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ABSTRACT

The six issues of Wilderness Medicine Newsletter published in 2000 provide medical and rescue information for the nonphysician in remote wilderness areas. Feature articles include: "Lions & Tigers & Bears, Oh My!" (wildlife precautions) (Jeanne Twehous); "Calamity in the Unroofed Temple" (collapse of a famous snow arch) (Nicholas Howe); "Considerable Bad Luck?" (mountaineering accident and rescue) (Mike Jewell); "Unraveling Abdominal Pain: A Wilderness Diagnostic Approach" (Adam Oster); "Oral Fluids and Cave Rescue" (Keith Conover); "Shedding Light on the Sunscreen Controversy: What Sunscreen Can and Can't Do--and Why" (Mark F. Naylor); "Dehydration and Associated Environmental Illness" (Andrea Geremia); "Leadership in the Prevention of Backcountry Injuries and Illnesses" (Sue Barnes); "'Lost Proofing': How To Avoid Getting Lost, and, If Lost, How To Be Safe and Help Yourself To Be Found" (Nancy Lyons); "Stonefish and Sea Snakes and Jellyfish, Oh My!" (Jeanne Twehous); "When the Shark Bites"; "Got the Travel Bug?" (Sue Barnes); and "Don't Get Bugged in Bed" (Chris Lourigan). Issues also contain announcements of wilderness first aid and medical training, search and rescue training, training in backcountry skills and avalanche awareness, and publications. (SV)

Wilderness Medicine Newsletter, 2000: For the Recognition, Treatment, and Prevention of Wilderness Emergencies.

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January-December 2000

Holly A. Weber, Editor

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Wilderness Medicine Newsletter

FOR THE RECOGNITION, TREATMENT, AND PREVENTION OF WILDERNESS EMERGENCIES

January/February 2000

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Volume 11, Number 1

LIONS & TIGERS & BEARS, OH MY!

By Jeanne Twehous, (W)EMT-B

There is a general rule of [wild] animal behavior that says that animals are wary of strangers and are cautious regarding the unknown, therefore normally avoiding people and the places they inhabit.

There is a general rule of the cosmos that says that rules are made to be broken.

When in doubt, heed the latter

For most of us who enjoy spending time in the backcountry, at some point we will, consciously or otherwise, put ourselves smack dab in the center of some wild creature's hearth and home. What we have to remember is that we are the visitors, rarely invited, and that the onus is on us to avoid an encounter that may end in the death of one or both of us.

When traveling through bear country (which includes almost every state in the US and province in Canada if you're considering black bears and grizzlies/brown bears), you would do yourself a service to keep some things in mind: Bears may be shy but they are also very curious creatures. They are quite clever, capable of reason, learn quickly, and have an excellent memory. They are able to learn and remember from a single experience. Their senses of hearing and smell are extremely keen. No animal has a more acute sense of smell—bears have been known to detect human scent more than 14 hours after a person has passed by. Their hearing is so sharp that they can detect normal human conversation from more than a quarter mile away. And their vision, once thought to be rather poor, is now shown to possibly equal our own (though they are near-sighted, bears can recognize form and detect movement at relatively long distances; their peripheral vision as well as their night vision is considered to be very reliable). Though they seem to have a lumbering, clumsy gait, even if you're an Olympic sprinter you can't outrun them—they can reach speeds of 25-40 mph. Though they can't remain at those top speeds for long, you won't outlast them either. Their endurance rivals their swiftness—they've been known to run for 10 miles without a break. And don't be fooled by the old wives' tale that says bears can't run downhill; they are actually quite agile at descending hills at a rapid pace. And if you believe that bears can't climb trees, well, you're simply wrong. Adult black bears

are exceptional climbers, and even grizzlies—though not as adept—have been known to climb high enough to snag their prey. (The highest a grizzly is known to have climbed during an attack is slightly less than 33 feet.) Bears are also extremely powerful beasts so don't expect to outfight one. The average black weighs in at around 250 lbs (ranging between 125-600 lbs) and the average grizzly at almost 500 lbs (normal range is 350-700 lbs). You won't find another animal that size that is as powerful. Now . . . add to all this the "no fear" factor of bears and you have a potentially very dangerous creature on your hands.

Remember, though, that most of the danger around bears lies in our inappropriate behavior while a guest in their homes. (For black bears, home generally means deciduous, coniferous, or mixed forests and swamps; they may stake out a territory of ~43 square miles to roam around in. Grizzlies prefer more open areas on the edge of forests or scarcely forested areas and arctic/alpine tundra. Their range is anywhere from 23 to 870 square miles.) Though most references on bears will divide attacks on humans into "provoked" and "unprovoked," remember that EVERY attack is provoked from the bear's point of view. You are either getting too close to their food supply—which they guard jealously and closely—or to their young—which they guard jealously and closely (mama black bears sometimes seem to have a lesser maternal instinct than their grizzly counterparts and have been known to abandon their cubs when danger was imminent). Though some attacks by both species have been found to be predacious in nature (you're not getting too close to their food supply, you ARE their food supply), those attacks are rare and most likely to happen when bears that are old and/or infirm are forced from their habitat and, therefore, from their normal food supply and must rely on whatever comes their way—including tasty hikers and campers.

