727)
Nov. 17-27 SOLO, Conway, NH (603-447-6711)
Nov. 29 - Dec. 8 Wheeling, WV (603-447-6711)

Wilderness First Aid/WFR Recertification
Sept. 4-6 Lake Placid, NY (518-523-9393)
Sept. 14-15 Del. Valley, PA (610-279-5900x244)
Sept. 21-22 UNE, ME (207-283-0171)
Sept. 24-25 Spokane, WA (603-447-6711)
Sept. 28-29 AMC, NH (603-466-2727)
Sept. 29-30 Spokane, WA (603-447-6711)
Oct. 18-20 Dartmouth, NH (603-646-2428)
Oct. 4-5 Seascape, CAN (506-529-4866)
Oct. 5-6 Outer Quest, DC (301-258-1914)
Oct. 18-20 Dartmouth, NH (603-646-2428)
Oct. 19-20 Alexandria, VA (703-836-8905)
Oct. 26-27 Alexandria, VA (703-836-8905)
Oct. 26-27 Sierra Club, FL (813-914-8057)
Nov. 8-10 Seascape, CAN (506-529-4866)
Nov. 23-24 AMC, NH (603-466-2727)

Wilderness/Rural EMT/FR Module
Nov. 13-17 AMC, NH (603-466-2727)

Wilderness First Responder Review
Sept. 7-8 HIOBS, ME (800-341-1744)
Sept. 9-10 Outward Bound, MD (800-341-1744)
Oct. 5-6 HIOBS, ME (800-341-1744)
Nov. 30 - Dec. 1 HIOBS, ME (800-341-1744)

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Aug. 24-25 School Bus Rescue, NH
Sept. 7-8 High Angle Rescue, NH
Oct. 11-13 Adv. High Angle, NH
Nov. 23-24 Search & Rescue, VT

WILDERNESS MEDICINE INSTITUTE
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Wilderness EMT
Nov. 25 - Dec. 20 Kelly, WY (307-733-4765)
Dec. 30 - Jan. 24 Pitkin, CO (970-641-3572)

Wilderness First Responder
Oct. 19-27 Bass Lake, CA (209-642-3899)
Oct. 21-30 Tahoe, CA (970-641-3572
Dec. 2-12 Kelly, WY (307-733-4765)

EMT Refresher/Transition Course
Nov. 8-9 - Pitkin, CO (970-641-3572)

Wilderness/Rural EMT Module
Nov. 12-17 - Pitkin, CO (970-641-3572)

WMN

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FOR THE RECOGNITION, TREATMENT, AND PREVENTION OF WILDERNESS EMERGENCIES

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ZAP! BANG! WHAT WAS THAT?

A Look at Lightning

by Bryan Yeaton, WEMT

Gerrish Island lies near where the Piscataqua River, dividing coastal Maine and New Hampshire, empties into the Atlantic. The island is popular with sea kayakers, with many inlets and coves to explore. On July 23, 1994, four kayakers sought refuge against an approaching thunderstorm in an old World War II bunker on the island, thinking it would be safer than the open water. Usually, they would have been right. But not on July 23. And not in a bunker reinforced with highly-conductive steel.

Others on the island during the storm reported seeing the bunker hit, but Chris Perry, one of the kayakers, doesn't remember any of that. "All I remember," he said in a report from the Associated Press, "is capsizing the boat, then righting it. The next thing I remember is waking up Sunday night in the hospital."

According to witnesses, all four were unconscious after the strike. Perry and 48-year-old John Freund required Cardio-pulmonary Resuscitation (CPR). Perry and two others were fortunate; Freund, the father of another of the paddlers, died in the hospital twelve hours later.

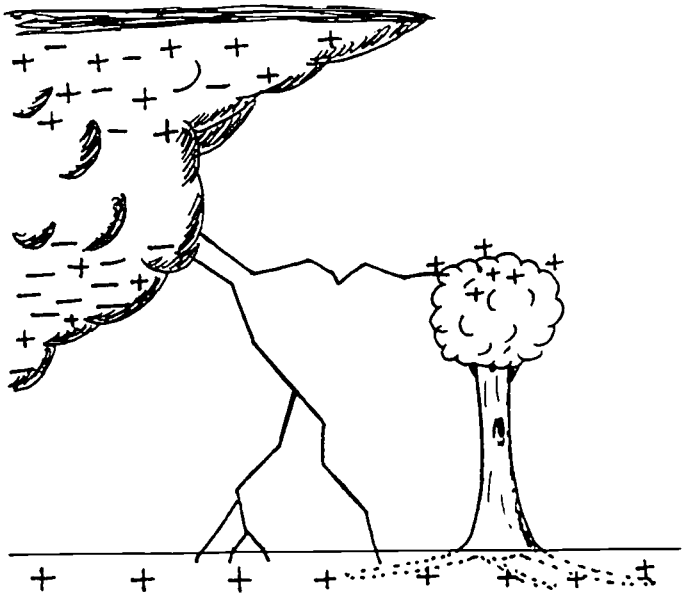
★ ★ ★

Shortly after midnight in July of 1982, Bob Walker* awoke to a huge clap of thunder. Although partly paralyzed after being struck, he realized he had other concerns: the group of teenagers he was leading up Mount Moraine. He and co-leader Warren Archer set out to check the tents. In one tent they found an unconscious 15-year-old student, whom they were able to rouse. When they got to the tent of the third leader, Heather Barnes, there was trouble. Barnes was sharing a tent with two sisters; the younger one, 13, was not breathing. Barnes began artificial respiration, but Walker could not find a pulse, and began CPR. Within a minute, Archer joined in to form 2-person CPR. For ten minutes, the two worked while ers obtained help at a nearby campsite. Paul Carson, an instructor with a local guiding School, arrived and took over for Walker. Within seconds of the switch, the student gasped; a subsequent pulse check verified the return of the heartbeat, although very weak.

Walker and another local guiding school instructor went down the mountain for assistance while more storms rolled in. Through the long night, the patient struggled through convulsions and semi-awareness, while the threat of more lightning caused the leaders to move the rest of the group to safer ground a short way down the mountain. By 7:15, nearly six hours after being struck, the patient lapsed back into a coma. Pulse and breathing faded but remained present.

Meanwhile, after their own epic to contact help, Walker and the instructor managed to contact the sheriff's department, which organized a rescue party. A nearby naval air station sent over a helicopter to try and pluck the patient off the mountain, but was thwarted by weather. Finally 10 1/2 hours after the strike, the patient was evacuated by litter, and reached the hospital still comatose. She remained in a coma for three weeks before emerging rather suddenly. She appears to have recovered very well, and is back in school.

Lightning has some amazing capacities, some of which we even understand. Still, when we are trying to avoid lightning, we are— to a certain extent— rolling dice, because lightning can do and has done whatever we least expect. So why even bother to do anything? Because, as with anything in science, though we cannot predict a particular outcome precisely, years of observation have demonstrated common patterns which, while not guaranteeing safety, can certainly put the odds in our favor. Before looking at how to avoid such a situation, and the devastation it can wreak, it may be helpful to understand the physiology of the storm and the strike.