Most bear attacks in
(continued on next page)

INSIDE:

Calamity In The Unroofed Temple	4
Considerable Bad Luck	6
Calendar	Back Cover

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(“Bears” – continued)

the backcountry will occur because of sudden encounters between bear and man where both are surprised by the other's presence. The “quiet” hiker, for instance, doesn't make enough noise to alert nearby bears to his presence thus giving them sufficient time to vamoose. Most bears really don't want to have anything to do with you, and, if you give them enough warning that you're coming, they will leave the area. Typical protocol used to be hanging bells from your pack when going into bear country as an attempt—albeit a feeble one—to alert any bears who might be in the area. In reality, it takes more than a little tinkle. If you are near rushing water, in a strong wind, or in a dense forest, the sound from a bell will not carry far. Also, low frequencies are supposed to travel better around trees so the higher pitch of a dinging bell is not going to be heard. Perhaps a better choice would be to use your deepest bass voice to belt out every round of “99 Bottles of Beer on the Wall” as you traverse through the heart of bear country. Sing, scream, have loud vehement conversations with your companions, make any kind of racket you can, but be aggressive about making noise. And don't assume that a bell will save you unless you're Quasimodo.

Another potential scenario for turning a bear encounter into an attack is crowding a bear, i.e. getting in his personal space. It's very exciting to see a bear in the wild, be it a black bear or a grizzly. Very often, an awestruck human, forgetting momentarily what he's dealing with, will attempt to get closer to the bear—perhaps to get a souvenir photograph or simply just to get a better look. Bears in many ways are like humans. One thing we have in common is that we don't like to have our personal space invaded. As humans, we can let somebody know when they're too close with a look, a gesture, or simply “get outta my face!” Get too close to a bear—and nobody knows how close is too close . . . it could be a few feet, it could be a quarter mile, depending on the bear and the circumstances—and you may never have another chance to invade anyone's space again.

Another trait we have in common with bears is that we both like to eat (bears are omnivores, and, therefore, eat both plants and animals like most humans), and neither of us is very happy when we are interrupted from our meals. Bears get particularly cranky, though, and, if you happen on to a bear that is feeding (especially on a carcass which it perceives as a special prize), it is an extremely dangerous situation. Almost like protecting its young, a bear will defend a carcass with a severe ferociousness that will likely end in an attack. As you hike, be alert to the smells around you. If an odor of rotting meat wafts by, you may want to make a detour.

The most dangerous encounter, of course, and one that is most likely to result in an attack, is an encounter with a sow and her cubs. The mother's paramount objective in this situation is the protection of her young, and she is a fierce defender. She will stop at nothing to ensure the safety of her cubs and reduce the risk of threat to them, whether that threat is real or perceived. Grizzly sows, especially, are devoted and

protective of their cubs and have an extremely strong maternal instinct. Steer far clear of mom and babies if you spot them in the distance.

Besides the backcountry, bear attacks most commonly occur in state and national parks and campgrounds which see large numbers of visitors and, consequently, large amounts of garbage. Perhaps the most dangerous bear here is the habituated and the food-conditioned bear. Normally, bears, like most animals, will shy away from people. But, if a bear keeps coming into contact with humans and there are no negative consequences (i.e., the bear comes to no harm), that bear will become used to people and will begin to tolerate them, resulting in habituation. Remember that fleeing costs a bear energy, and he won't do it unless he perceives that a threat exists. Even more dangerous is a habituated bear that is also food-conditioned. Ignorant campers and tourists may feed a bear, thinking that it's funny or cute, or they may leave food and/or garbage unattended at their campsite. The bear forms an association—people equals food. This is a truly dangerous animal. Encounters with these bears are more often associated with injurious attacks than those encounters with non-food-conditioned bears. It is these bears, too,

(along with the old and infirm) that are most likely to decide to eventually treat humans as prey. The 1960's research of John and Frank Craighead in Yellowstone National Park showed the relationship between food-conditioned bears and aggressive behavior. At the time, Yellowstone disposed of its garbage in open-pit dumps, and it was not uncommon to see over 50 bears at a time feeding at the dump—quite a phenomenal sight as bears are mostly solitary creatures. The other thing that the Craigheads noticed was how aggressive and violent these bears were towards one another as each perceived the others as competition for their food supply. At the same time, these bears had lost their fear of humans, and it was not unusual to see bears scrounging in campgrounds and trailer parks for food or garbage. Considering the aggression shown by the bears at the dump and the park's system of waste disposal, it was no wonder that before 1970 over half of all grizzly-bear inflicted injuries in national parks occurred in Yellowstone.

So, how do you avoid an encounter when you're in bear territory? And how do you know when an encounter might become an attack? If a bear does charge, is there a way to tell whether or not it's bluffing? And, perhaps most importantly, if you are attacked, how should you respond? Unfortunately, predicting bear behavior is about as easy as predicting where and when lightning will strike. Although you can make general assumptions about both, each will do exactly what it wants, unconcerned about what you think *should* happen. Bears, like humans, are individuals, and making predictions about one bear's behavior is akin to trying to predict how one person will behave from observing another. Although you can't know the absolute best way to respond in every situation, you can use your head, do some homework on bear behavior, and understand the things that CAN provoke attacks and try to avoid them:

- Be prepared BEFORE you go. If you plan to be in bear

So, how do you avoid an encounter when you're in bear territory? And how do you know when an encounter might become an attack? If a bear does charge, is there a way to tell whether or not it's bluffing? And, perhaps most importantly, if you are attacked, how should you respond?...

country, know what type(s) of bears inhabit it and how to identify them (e.g., black bears aren't always black and grizzlies aren't always brown or "grizzled" in appearance). Find out about local bear activity before you go, and, if there have been recent sightings, avoid those areas. Also, educate yourself about bear behavior, habitat, tracks, feeding habits, etc.

- Always be alert as you hike, using all of your senses. Watch for signs of bear—tracks, scat, marks on trees, half-devoured salmon. Be alert to smells (of rotting carcasses) and sounds. Expecting a bear at every turn is a good way to heighten your senses.

- Make lots of noise as you hike—remember, a surprised bear is usually not a happy bear.

- If you do see a bear, give it lots of space. Avoid the temptation to get "just a bit closer" to photograph or get a good look. It may be your last good look at anything. And never, never intentionally feed a bear.

- Keep bear attractants to a minimum, e.g., don't bring sardines for lunch if you're traveling in bear country. Don't wear perfumes or deodorants or lotions with a strong scent. Whether women that are menstruating attract bears has been a theory that has not been proven definitively either way. If you are a woman having your period in the backcountry, make sure that you practice good hygiene and keep used tampons and napkins in double ziplock bags just to be on the safe side—do not bury or attempt to burn them.

- Hang food, garbage, and anything with a heavy odor as high and out of bear reach as possible (as far out on a limb as it will go). Also, remember to hang bags as far away from your camp as possible so that if a bear does come looking for dinner, you won't necessarily be the first item on the menu.

- Always be thinking about what you will do if the impossible happens. Be on the lookout for possible escape routes—appropriate trees to climb (ones with small branches that could hold your weight but not that of a grizzly). Don't consider water sources as escape routes, though—bears are great swimmers.

So what if the impossible happens and a bear does charge you? Here are a few options to ponder:

- 1) Stand your ground or move slowly away while trying to intimidate the bear by shouting, yelling, banging pots together, etc.,

- 2) Stand your ground or move slowly away but remain quiet and attempt to be non-threatening,

- 3) Immediately drop to the ground and play dead, rolling up into a ball to protect vital organs, hands and arms cradling head and neck,

- 4) Turn and run!

The last option is almost never an option. However, if you

believe the bear is preying on you—he drags you from your tent and/or sleeping bag or is relentless in the attack (most defensive attacks last only a few minutes), your only hope is to try to get away from the bear. Fight for your life and try to distract the bear so you can somehow escape. If it wants you for dinner, playing dead is like giving yourself up as the entree. If the attack is a defensive one though, (a mother protecting her cubs), then playing dead may save your life. But wait until the attack is imminent (the bear is standing over you) to drop and roll up into a ball. (It's best to keep your eye on the bear as much as possible while he's charging.) The first two options may depend on what type of bear you're dealing with (be sure!). If it's a black bear, being aggressive may scare him off; if it's a grizzly, attempt to be as non-threatening as possible. In either case, though, if you've surprised the bear and encroached into his private space, backing up and giving him more room may be all that is needed. According to one theory of bear behavior, the bear will decide before it charges whether or not it is going to attack. If that's the case, then it doesn't matter what you do! Say your prayers and remember the rule of the cosmos

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CALAMITY IN THE UNROOFED TEMPLE

BY NICHOLAS HOWE

Ever since I can remember, a remote closet in our house has held essential things that have outlived their need. There's an ornate sword in there, the one great-grandfather Jenckes wore while parading with the Providence First Light Infantry. There's also a complex device made of tin; it has a small tank with a filter and three lamp wicks, each of which can be adjusted with a knurled brass wheel smaller than a dime. It's the power supply for what my grandfather's generation called a magic lantern, a kerosene-burning slide projector. Camera lenses of the day sometimes made an image that was brighter at the center than at the edges, so the three wicks would be adjusted to burn at different intensities and the magic lantern projected an evenly-illuminated image against a bed sheet stretched across the living room wall. If the room was large enough, the guests were in front of the sheet and the magic lantern behind it; this was called a shadow play.