"A BOLT FROM THE BLUE"

The phenomena which causes lightning is exactly the same as when you scuff your feet along the carpet on a cold, dry winter's day. By separating electrical charges, you are creating an imbalance Nature wants to equalize; when the charge potential is greater than the insulating capacity of the air (or resistance), the electricity will "arc" to the ground- you get a shock, and Nature has its balance.

Of course, in an electrical storm, the charges are significantly greater, so the bolt can arc over greater distances. Most often, such a storm occurs when a cooler, drier mass of air replaces a warmer, more humid mass by burrowing underneath and forcing the warm air upward, sometimes at great velocity. This rapidly rising air condenses into clouds (sometimes called "cells") whose tops may be over 40,000 feet above sea level, well into the jet stream The summit of Everest, by comparison, is 29,028 feet. This wind can push the top of the cloud ahead, creating the classic anvil shape (see diagram).

Meanwhile, static charges build as billions of collisions occur between ice crystals and water droplets; negative ions are pulled from the ground, leaving the ground with a positive charge, while the base of the cloud becomes mainly negative (the top of the cloud is also positively charged, enabling the most common lightning: within the cloud). When this potential overcomes the air's resistance— ZAP!— you get a very long spark: lightning. Lightning chooses the route to the ground with the least resistance, which is usually also the shortest. Usually. This is why mountain ridges and Empire State Buildings are poor places to be in a thunderstorm. Moreover, in some cases, buildings and mountains reverse the charges and actually initiate their own flashes.

A similar, though not usually as powerful, situation can occur in areas where the ground heats up during the day, causing the updraft of heated air. These are called convective storms, and are usually not more than an hour each in duration, although several cells in succession can lengthen the duration from your ground perspective. Thus, it is critical to know the weather patterns in the area you are working. In the Blue Ridge of Virginia, my crew was chased off the crest on nine of our twenty-five days in the field. In Minnesota, it was an occasional problem, while in New Hampshire convective storms are not common.

The most dangerous part of the storm is the leading edge, where the most potent charge has accumulated. Lightning usually arcs out in front of the storm, often for several miles. This little known fact is probably responsible for many deaths and injuries in people who saw the clouds and figured they had plenty of time to get off the ridge, off the golf course, or out of the water. This could also be responsible, at least in part, for the phrase "a bolt out of the blue."

The actual bolt is a complex series of events, usually starting with a flow of negative charge (ions) traveling from the cloud toward the ground in a series of steps, called the "stepped leader." These steps are fairly rapid, often in 50-yard segments lasting one-millionth of a second, with an interval of fifty-millionths between steps. The process takes about twenty-thousandths of a second. At this point, according to Martin Uman in his book *All About Lightning*, the charge doesn't really have any specific direction (i.e.. place that it wants to strike), and not until it connects with a flow of positive ions rushing from the ground, only tens of yards above it, is ground zero decided. Then, a huge flow of positive charge surges back up this channel (at 20-60,000 miles per hour), creating the bright flash we see as well as most of the thunder. So if someone asks you if lightning travels from the cloud to the ground or the ground to the cloud, you may answer them emphatically "yes."

The charge in a single flash of lightning is enormous. Normal household current comes in at 220 volts, and most appliances run at no more than 15 amps. In a fraction of a second, lightning can deliver several hundred million volts (some estimates are even as high as 2 billion) at 200,000 to 300,000 amps. As a result, lightning can unleash devastating damage, as well as create some pretty peculiar phenomena.

Lightning can get to you in several ways. The most obvious is a direct strike, which only 20% survive; of those, three-quarters will have permanent neurological damage. More common ways of being "struck," and more survivable, are "splash" and "step," the latter also called "ground" or "ripple." Splash occurs when the main charge strikes a nearby object, say a tree or building, and splashes over to you, with the charge dissipating over increasing distance. Similarly, step current also weakens over distance, but the big jolt has struck the ground and traveled out on concentric rings, either through the soil, through root systems, or even through things such as wet pavement. The better the ground at conducting, the more potent your charge at a given distance. There is also the "blast" effect, to be discussed later, caused by the same rapid expansion of air (most scientists believe) which precipitates thunder.

Surprisingly, burns are not the most severe problem in dealing with a lightning-injured patient. Even the heart is only temporarily stopped in most cases, as the electricity shocks it similar to a defibrillator. However, it does have an affinity for the most electrical organ in your body: the brain. Furthermore, lightning can zero in with surgical precision to the respiratory center in the brainstem, and knock out the drive to breathe. Indeed, it is believed that the majority of cardiac arrest in lightning patients results secondarily from respiratory arrest. So the key in these patients is aggressive, longer-term CPR; since there is nothing structurally wrong with the heart, such as coronary artery disease, these are some of the most salvageable patients in cardiac arrest. However, since the respiratory center is affected, you may have to continue artificial ventilation (either pocket mask or BVM) for extended periods, even after the heart has resumed beating. At the hospital, patients will be attached to a ventilator which performs automatically until respiration returns on its own. This can take hours or even days, and there is even one report of a patient needing the ventilator for two months before respiration returned on its own.

The possibility of revival of these patients by CPR alone, and the lack of life-threatening danger to those with pulses and breathing, causes us to reverse our standard triage rules. Normally, in a mass casualty situation, we must write off pulseless patients to concentrate resources on those who have a chance of survival (arrests from traumatic causes have a poor prognosis). The "walking wounded" in a lightning scenario are probably not only going to survive, they are potential resources to perform CPR and other patient care. Even though the normal backcountry protocol for CPR is to stop if it hasn't worked within 30 minutes, exceptions are often made for lightning strike victims. Heart tissue is healthy in a lightning-injured patient— not dying because of disease— therefore, we do CPR for as long as we can, since getting oxygen to the heart can be enough to revive the patient. There are reports of lightning patients being saved after thirty minutes of continuous CPR; however, according to Mary Ann Cooper and Christopher J. Andrews in their chapter on Lightning from Wilderness Medicine (edited by Paul S. Auerbach), these are not well-documented.

Much neurological dysfunction occurs over the longer term, and only perhaps 25 percent of strike victims escape without any neurological loss. At least half of patients are knocked unconscious, some have partial paralysis, but most recover quickly, and permanent damage will result in only about a quarter. Some patients do suffer severe, permanent loss, but that must be assessed in a hospital, and should not affect your first aid care. As stated, most patients, except those in cardiac arrest, will survive without further intervention, allowing you to concentrate effort on pulseless or breathless victims.

Burns do happen, but most are fairly minor, due to the "flashover effect." Since lightning prefers the least resistance, it often chooses to travel over the outside of an object. On a hot, humid day, your body is usually covered with an electrical conductor: sweat. It is much easier for the charge to travel around than through you. However, several hundred million volts traveling through this water causes it to vaporize, expanding 10,000 times. The result often is that victims will have their clothes literally blown off, leaving them standing addled and naked, but otherwise unhurt. It is not recommended that we try this as an experiment to see if it does, indeed, work.