Those generations did not require the elaborate distractions that fill our late twentieth-century days; there was not as much noise then, and one or two magic lantern shows in the course of a summer would be remembered all winter long. The outdoor equivalent of a magic lantern show was a hike up to the snow arch in Tuckerman Ravine.

For a geologist, Tuckerman Ravine is easy to describe: it's a cirque cut by a local glacier that remained after the continental ice sheet melted. It was more than that for Starr King. He published *The White Hills* in 1859, and tells us that when he saw Tuckerman Ravine, "One might easily fancy it the Stonehenge of a Preadamitic race, the unroofed ruins of a temple reared by ancient Anaks long before the birth of man, for which the dome of Mount Washington was piled as the western tower." The public preferred Starr King's version.

The ridges on three sides of the unroofed temple act as snow fences and break the force of the winter winds. As with snow fences of every kind, the snow falls to the ground on the downwind side; in this case, into the ravine. The snow piles in from October until May, not just the ravine's own allotment but also the accumulation that's swept from the treeless uplands on three sides. By the middle of spring, the drift piled against the headwall of the ravine may be more than 100 feet deep and compacted to the consistency of glacial ice. There comes a time in early summer when that headwall snowbank is all that's left. As meltwater from higher up cascades down behind it and tunnels through the icy mass, the snow arch is formed.

Ethan Allan Crawford discovered the arch in the summer of 1829, and he was deeply impressed: "Such was the size of this empty space that a coach with six horses attached, might be driven into it. It was a very hot day, and not far from this place, the little delicate mountain flowers were in bloom. There seemed to be a contrast - snow in great quantities and flowers just by - which wonderfully displays the presence and powers of an all-seeing and overruling God, who takes care of these little plants and causes them to put forth in good season".

Major Curtis Raymond was also impressed. He spent his summers at the Glen House, and he thought there should be a way to hike from the Glen up to the ravine to view the snow arch. In 1863, Mr. Raymond began to build a trail extending 3.3 miles from the carriage road to the snow arch, and he maintained it until his death in 1893. By that time, the snow arch was drawing

admirers from near and far; there was something about the dreadful grandeur of Tuckerman Ravine and the graceful relic of winter still there in mid-summer that people found irresistible. By that time, the snow arch had killed Sewall Faunce.

SEWALL FAUNCE JULY 1886

C.E. Philbrook kept lodgings in Shelburne, New Hampshire. His place was called Grove Cottage, and on the morning of July 24, 1886, a group of eleven guests climbed aboard his mountain wagon and rode to Osgood's Castle, a picturesque creation built in Pinkham Notch where the Cutler River crossed the road. This was the start of the trail up to Tuckerman Ravine, where Mr. Philbrook's guests would view the snow arch. It was a bright and lovely day and they reached the ravine at two o'clock. Edwin Home was the most experienced hiker in the party and he was accompanied by his wife, three other men, five other ladies, and young Sewall Faunce. The boy had just turned fifteen, and his parents back at Grove Cottage had entrusted him to the care of Mr. Home.

The hikers were in high spirits when they reached the snow arch, and the weather, always uncertain on Mount Washington, was so fine that Mr. Home decided to climb on up to the summit of the mountain and walk down by the carriage road. When his party reached the ravine, they saw the snow arch at the right side and he knew the trail led up the headwall still farther to the right. Apparently not fatigued at all by the climb up from the valley, Mr. Home quickly scrambled up the trail above the rest of his party.

Everyone in the group knew that the snow arch melted gradually until the span could not sustain its own weight, then it would fall and drop tons of ice on anyone underneath it. Accordingly, they did not climb up on top of the snow mass, but they did scamper into that space which Ethan Allen Crawford thought might hold a coach and six. Even the most hesitant visitors are tempted to do this; there's the deep cavern, the dashing water, and the twin contrasts between the cathedral darkness inside and the high blue sky at their backs, and between the frigid air in the cavern and the heat of the day outside. Returning to that new summer, the group found convenient rocks to sit upon while they contemplated the majesties on every hand.

Meanwhile, R.J. Beach and F.D. Peletier were just leaving Hermit Lake, the glacial tam half a mile back along the trail. They were both from Hartford, Connecticut, and Mr. Beach was a cadet at West Point. They'd arrived by the Raymond Path, eaten their lunch at Hermit Lake, and started on up to the floor of the ravine. They planned to view the snow arch, then climb to the summit of the mountain.

Mr. Lathrop, one of the single men, was standing next to Miss Pierce, one of the single women. Sewall Faunce was standing farther away in front of them. Mr. Lathrop said a few words to Sewall. A moment later he found himself thrown forward as if by the hand of an unseen giant, and someone cried out, "We are killed! We are killed!" The snow arch had not collapsed, it had not fallen down into the cavern; it had tipped over frontwards, toward the hikers Mr. Home had brought to the ravine.