The way to get a serious burn is to create a path for the charge to get to ground through your body, like leaning against a tree which is struck, or standing in a nice wide stance with metal-spiked golf shoes rooted to the ground. Internal burns of critical areas— cranial, cardiac, pulmonary— carry high mortality.

Most lightning-induced burns are either linear or punctuate, the latter appearing somewhat like wounds from shotgun pellets. Both are treated as you would treat any burn. One other burn-type injury commonly associated with lightning is now not considered to be a burn at all. Many patients would present with a "fern-like" or "feathery" pattern, which was hypothesized as being the burned imprint of nearby vegetation or caused by the burning of fluid in the capillaries. It is now believed to result from the flow of ions over the skin. It is apparently harmless, and no treatment is required.

There are other, less common injuries associated with lightning, which are treated normally, depending on your assessment. Because of the blast effect, the victim can be thrown violently for some distance, resulting in any type of major or minor trauma. Thus, any patient struck by lightning (or any electrical charge)— even if he or she appears healthy— needs to be evaluated in the hospital. The possibility of internal damage and long-term consequences makes it vital that you perform complete and thorough primary and secondary surveys (or initial and ongoing assessments for EMT's in the new curriculum). Also, do not forget about hypothermia; wet and injured patients get cold very quickly.

PREVENTION

Many are the myths associated with lightning, and many, too, are the suggested remedies and ways to keep oneself from being struck. Uman discusses the belief, which persisted into the 1700s, that the pealing of church bells either: scientifically, broke up the electrical channel that lightning would follow (wrong); or, commonly, warded off evil spirits. Such beliefs cost 103 bell ringers their lives over a 33-year period. Uman notes that Medieval church bells are often inscribed *Fulgura frango*: "I break the lightning."

Our twentieth-century wisdom allows us to admit there is still much we do not know about lightning. But, there are things we do know, and some places we definitely do not want to be. Still, as with anything in medicine, it is much easier to prevent lightning injuries than to treat them. If you are in a

situation where you are in lightning danger, the problem has most likely arisen in the planning stage.

Most obviously, you do not want to be on a mountain peak or ridge during an electrical storm (or even if there is potential for one), no matter how beautiful you expect the sunset to be. Storms with such violent potential can build quickly, or move with surprising speed. Odds are still that lightning will strike the highest object, and, on a peak or ridge, you are it. The key is to be off before the storm hits, or to have an alternate plan if your route will take you over such geography in a storm.

If you are in imminent lightning doom and trying to scurry down the mountain, it has been suggested that going down the lee side, opposite from the approaching storm, may be safer, due to lightning's tendency to strike out in front. Above treeline, a boulder field is often not a good place to hunker down, as the rocks will probably be of fairly uniform heights, with none offering any particular protection. Gullies or ravines, while affording a lower venue, are where the rushing water is going to collect. The electrical current of a lightning strike has a penchant for these natural water pathways. If you are in that same path...

Being below treeline is often recommended as the place to be, but it still is no guarantee against being struck. For this reason, it is recommended that groups spread out with 30 to 40 yards between individuals, so that if only one or two are struck, there will be survivors left to do CPR. Also, if there are multiple leaders, they should be at opposite ends of the group so that there is a better chance that at least one will be able to assume control.

Once in your (relatively) secure location, the classic "lightning safety" position is standing or squatting on a non-conductive pad (such as ensolite). The smaller you can scrunch yourself comfortably, with no extraneous limbs hanging over, makes it less likely for the charge to arc. This position, apart from being low to the ground, aids in separating you from ground current by not giving lightning a reason to arc up through your body and back to the ground. The pad doesn't really insulate you from the charge; in order to protect from a direct strike, your insulation would have to be over a mile thick!

If you should happen to pass a pleasant looking cave on your way down the mountain, keep on hiking. Although in specific circumstances caves can be safe places to wait out a storm, the requirements for such are somewhat complex, and not something you want to be figuring while Zeus is taking aim.

Here is an often-asked lightning question, which sounds like it has come straight off the SAT's: You are at the exact center of a perfectly circular lake, in an aluminum canoe. A thunderstorm is coming at you from the west at thirty-five miles per hour. Where do you go? A) Into the storm. B) Away from the storm. C) Toward either lateral shore. D) Get out of the canoe and into the water, as you will no longer be the tallest object around. or E) Find religion and use it quickly.

There probably is no perfect answer to this query; however, "A" seems to make the most sense, as it puts you under the dangerous part of the storm— the leading edge— for the shortest time. "B" and "C" aren't terrible options (at least compared to the situation you are already in), but as to "D;" were I to be knocked unconscious, I would prefer to be in the canoe rather than floating in the water. Some river guides have related that, in steeply-sided, narrow canyons, they feel it safest to continue down river, rather than get to shore, due to their perception that lightning will strike at a sharp-enough angle so as to strike the walls and not the river. There may be some validity to this reasoning, although the author has not seen a study done on this. It may also just be that the odds have not yet caught up with the rafters.

A FINAL REITERATION

Lightning is powerful and beautiful, terrible and deadly: consistently the most deadly natural disaster in the United States. As outdoor users, our best protection from lightning is not to put ourselves or our groups into locations and/or situations where lightning has a good shot at us. Barring that, you may play your cards the best you can, but the dealer still controls the odds. We go out into the wilds for many reasons, for the beauty, for the challenge. But when we deal with the stunning forces of Nature, discretion is certainly the better part of valor. If you choose to pit yourself against a lightning storm, all two billion volts of it, you will lose.

**Although this is an actual account, the names and places of those involved has been changed to protect their privacy.*

PRIMARY SOURCES AND FURTHER READING

All About Lightning; Martin A. Uman. Dover Publications, Inc. Mineola, N.Y. (1986). Although some of the facts are dated, Uman is one of the world's leading experts on lightning, and his explanation of the physics of the lightning stroke, as well as some historical perspective, are entertaining and informative.

"Lightning Injuries;" Mary Ann Cooper, Christopher J. Andrews; Chapter in *Wilderness Medicine*, Management of Wilderness and Environmental Injuries, Third Edition, Edited by Paul S. Auerbach; Mosby Year Book, Inc. St. Louis, Mo. (1995). This book is written primarily for physicians, but there is plenty of treatment to learn for the Wilderness Rescuer. Dr. Cooper, working out of Chicago is an authority on treatment of lightning injuries, and is featured on the Weather Channel's excellent lightning video: *Sky On Fire*.

Another informative video on lightning comes from the PBS series *Nova*, and may be available through your local PBS station, or through several video catalogs.

THE 1996 EVEREST TRAGEDY

Retrospective...and Lessons Relearned...
By Charles Houston, MD

Editor's Note: The following article appeared as a letter to the Editor of The Newsletter of the International Society for Mountain Medicine *in the Summer, 1996 Edition. Because the content is so germaine to the principles of wilderness medicine, we have reprinted this with the permission of Dr. Houston and the ISMM.*

The comments that have been made about the tragedy on Everest last May are right on target. As the climbers straggled back to the South Col or died, I watched helplessly on my home computer as consultant on high altitude for the McGillivray Freeman Company who were making an IMAX film on Everest at the time. It was bizarre, watching from the comfort of home, as the disaster grew. I longed to shout advice: perhaps every major expedition should have a cyber-consultant who is unaffected by altitude!

Pete Schoening, who had saved our lives as we struggled down after ten days of storm near the summit of K2 in 1953, was with one of the Everest teams, and even though Pete is too experienced to have been caught, I did worry specifically for him.

Also I thought back to 1938 on K2, when Pasang Kikuli (who had been with me on Nanda Devi in 1936) warned us that the weather was changing "just like Nanga Parbat" where he had been one of the few survivors. We turned back safely just below the summit, to climb again!

Nine people died high on Everest last May and mountaineers can learn much from the tragedy - if we choose to do so. It was eerily reminiscent of the German disaster on Nanga Parbat in 1934 when three climbers and six Sherpas died during their disorganized retreat through storm. It was also much like the deaths on K2 in 1986, and yet again in 1995. All were major disasters, and all shared the same causes - four hostile factors - **four H's** - which impact humans at altitude.

1. **HYPOXIA** impairs judgment, slows reflexes and dulls perception of reality. On Nanga Parbat in 1934 and on K2 in 1986 and 1995, experienced climbers died because of poor judgment and bad decisions. At those great heights, even using good oxygen equipment, a climber is still hypoxic because his inspired oxygen is only that which a person gets breathing air at 22-23,000 feet. Bear in mind that a climber who is relying on bottled oxygen is not as well acclimatized as one who is not. The climber may feel a bit better using supplemental oxygen and make better decisions perhaps, and is not as devastated by hypoxia. But he or she will be worse off when the oxygen supply runs out than is the individual who has been breathing air all along. The shock of losing supplementary oxygen is severe - like being taken in minutes from a comparatively 'safe' altitude to a very dangerous one.

2. **HYPOTHERMIA** dulls the mind much as hypoxia does, and even the best clothing will not fully protect against cold when a person is not active. A great deal of heat - and water - is lost when the huge volume of inhaled cold dry air is exhaled, draining body heat and water. Cold climbers are liable to make mistakes.

3. **HYPOGLYCEMIA** (low blood sugar due to lack of food) causes similar mental impairment, in addition to weakness. The cold, hungry climber high on Everest is in serious danger.

4. **HYDRATION** is very important because not enough water thickens the blood, making it move sluggishly through the blood vessels, thus further depriving the body of oxygen and nutritives like sugar. The brain and extremities are particularly vulnerable. Unless a person drinks at least a gallon of water a day, the totally dry air on high mountains rapidly causes dehydration.

These four hazards are additive and cumulative, and, as you noted, caused most of the casualties on the expeditions I've mentioned, and doubtless have contributed to many others too.

Nowadays a less subtle danger lurks in the commercialization of climbs on very high peaks and may have worsened the 1996 Everest tragedy. Clients who invest a lot of money in an Everest summit attempt may press their professional guide to continue despite threatening weather and delays. The guide whose judgment is somewhat impaired at great altitude may yield to pressure, perhaps from those whose ambition exceeds their ability.

An obvious problem results when many people start together up a narrow ridge: the whole train is slowed as successive climbers struggle with difficult pitches. This delayed many on Everest and they were caught by storm on the descent. The expert climber who was doing the IMAX film saw that this might happen and took his crew down instead of up.

The drama of such tragedies catches public attention. Many other climbers have been caught in equally terrible circumstances and survived. More often than not the selfless cohesion of their group has been the factor which enabled them to survive the odds against them. This was true on K2 in 1953 but not in 1986.

As do many others, I believe that many of the people died on Everest in 1996 because they put ambition above prudence. Though threatened by storm, delays, and the inexperience of some, they pushed on. Some died, others made it down alone. There were many victims but there were a few heroes too.

As indicated in his WMN Interview, Dr. Houston does welcome questions and comments. Letters can be sent to 77 Ledge Road, Burlington, Vermont 05401. His e-mail address is chouston@moose.uvm.edu.

CELL PHONES REVISITED—

American Alpine Club Board of Directors' Opinion on the Use of Cellular Telephones in the Mountains

By Jed Williamson, AAC Secretary

Editor's Note: Since the printing of "Hello...911?" by Bryan Yeaton in the January/February Issue of WMN, there has been much discussion and debate on cellular phone use in the backcountry. The American Alpine Club is one of the first outdoor-related organizations to take a definitive stand on the issue.

The membership of the American Alpine Club, young and old, has seen many changes take place in the sport of climbing. From clothing and tentage to ropes and protection devices, there have been countless developments as new synthetics, alloys, and methods of assembly have come along. Access to remote areas has increased as roads and air travel links have increased. Communications links have changed as well, going from yodeling and flashing lights to two-way radios and now cellular telephones.

What has not changed in the AAC are our stated purposes, which include preservation of the mountain environment and dissemination of knowledge regarding developments in mountaineering. From time to time, we have considered issues that may result in having an adverse effect on the mountains and mountaineering, and then adopted Policy Statements regarding them. The use of cellular telephones in the mountains and even on climbs near the road head is one such issue. Therefore, we offer the following on this newest form of communication:

Whereas the Board of Directors of the American Alpine Club recognizes that there have been many technological developments affecting clothing and equipment since the sport of climbing began, and

Whereas the Board of Directors of the American Alpine Club recognizes that all such developments can have both a positive and negative effect on the sport of climbing,

We, therefore, urge those entering into the mountain environments to consider the use of cellular telephone as follows:

1. The cellular telephone is not a substitute for skill and knowledge in the fundamentals of climbing, which include, but are not limited to, being able a) to find one's way (navigation), b) to prevent against being in situations that could readily result in life-threatening injuries, c) to treat injuries, and d) to provide for one's own evacuation/rescue in the event of being unable to continue to climb due to difficulty, weather, illness, and/or injury.

2. The cellular telephone is in and of itself not a safety device, nor does it guarantee the delivery of any perceived or needed services in the mountains.

3. The cellular telephone does not preclude the protocol of letting appropriate people know where one is going and when one intends to return.

4. Using a cellular telephone in the mountains and, in particular, in the presence of others to call family and friends, transact business, or resolve on-going conflicts may be an infringement on the mountain experiences for which many of these others have come. These experiences include quietness, a focus on the immediate environment, and a sense of personal space.

5. Using a cellular telephone to ask for unnecessary services, which include but are not limited to a) asking directions, b) asking for additional clothing to be brought to the user, and c) asking to be rescued for a non-life-threatening or disabling injury, is properly considered by those agencies who might be called upon to render such assistance as an abuse of the technology, both on a practical and philosophical level.

6. A cellular telephone IS a communication device that may aid in the saving of lives and limbs if used solely for that purpose in the mountain environment, after all the above have been taken into careful consideration.