Mr. Home was about 400 feet up the trail on the headwall when he heard the crash and looked down into a cloud of snow

and flying ice. At that moment, as one of the men later put it, "We looked around us to see who were lost and who were saved." Mr. Home rushed back to his friends and found Miss Pierce trapped by several blocks of ice. He heard his wife cry out, "Where's Sewall?" Mr. Home answered, "My god! Think of his father and mother!" One of the other men remembered, "We did not dare to think, we must do!"

Miss Pierce was upright, but buried to her waist in ice and snow and unable to move. The men extricated her without much difficulty, but she was shaken and in pain and they laid her out on a nearby rock. Then they turned back to the enormous pile of snow and broken ice, tons and tons of it, and began picking and prying at it with their walking sticks, trying to find Sewall. They could make no headway at all, so after a brief discussion Mr. Home decided to try to find help on the summit.

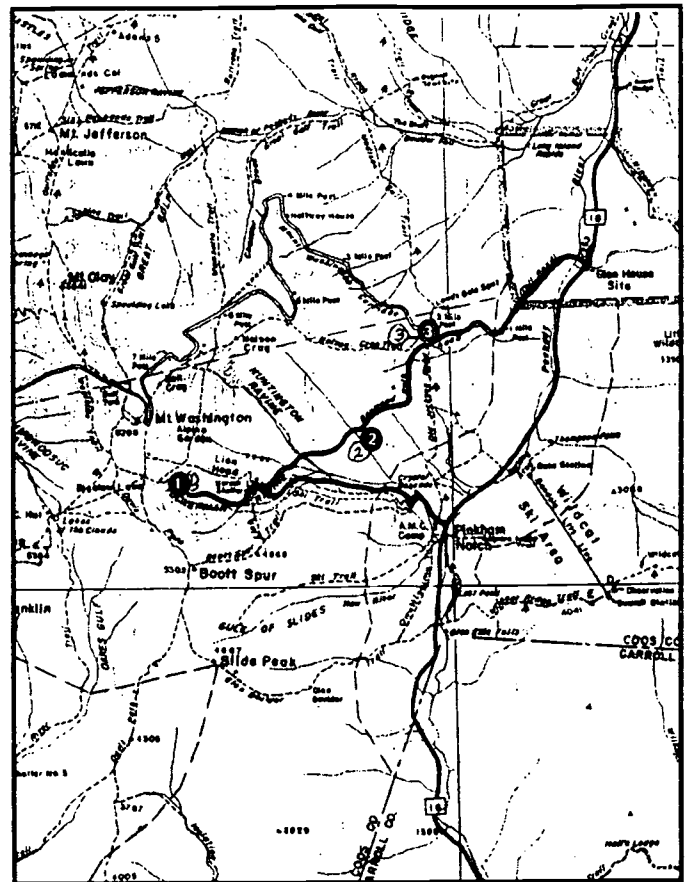
R.J. Beach and F.D. Peletier were just topping the rise above Hermit Lake known as the Little Headwall. They were hurrying to reach the summit but they were not sure of the way, so they were glad when they met several ladies coming down and asked them about the trail. The ladies, however, were not much help. They seemed distracted, they said they had to get to the bottom of the mountain as fast as they could, and they said something about an accident. The two young men hurried up to the huddle of people at the snowbank and quickly added their efforts to those helping Miss Pierce.

Mr. Beach, the West Point cadet, asked her if she was hurt and she said she was; he asked her to describe the pain and she said it was in her back and she could not walk. Satisfied that her arms and legs were not injured, the two young men took off their belts and looped one under her arms and the other around her legs. Hoisting her with this crude sling, they started for the valley.

Mr. Home reached the summit in forty-five minutes, about half the time usually needed for the steep rough hike. The summertime population of the top of Mount Washington was considerable. The U.S. Army Signal Service acted as the national weather bureau in those days and their observers occupied one summit building. The Summit House was a full-service hotel with a large roster of guests and help, some of whom stayed in the original Tip-Top House. The cog railway and the carriage road kept employees on the summit, and another building was occupied by the publisher, editor, reporters, and pressmen of *Among the Clouds*, the twice-daily newspaper published up there during the summer season.

Mr. Home went straight to the Summit House with his terrible news and, as a guest said later, "It needed but the intimation of human suffering and death to start a sympathetic and willing company to the rescue." The signal servicemen, employees of the hotel, the railway, and the road, and the entire staff of the newspaper all turned out and started down the mountain with axes, shovels, blankets, and "restoratives," which in the language of the day usually meant brandy.

The rescue party from the summit reached the trouble at 4:00 P.M., just as four other men were leaving with Miss Pierce. Hope for Sewall's life still ruled and the summit group began chopping and digging above the point where they were told he was entombed, but it quickly became obvious that their tools and forces were inadequate. Someone suggested a tunnel and in about four minutes one of the men uncovered Sewall's head, pressed against a rock. As they continued to dig, they realized that he'd been standing on top of a rock and was still in the same position, but jammed hard against another rock. There was, as one of the men put it, no breath in his body.



- 1 SNOW ARCH IS AT BASE OF RAVINE HEADWALL
- 2 MISS PIERCE CARRIED OUT BY WAY OF RAYMOND PATH
- 3 MET WAGON AT 2-MILE ON CARRIAGE ROAD

Seven men started back up the headwall with the body, but the going was so difficult that one of them soon hurried on to the summit to find a stretcher and recruit three more men. They rejoined the others just above the headwall of the ravine and regained the summit at 6:15. A doctor staying at Horace Fabyan's hotel had taken the late cog train to the summit, and he was puzzled to find scarcely a sign of injury anywhere on the boy's body, though the sole of one shoe was partly torn off.

The women who started for the valley immediately after the accident brought the alarm to the Glen House, and Mr. Milliken, the keeper, organized a six-horse mountain wagon with fourteen men and a doctor who would go two miles up the carriage road to the point where the Raymond Path departed for the ravine.

Meanwhile, the West Point cadet, his hiking partner, and two other men were making their way down with Miss Pierce, but they found the carry exceedingly difficult. It could be worse, she reminded them, and pointed out that she weighed only 112 pounds. Thus encouraged, they struggled on down the Little Headwall with the belt arrangement. This proved so awkward for them and, they feared, so painful for the plucky Miss Pierce, that they decided they could get only as far as Hermit Lake by nightfall. Three of them would stay there and one would go to the valley and return with provisions for the night, then they'd start out again in the morning.

To their surprise, a relief party from the valley met them at Hermit Lake. There was a new telegraph connection from the summit to the Glen House and word of the accident reached the valley immediately after Mr. Home reached the summit, a factorial

(continued on next page)

advance in the speed of communications. Now they determined to improve the carry and press on through the evening. Having no ax, they hacked down two trees with a shovel and improvised a litter with their rain coats, their belts, and what the West Point cadet gallantly described as "the lady's gossamers." These would have been her stockings, though no gentleman would use that word lest he reveal too great a familiarity with a lady's legs.

Major Raymond's path left the carriage road at the two-mile mark and gained 1,900 feet in 2.7 miles to reach the ravine, a rather moderate grade by local standards. The way was complicated, however, by four stream crossings, two of them twenty feet wide and all filled to the top of their banks this evening with the runoff of waning snows higher up. The rescue party's birch poles cracked twice and they stopped to cut new ones.

A giant of a man joined them, and he held back branches and lifted blow-down trees out of the way that four other men together couldn't move. A large stone rolled onto the foot of one of the crew and he was lost to the carry, but after three hours on the Raymond Path, R.J. Beach heard a shout from somewhere in the darkness ahead of them.

"Come and give us a lift," he called, and the answer came back, "I will if you'll hold my horse." It was the Glen House crew with the mountain wagon on the carriage road, and in a few more minutes they had Miss Pierce eased onto a mattress in the wagon. They reached the Glen House at 9:15 P.M., just seven hours after the accident.

Two hours later, the body of Sewall Faunce arrived at the Glen House; it had been brought down the carriage road by mountain wagon. The next day, the grieving party gathered once more at Grove Cottage and composed a formal resolution of thanks to the many people who had helped them. Then they passed it by unanimous vote.

From "Not Without Peril", Excerpts by permission of AMC books. Publication is expected in April, 2000. Check www.outdoors.org for details.

About the author: Nicholas Howe lives in Jackson, New Hampshire, in the eastern shadow of Mount Washington, and he writes:

This book grew out of an article I wrote for the February 1995 issue of Yankee Magazine that was titled "Fatal Attraction" and told of the terrible winter of 1994 on the Presidential Range. It drew letters and calls from people who had been involved in accidents on the range as far back as 1911, then more material came from two years of blowing dust in old archives and from dozens of interviews as far away as Alaska. More of the background for this book came from my own lifelong hiking in the White Mountains, a habit I got from my father and grandfather.

From 1948 to 1953, I was working for Joe Dodge in various capacities and seasons with the Appalachian Mountain Club, mostly as hut crew at Madison and as a muleskinner, a gentle art now lost to the White Mountain trails. Those years with the AMC brought service on several rescues, a practice extended by two winters on the ski patrol at Sun Valley, Idaho, where one of my customers was the Empress of Iran.

I've also been a most grateful consumer of the kind of skills learned at SOLO. I had severe accidents in difficult places in 1978 and 1979, then another pair in 1993 and 1995. EMTs attended to me in each one, and they undoubtedly saved my life in two of them.

CONSIDERABLE BAD LUCK?