This policy was adopted by a unanimously passed motion at a duly constituted meeting of the American Alpine Club Board of Directors on September 28, 1996.

MOTION MISERY

by Buck Tilton

A plethora of "home remedy" recommendations have passed down my throat including dill pickles and saltine crackers, stewed tomatoes and saltine crackers, horseradish with or without the crackers, and crackers all by themselves. They universally have had the same effect on "yours truly": none. Some experts have told me a stomach containing only liquids deals with motion easier than one full of solids. Others have told me the opposite. If you've tried something and it works, keep using it and read no more. If motion sickness plagues you, perhaps one of these remedies will work.

Focus your eyes, whenever possible, on a distant stationary point. Something on the horizon would be appropriate, such as a mountain peak or a tall tree. A fixed point of reference should give your brain help in sorting through the mess of messages. If you can go below on board a ship, don't. Below decks you'll have no point of reference.

Since motion is the culprit, attempt to avoid as much of it as possible. In a large boat, sit or stand near the center, keep your head still and your eyes straight ahead. On an airplane, sit over the wings where the ride rocks the least.

By lying down with your eyes closed, taking deep calming breaths and reducing the flow of messages to your brain, you

might be able to put a stop to your ailment. But what a rotten way to spend a vacation.

Chinese medicine claims acupressure on the *Nei-kuan* point will control nausea. The magic spot lies on the inside of both wrists, between the two tendons you can feel on the thumb side of your arm, just below the bones of the wrist itself. Pressure can be applied here with one finger for at least a full minute each on both wrists, or you can wear Sea-Bands, a wrist-band available in many pharmacies for around ten dollars that presses constantly on the *Nei-kuan* point. Sea-Bands may be ordered, with precise directions, from Magellan's, a catalog for travelers, at (800) 962-4943.

Two capsules of powdered ginger root (500 mg each) taken 20 to 30 minutes before motion prevent sickness for numerous sufferers, so they say. If you've got raw ginger root, grate one teaspoon, add it to four ounces of water and steep it for 10 minutes for the same result. Since a cup of ginger tea must be downed approximately every half hour in order to maintain a non-nauseous state, you might as well brew up a thermos-full.

Antihistamines are medications that prevent motion sickness apparently by interrupting communications, the nerve impulses, between the vestibular system and the brain. Over-the-counter you can buy many antihistamines, but some have proven to be particularly effective for many people. A good bet is meclizine (Antivert, Bonine), a drug that should be taken once every 24 hours starting at least an hour *before* you expect to be rocked and rolled. Meclizine may cause mild to moderate drowsiness and a dry mouth. Cyclizine (Marezine) is another non-prescription antihistamine which works similarly to meclizine but must be taken every four to six hours starting at least an hour before you shove off or take off. Dimenhydrinate tends to cause extreme drowsiness, but, in the plus column, it comes in liquid form suitable for small children. Also over-the-counter in tablets and liquid, and also suitable for children, is diphenhydramine (Benadryl). Available with a prescription only, promethazine (Phenergan, Mepergan) works to prevent *and treat* motion sickness, a bonus if you forgot to take a pill before you started feeling nauseous. Promethazine, too, causes severe drowsiness in some folks. People report successes and failures with these drugs, and the only sure-fire way to know if one of the antihistamines will work for you is to try it.

Transderm Scop (scopolamine), a patch placed behind the ear, was supposed to release small amounts of the drug over a period of three days right through your skin. When it was available, by prescription only, you could press the patch in place the night before a trip and expect no motion sickness. Currently off the market due to the patch's failure to reliably release the medication, Transderm Scop is expected to be back in the arsenal of anti-seasickness medications by 1997. Call (800) 452-0051 for more information.

The *Wilderness Medicine Newsletter* is intended as an informational resource only. Neither the *WMN* or its staff can be held liable for the practical application of any of the ideas found herein. The staff encourages all readers to acquire as much certified training as possible and to consult their physicians for medical advice on personal health matters.

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Wilderness Medicine Newsletter

FOR THE RECOGNITION, TREATMENT, AND PREVENTION OF WILDERNESS EMERGENCIES

NOVEMBER/DECEMBER 1996 ISSN-1059-6518 VOLUME 7, NUMBER 6

PREVENTING JACK FROST FROM GETTING THE BEST OF YOU

A Potpourri of Backcountry Problems and Solutions

by Frank Hubbell, DO; Murray Hamlet, DVM; and Buck Tilton, MS

FROSTBITE:

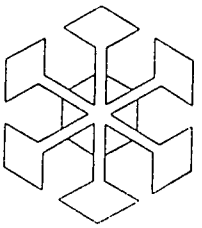
Frostbite is localized tissue damage caused by the cold. It creates a spectrum of injuries depending on how cold the tissue becomes. Ranging from little or no damage to extensive damage resulting in tissue loss, this spectrum of injuries can be classified in three basic categories: frostnip, superficial frostbite, and deep frostbite.

The initial stage of injury can be termed *frostnip*, and it's not a true frostbite injury. Skin is pale and numb, cold to touch but still soft and pliable.

The first true frostbite is superficial frostbite. This occurs when the tissues are damaged by cold (ice crystal formation between cells and dehydration within cells) but without solid freezing of tissue. The signs and symptoms of superficial frostbite are similar to frostnip: pale skin and numbness, both due to decreased circulation to the area. Even though the area is pale and numb, it is still soft and pliable to the touch— it will dent when you push on it.

Treatment of Frostbite:

Treatment of frostnip and superficial frostbite consists of skin-to-skin rewarming. The cold area should be in contact with warm skin. For example, a cold finger can be cradled in a warm armpit, or cold feet placed against the warm belly of backcountry partner. Do not massage cold tissue or place it near a heat source, both of which may increase damage.



When superficial frostbite is rewarmed, a large fluid-filled blister, called a *bleb*, sometimes forms. If this occurs, do not pop the blister. Blebs filled with clear fluid do better in the end than blebs filled with blood fluid. But, no matter what fills the bleb, it is extremely important to insulate the area well with dry material to prevent refreezing and evacuate the patient.

If frostbite is not treated in the superficial state, it can progress to deep frostbite. Deep frostbite can be recognized because the affected area is frozen solid. This type of severe frostbite is extremely painful when rewarmed. Severely frostbitten feet, once rewarmed, typically prevent the patient from walking. Instead of rewarming, it is usually best to insulate the frozen tissue well to prevent any further freezing. It is imperative to evacuate the patient. In extreme situations, when possible, deep frostbite may be rewarmed in the field. Rewarming should be rapid without being damaging. The best method involves soaking the frozen tissue suspended in circulating slightly-salty water pre-heated to 104-108 degrees Fahrenheit. Too much heat should be carefully avoided. Once rewarming is accomplished, the affected parts should be gently dried, covered with an antimicrobial ointment, and kept elevated. Pain killing drugs would benefit the patient. Refreezing must be avoided. Evacuation of the patient with rewarmed frostbite should be given priority consideration.

Prevention of Frostbite:
As with hypothermia, frostbite is preventable. Unlike other mammals, humans are not covered with a warm fur coat. Instead, people have to make a conscious effort to carry an outer covering. The first rule in prevention of frostbite is to have the proper clothing for the environment you're going into and know how to use it. Ideal clothing will insulate well even when wet. It should not be constrictive, especially in the feet where humans are the most susceptible to cold damage. There should be extra clothing available if you do get wet.

The second rule is to pay attention to your body. As soon as a cold or numb area is seen or felt, rewarm it to prevent superficial frostbite from becoming severe deep frostbite.

Stay well-hydrated, and eat often.

CHILBLAIN:

Chilblain results from a non-freezing cold exposure to the hands and feet, which usually produces swelling, an abnormal redness of the skin, and some discomfort. Lesions generally occur between the joints, rather than over them. The chronic form of chilblain is termed *pernio* with superficial necrotic plaques about a half millimeter thick. Pernio is caused by repeated exposures to above freezing temperatures, usually associated with high humidity. This injury is produced by recurring vasospasm and localized histamine release in the tissues which accounts for the subsequent compromise of blood flow. Once warming begins vasodilation causes the area to appear swollen and red or purple, quite tender and warm to the touch. Itching is usually a common initial symptom, which, as the warming progresses, is replaced by pain and tenderness. Occasionally blisters with superficial ulcers will form.

Chilblain is usually a self-limiting disease which has few long-term sequelae, although the pain from pernio injury can last a life-time. Chilblain cases are most common in cold, damp climates such as England, although they do occur in the United States. Typically, women are affected more than men, with the disease beginning before the age of 20 in most patients.

Treatment of Chilblain:
Treatment will vary based on the severity of the chilblain case. Supportive measures similar to the treatment of frostbite are recommended. Protection from cold, gentle rewarming, and dressing with warm, soft, and dry materials will be of help. In some cases non-steroidals may be effective early on. In others, reserpine (also used in Raynaud's Disease) may be used.

Prevention of Chilblain:
Here again, the best way to prevent chilblain is to dress appropriately for the conditions— keep warm and dry. Wear clothing in layers so that pieces can be added or taken away as necessary. Avoid clothes that constrict body movement. Eat plenty of nutritious energy food and stay hydrated ("Pee often and plentifully").

SNOWBLINDNESS:

If six to twelve hours after overexposure to the sun's ultraviolet radiation (to which you're especially susceptible as it bounces off snow), your eyes feel painful, like they're "full of sand," the corneas of the eye have been sunburned making them extremely sensitive to light. Because it hurts so much to open those peepers, you are temporarily (not actually) blind.

Treatment of Snowblindness:
Cool, wet compresses may be applied as needed for pain. A small amount of antibiotic ointment may be used several times a day for two to three days. To utilize the ointment, pull down the bottom lid, apply a thin coating, blink a few times, and keep still with eyes shut until the ointment melts. Also effective in the treatment of snowblindness is a thick application of artificial tears. **Do not use steroids.** If possible, don't use the eyes for 24 hours and cover with patches for the first 12 hours. Snowblindness almost always resolves harmlessly in 24-48 hours. Prolonged discomfort would be reason to come off the mountain and find a physician.

Prevention of Snowblindness:
Problems can be prevented by wearing sunglasses that block all, or almost all, ultraviolet light. On snow or water, sunglasses should fit well and have side-shields to block reflected light. In mountaineering or other situations where glasses are at risk of being blown off, always travel with a spare set. In an emergency situation, fashion a pair of glasses by cutting narrow horizontal slits out of ensolite pad, cardboard, or other material and attach them with a piece of parachute cord, string, or even a spare bootlace.

RAYNAUD'S DISEASE:

Although Raynaud's Disease is a relative of cold exposure, it is not usually considered to be one of the true cold injuries. Raynaud's is an abnormal peripheral constriction (primarily in the hands, but also the feet) associated with emotional stress, vibration, or cold. It is often a symptom of more serious life-threatening autoimmune disease but can exist as an idiopathic syndrome. Symptoms manifest themselves typically when there is a drop in temperatures, even if that drop is from 70 - 50 degrees Fahrenheit— temperature extremes are not a requisite. Those who do suffer from Raynaud's may find themselves completely disabled when it comes to participating in outdoor activities during periods of cold weather.

The disease is marked by intermittent bilateral episodes of ischemia in the fingers and toes. The patient will typically have the following symptoms: episodic constrictions of blood vessels, color change, numbness, and paraesthesia in the

affected areas. The rewarming phase is often associated with tingling and pulsating pain. In Raynaud's patients, symptoms may escalate with advancing age.

Treatment of Raynaud's Disease:
Treatment of Raynaud's is definitely not simple, although not participating in activities that produce vasoconstriction is an excellent first step. Avoiding cold climate activities also helps; however, people will be people. When in these cold environments, keeping the torso warm is key. By maintaining a higher core body temperature and keeping the skin warm, the likelihood of a peripheral response is decreased.

The use of insulated hand- and footwear is particularly important. Thick woolen gloves covered by insulated mittens are helpful. Chemical heat pads can be effective for short periods, especially in boots or skates.

Sympatholytic agents and calcium channel blockers have been the most effective pharmacologic therapy and appear to give positive results in about 50% of affected patients. Nifedipine, diltiazem, prazosin, and reserpine have also been somewhat effective but have side effects that make them less desirable.

Home Remedy for Raynaud's
A Pavlovian-type conditioning procedure that has proved effective in the management of Raynaud's disease and that can be performed easily at home has been developed. This procedure involves the repeated dipping of the hands in hot water at the same time the torso is being exposed to cold. The steps are as follows:

- Fill two containers large enough to accommodate both hands with hot tap water (about 108°F*). Place one in a cold area, either a cold room, basement, or outdoors; place the other in a warm room.
- Dress lightly, as you would for indoors. In a warm room, immerse both hands in the 108°F water for 2 to 5 minutes.
- Wrap the hands in a towel and go to the cold area. Again place the hands in the container of 108°F water for 10 minutes.
- Come back indoors and again put both hands in the 108°F water for 2 to 5 minutes.
- Repeat this procedure 3 to 6 times daily every other day for a total of about 50 trials.

**Please note: Domestic hot water may be 120°F as it leaves the tap— this is too hot.*

Significant improvement in symptoms, peripheral blood flow, and the healing of digital ulcers after this procedure has been used have been noted. The process underlying this sequence involves disconnecting the central constrictor message from the local one, thereby causing the peripheral vessels to dilate rather than to constrict in response to torso cooling. Although this procedure is time-consuming, it has been shown to produce results that can last for a number of years. Also, remissions can be induced with only a few repetitions of the immersion process.