On October 23, 1999, a series of events occurred on a stormy, snowy night in the northern Presidential Range of the White Mountains of New Hampshire which narrowly skirted the edge of saving someone's life at the expense of the safety of others. This rescue scenario precipitated a media maelstrom in the greater New England area. For nearly two months the actions of Dr. Bernie Dahl's foray on Mount Washington were critiqued in search and rescue circles. Several issues were at the heart of the debate: Dahl's choice of food, clothing, and equipment; his poor judgment in light of existing weather conditions; and his reliance on a cell phone. In his defense, Dr. Dahl recounted his version of the story in several papers including the Maine Times and the Conway Daily Sun. In his justification of his continuing his climb despite adverse weather conditions and a bad knee, he does acknowledge ill-preparedness and improper equipment along with many other factors as having contributed to his ordeal. Among the reasons given, Dahl cited "considerable bad luck." What follows is a letter in response to one of Dahl's explanations that ran in the Conway Daily Sun on January 13, 2000. It is, perhaps, one of the best "educational" reviews of the incident.

Dear Editor,

Mr. Dahl's 'unlucky' experience on Mt. Washington presents the perfect opportunity to clarify a few issues relating to hiking (I'll use the term 'climbing' because of Mt. Washington's alpine character) in the White Mountains.

His misadventure offers this opportunity not only because he made several classic and fundamental errors but also because he seems persistently unable to understand the nature of those errors - even in hindsight. His story, from beginning to end, is a common story of what not to do in the mountains and displays a typical and alarming innocence - even ignorance - regarding climbing on Mt. Washington.

Truly experienced and mature climbers are not usually the people that need to be rescued on Mt. Washington. This is not a coincidence. Nor is it because they are 'luckier' than other climbers. Instead, it is because they operate from a position of great conservatism and they function on a firm foundation of knowledge. This does not mean that experienced climbers are immune to bad luck. Misfortune can strike any of us at any time. However, experienced climbers substantially limit their risk by carrying appropriate gear, by developing contingency plans, and by conservatively functioning within appropriate guidelines of behavior. It is a myth recently created by the media that climbers are driven purely by thrill and thrive on risky behavior. Mature climbers are masters at limiting risk.

Every excursion into the wilderness is inherently dangerous because we leave the support that civilization offers us.

The further we travel from food, hospitals, and shelter, the more danger we are in. In addition, the level of danger increases as the conditions into which we are entering become increasingly adverse. Because the conditions on Mt. Washington are particularly inhospitable (the lack of trees is a clue), it is very important that climbers that go up there follow some basic rules. Below are some of the guidelines that experienced and professional climbers follow while traveling in the mountains – especially above tree line:

- * They check the weather forecast before they leave and are fully prepared for the weather to be worse than expected.
- * They leave wide margins of error in every aspect of their excursions.
- * They start early and leave significantly more time than they think they need to return safely. (They never forget that the climb is not over until they are back to their car.)
- * They take more food, water, and clothing than they think they need.
- * They are prepared to spend the night; they carry enough warm clothes to survive the worst possible temperatures and winds that the mountain has to offer for that time of year.
- * They make certain that someone knows EXACTLY where they are going and what trails they will use – and at what time they are expected to return. This means that they do not change plans unless it is required for their safety.
- * They choose a conservative turn-around time, and THEY STICK TO IT.
- * They are alert to the approach of deteriorating conditions, and they are readily willing to turn around. (Note Mr. Dahl's persistence). Refusing to turn around in the face of deteriorating conditions is perhaps the single most common and serious contributing factor to mountaineering accidents. Climbers are faced with tremendous temptation to go forward.
- * They always "leave themselves an out:" At every moment they have at least one plan of escape.
- * They carry all the gear they need that is relevant to the trip. On Mt. Washington, examples are (and this list is not meant to be inclusive): a watch, a compass, a map, emergency gear, a head lamp, goggles, and a first aid kit. Excuses like, "I could not have seen the compass anyway" are ridiculous.
- * They proceed on a foundation of sane priorities. For instance, they place their safety, the safety of their partners (and rescuers), and the love of their families above their need to feel accomplished, important, and heroic.
- * They are brutally realistic while assessing their own condition and the condition of the environment. For example, they do not try to convince themselves they feel better than they actually feel, that they are stronger than they actually are, or that the weather is "not so bad".
- * They assume as little as possible. For instance, they do not assume that the weather forecast is accurate, that the weather will get better, that conditions will be mild in October (!), that rescuers will be available, etc.

Expeditions that stand on flimsy foundations built on opti-

mism, pessimism, and hope must depend on luck for their success. Expeditions that stand on solid foundations built on realism, sane priorities, and preparedness depend on knowledge and strategy for their success. Safety is never guaranteed. However, experienced and mature mountaineers stack the odds overwhelmingly in their favor.

When assessing Mr. Dahl's adventure in light of the above principles, it becomes obvious that Mr. Dahl made at least several critical errors. It becomes clear that he was woefully unprepared for his trip, that his judgment was seriously lacking, and that his misadventure was not primarily a result of bad luck. In addition, we can come to understand why articles such as the one in the Conway Daily Sun or the Maine Times are misleading and thus might contribute to the false security of future hikers.