Prevention of Raynaud's Episodes:
If you have a known Raynaud's episode, there are some simple measures you can take to help prevent complications. Wear heavy gloves (or more preferably mittens) and avoid situations that could put you at risk of being stranded in the cold, such as backcountry ski touring. In the cold weather months you should have added protection in your car in case you are delayed or stranded while traveling and must remain in your car for a longer-than-planned-for period. Similarly, when on the trail you should have quick heat and shelter options available. Avoiding smoking is also critical, as tobacco is known to exacerbate the disease.

Editor's note: The authors have printed more in-depth versions of these topics in other sources. Feel free to contact WMN for information on these resources.

WHO'S WHO IN WILDERNESS MEDICINE:

An Interview with David Kuhns, PA-C

by Rebecca S. Newton, WEMT-B

"Do we really *need* seventeen kinds of catfood?", laughs David Kuhns. A physician's assistant who has provided medical care in parts of Asia, Africa, and North America, Kuhns remembers his first visit to an American supermarket following his recent return from Somalia. "When I came back from Somalia, the first place I stopped was the supermarket. I just stood there and stared.... I was so overwhelmed by the variety." He laughs quietly as he tells the story, but the issues behind the questions he has come to ask himself are quite serious. Kuhns's work abroad has redefined his perspective on the medical care that he practices in the US, and has also shaped his view on broader aspects of American culture and resources.

Still, Kuhns's groundings in the emergency medical field undoubtedly rest in his wealth of experience in both rural and urban regions of the United States. Kuhns has been involved in emergency medicine since its new beginnings during "the early days," the reformations of the field in the 1970s. As a high school student in the early 1970s, he enrolled in one of the first courses of what was to be the precursor to today's EMT training programs. After school, he found himself working in the Air Force, and continued his work in emergency medicine as an Air Force medic during the next five years. When he got out of the service in 1977, he began his training to become a PA. This decision to return to school Kuhns attributes in part to the work he had observed other PAs performing; he explains, "I'd worked with PAs all the way and thought that would be the best route for me to follow."

Kuhns's PA training and one subsequent year were spent in St. Louis, Missouri, focusing on emergency medicine, including an affiliation with the city hospital emergency department. "With the next step," Kuhns explains, "I was looking for a change. And I found it." This change brought him to northern New England, first to the Maine coast and to a small island called Isleboro. Serving a year-round population of five hundred that swelled to nearly three thousand during the summer months, Kuhns's task was to provide medical care for the island's residents— by himself.

Working alone was hardly the only challenge that Kuhns faced during his Isleboro days. "The connection to the mainland was by ferry," Kuhns recalls. "That was about a three mile trip as the seagull flies. On a good day, it would take several hours to get somebody across." Looking for a change from urban midwestern America, Kuhns certainly had found it. In the years that followed, Kuhns directed his energies toward mainland New England, becoming involved with the Outward Bound school, Wilderness Medical Associates, and Portland's Maine Medical Center. Now, he has been working with Maine Med for nearly twelve years.

In reaching beyond the boundaries of the United States during the past few years, Kuhns has discovered still more directions in which to explore his life's work. In 1994, Kuhns took a leave of absence from his job at Maine Med to travel to Somalia with Doctors Without Borders. He returned from his trip to Somalia in March of 1995, and just eight months later left again with Doctors Without Borders, this time for a six-month stint in Afghanistan through May of 1996.

His time abroad has brought him new reflections on his work— and on the medical field as a whole— in the United States. "I've come to appreciate that here in the US we focus more and more on putting a lot of time and energy into cutting minutes off of response time, trying to fine-tune medications and their response, looking for the ideal drug to serve this or that particular function." Kuhns believes that this focus on continual attempts to speed and to polish the system is the primary factor that sets the healthcare attitudes of the US apart from those of other nations.

As Kuhns interprets his observations, the US approaches medical technology "at a whole different angle from what happens in the rest of the world." And how does much of the rest of the world approach its own medical needs? "[The efforts are] very low-tech, very practical, very much public-health driven— a kind of a utilitarian approach of the greatest good for the greatest number." With his depth and breadth of international and emergency medical experience, Kuhns has reason to be sensitive to the variety of opportunity in the US and to have an unusual perspective on the strengths as well as the shortcomings of healthcare systems in the cultures with which he has worked.

Ultimately, Kuhns's greatest frustration in his international work is the same that feeds the roots of so many fears: that the impact he can make, in the end, may be minimal. Kuhns tells the story of the hospital and series of ten clinics around which his work in Somalia was based. While he was there, fighting broke out in the town. Just after he and the other inhabitants were evacuated, his compound was destroyed and the hospital gutted. "Everything that we had done during our six months there— everything that I thought of as being tangible— was suddenly erased. And this town of 200,000 is now evacuated, empty. And has land mines placed all through it again." Driven by experiences like these, Kuhns is currently working diligently on the world campaign to ban land mines. To this end, he has given presentations on the issue at a number of national conferences and has testified before the US Senate Foreign Relations Committee.

Although the frustrations in his work seem great and the impact sometimes minimal, the rewards are very real. To anyone considering undertaking medical work abroad to gain experiences such as the ones he has had, Kuhns implores, "If the opportunity arises, by all means go for it. It can— and most likely will— change your life." The best advice that he can offer for those who choose to do so is to "try to keep your eyes open and your mouth closed— and your ears open." Kuhns explains how his perspective has been widened by his willingness to listen rather than to try to provide easy and immediate solutions: "I think many of us may have a tendency to go into situations like these and think, 'We're the pros from Dover and we can tell you how *we* do things.' That's all well and good when you're sitting back here [in the States] in a seven hundred million dollar hospital. But when you're working in a bush clinic holding a handful of different drugs, and none of them are probably going to do the right thing, it's a whole different approach."

With this comment, Kuhns's words invoke what is perhaps the most important principle of wilderness medical care: resources are useless without the ability to make intelligent and creative use of them. He insists upon— and upholds— respect for the people who are native to the regions in which he works. "The local staff— although they may not have the same expertise of technology or educational background that we have— still has the wealth of experience that comes from having worked in those situations before and from being able to put things into context."

The adjustment to new contexts, in fact, is what Kuhns cites as one of the most difficult aspects of the transitions that he has had to make in his international work. "You lose all of your reference points. Just imagine: you walk into a two hundred bed hospital that doesn't have windowpanes, and that has holes in the roof from shrapnel and bullet holes from the fighting that has been going on around it. And then you walk around the hospital compound and find used needles and syringes and Foley catheters and goats and chickens. And you walk through all of that, out of a mine field, into the operating room...."

In a sentiment common to many who link their passion for medicine to a love of wilderness medicine, Kuhns notes that what he treasures most about his work in wilderness medicine

is that it can sometimes restore to him this sense of context that is so easily lost, can allow him "to get away from everything and to kind of ground myself— which seems to become more and more difficult these days." Of his international work, Kuhns explains that the part that he values most is "meeting the people and getting to know them. Finding out that they may have a different language, may have a different religion, may dress differently and eat different foods, but that there are still human qualities that are common. Not to be appalled at the differences but to look at the positive side and to experience that has been the best thing that I've been able to take away from my work."

Asked what he views as his greatest personal contribution to wilderness and international medicine, Kuhns pauses. "The contributions are very small-scale," he modestly— but realistically— emphasizes again before being more specific about his own experience. "What I've been able to do most effectively has been to bring the images back— to share with people back here just a sampling of what the experience has been, to make them more appreciative of what we do have, to get them to thinking about our society. We are all humans. We all share a common thread and a common link. Whether that link be from Conway to Portland or from Portland to Bangladesh— wherever it might be— there are connections. And we need to remember those."

WMN readers who wish to contact David Kuhns with further questions may write him at the following address: 172 Middle Road, Cumberland Center, ME 04021

HEED THE WARNINGS

Revised Avalanche-Posting System

By Bryan Yeaton, WEMT

In 1982, while patrollers at California's Alpine Meadows ski area were trying to assess the daily avalanche hazard, a massive slide let loose, burying roads and buildings. One woman, amazingly, was pulled alive from a building five days after the slide. Seven others, however, were not so fortunate.

On March 24, 1996, two Massachusetts men were apparently adjusting their equipment in the middle of a common avalanche path in the Gulf of Slides, on New Hampshire's Mount Washington, when a skier above set off a huge slab avalanche. The men were carried 500 feet downhill at perhaps 100 miles per hour, but it was more than six hours before the bodies were found in the tons of debris. Melted snow around their faces reveals that they did not die immediately from their injuries.

Although the United States and Canada suffer only a fraction of the avalanche deaths which occur in Europe, the people responsible for prevention— the forecasters and rescuers— are still concerned about the loss of life, and have been working for the past several years to update the warning system. The Canadian Avalanche Association (CAA) and the American Association of Avalanche Professionals (AAAP) have recently revised and issued the forecasting system, and many organizations who forecast for public or private avalanche-prone lands (like the Forest Service and Park Service in the United States, and ski areas in both countries) are using it already. In addition to accuracy for the agencies, the addition of a color-coding system should make it easily recognizable to backcountry users.

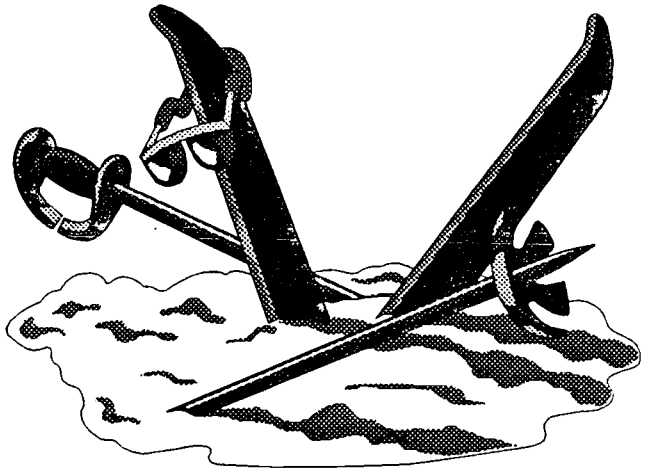
The new system is very similar to the former, with the major difference being the addition of a fifth category. According to Chris Joosen, Snow Ranger for the White Mountain National Forest, the extra category allows forecasters to be more specific without getting too burdened with superfluous details. "The system in Europe," says Joosen, "is too specific; it can tend to confuse. We wanted distinctive divisions between levels."

The United States Avalanche Danger Scale (see accompanying chart) rates the avalanche probability by the following danger levels: Low (represented by Green), Moderate (Yellow), Moderate to High (Orange) [Note— In Canada this is called "Considerable"], High (Red), and Extreme (Red with Black border). While Joosen emphasizes this is not a required destination system, it is hoped that all posted avalanche areas will adopt it.

Joosen also adds that, although the revised system allows for more consistency for avalanche-prone ski and backcountry areas, the forecasters best indications are their intimate knowledge of a particular area. Similarly, users of potential avalanche areas need to realize that these postings— especially in unpatrolled areas— may cover large geographical areas, and are not updated daily, so climbers and skiers need to factor in their own common sense before entering dangerous areas. Joosen says that, despite postings, people need to be prepared to find and rescue avalanche victims on scene, and not go immediately for help, according to *The ABC of Avalanche Safety* by E.R. LaChapelle, 50 percent of buried victims will die within the first one-half hour, and only 20 percent will survive two hours. LaChapelle points out that only one-third of completely buried victims survive, and half of those are less than 1 ½ feet under.

Everyone entering an avalanche area, says Joosen, should carry an avalanche shovel and a transceiver, the latter worn close to the body (not in a pocket), so it will not get ripped away when tons of snow traveling at 100 miles per hour slams into them. Still, Joosen believes the new system will make it easier for forecasters to give skiers and mountaineers an accurate representation of the danger, so they will make the prudent decision, and not have to face that deadly white wall.

Editor's note: For more information on safe travel in avalanche-prone areas, pick up a copy of The Basic Essentials of Avalanche Safety by Buck Tilton, *published by ICS Books.*



AVALANCHE SAFETY BASICS

Avalanches don't happen by accident and most human involvement is a matter of choice, not chance. Most avalanche accidents are caused by slab avalanches which are triggered by the victim or a member of the victim's party. However, any avalanche may cause injury or death and even small slides may be dangerous. Hence, always practice sage route finding skills, be aware of changing conditions, and carry avalanche rescue gear. Learn and apply avalanche terrain analysis and snow stability evaluation techniques to help minimize your risk. Remember that avalanche danger rating levels are only general guidelines. Distinctions between geographic areas, elevations, slope aspect, and slope angle are approximate and transition zones between dangers exist. No matter what the current avalanche danger there are avalanche-safe areas in the mountains.

UNITED STATES AVALANCHE DANGER DESCRIPTORS

Danger Level (& Color) **...WHAT...**	**Avalanche Probability and Avalanche Trigger** **...WHY...**	**Degree and Distribution of Avalanche Danger** **...WHERE...**	**Recommended Action in the Backcountry** **...WHAT TO DO...**
LOW (green)	Natural avalanches very unlikely. Human triggered avalanches unlikely.	Generally stable snow. Isolated areas of instability.	Travel is generally safe. Normal caution advised.
MODERATE (yellow)	Natural avalanches unlikely. Human triggered avalanches possible.	Unstable slabs possible on steep terrain.	Use caution in steeper terrain on certain aspects.
MODERATE TO HIGH (orange)	Natural avalanches possible. Human triggered avalanches probably.	Unstable slabs probable on steep terrain.	Be increasingly cautious in steeper terrain.
HIGH (red)	Natural and human triggered avalanches likely.	Unstable slabs likely on a variety of aspects and slope angles.	Travel in avalanche terrain is not recommended. Safest travel on windward ridges of lower angle slopes without steeper terrain above.
EXTREME (red w/black border)	Windspread natural or human triggered avalanches certain.	Extremely unstable slabs certain on most aspects and slope angles. Large destructive avalanches possible.	Travel in avalanche terrain should be avoided and travel confined to low angle terrain well away from avalanche path runouts.

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