Finally, in the midst of the recent discussion concerning Mr. Dahl's story, lies the issue of the use of cell phones. I can not speak for other climbers but I will dare to guess that it is not the use of cell phones about which most climbers and rescuers are concerned. Many of us now carry either phones or radios in case of an emergency. But it is important to understand that we do not use the presence of our cell phones as justification for traveling into the mountains. We do not use our cell phones as justification to forge ahead in the face of adverse conditions. And we do not use our cell phones to replace competence and preparedness. I wonder if Mr. Dahl was using his phone – even subconsciously – as a justification for continuing into the snow storm that almost killed him.

Sincerely,
Mike Jewell

About the author: Mike Jewell is a professional mountaineer and climbing guide who works through the Mountain Guides Alliance in Intervale, New Hampshire with twenty-five years of experience under his belt. Mike uses his skills as a SOLO Wilderness First Responder while serving on the climbing team of the Mountain Rescue Service in North Conway, New Hampshire.

Editor's Note: On December 29, 1999, the New Hampshire Department of Fish and Game, along with the support of the New Hampshire search and rescue communities, the New Hampshire Division of Parks and Recreation, the New Hampshire State Police, the New Hampshire State Fire Service, and many others, unveiled a two-pronged program to reduce the number of search and rescue missions in the state. The first approach is an educational effort to get people to be more prepared and more responsible for themselves in the backcountry. The second part is the announcement of their legal ability to charge individuals, groups, or group leaders for rescues due to reckless actions. More information about this program can be found on the New Hampshire Fish and Game website at <www.wildlife.state.nh.us>.

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FOR THE RECOGNITION, TREATMENT, AND PREVENTION OF WILDERNESS EMERGENCIES

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UNRAVELING ABDOMINAL PAIN: A WILDERNESS DIAGNOSTIC APPROACH

By Adam Oster, (W)EMT-B

One of the most challenging moments in my short career as a youth canoe trip leader centered on a situation which involved one of the participants. We were only 4 days into what was scheduled to be a 21-day whitewater canoe trip in a remote part of northern Quebec in July of 1996. The 10 participants ranged in age from 15-17-years-old. We had equal numbers of young men and women. All of the participants had a considerable degree of experience in handling themselves in remote locations. They were also aware of the exhilaration and, at times, anxiety-causing nature of whitewater traveling.

On day 4, one of the young women began complaining of pain and cramping in her abdominal area. She described the pain as coming in waves every few hours. It was relieved by ceasing whatever she was doing and bringing her knees to her chest. Nothing in particular seemed to aggravate it. The pain was dull, poorly localized, and did not radiate to her back, groin, or shoulder. She was unable to sleep through the night without being awakened by this pain.

She had some nausea without vomiting. She had no diarrhea, blood in her stool, spotting, or painful urination. Her past medical history was non-contributing. Her family history was negative for gastro-intestinal diseases. She did admit to previous sexual activity prior to the beginning of the trip but was quite sure that she could not be pregnant (her period occurred in between her last sexual encounter and the commencement of the trip).

On an exam, she did not appear ill. Her vital signs at the time of the exam and for her entire time spent in the field were stable. On the abdominal exam she did not have guarding or rebound tenderness. She did have pain to deep palpation centrally over the umbilicus. No masses were noted.

The other co-leader and I spent some time conferring on this issue. Suffice to say that we were unsure about how to proceed. For both of us, the abdominal area was like a big black box of mysterious organs in mostly unknown locations. We were aware of the severity of some of the potential medical conditions but remained unsure about how to narrow down the field of possibil-

ities. We decided, with considerable lip-biting, to wait for 48 hours and then reassess.

The crampy pain increased in severity over the next two days without noticeable progression in quality or location. Our young participant continued to eat and drink small amounts. She was becoming unable to participate physically in the trip and increasingly became socially withdrawn because of her own belief that her illness was an imposition to the group and an impediment to the group's intentions of finishing the trip on time.

The onset of abdominal pain in a remote setting is a worrisome scenario. The diagnostic possibilities range from the relatively innocuous (anxiety, attention-seeking behavior, or constipation) to the extreme medical emergencies (an ectopic pregnancy or appendicitis, for example). How does someone sort out what's going on to a level of satisfaction which allows her to make an informed decision? If diagnostic certainty is unrealistic, how can someone discriminate between what needs immediate attention and what is self-limiting? Finally, if the disease process still remains unclear, should the index of suspicion be high enough that an evacuation should be considered?

Taking a thorough history of the patient may go some distance to suggesting both the acuity of the condition and the index of suspicion that you ought to entertain. A history that is superimposed on a basic awareness of the major diagnostic possibilities, however, may better guide the questions that are asked and help in interpreting the responses.

Conducting a thorough physical exam may also support the possibilities that you've determined are more likely than others, following the history you've just taken. It's important to recognize, though, that a physical exam cannot

(continued on next page)

INSIDE:

- Pearls of Wisdom3
- Cave Rescue4
- Bopsy6
- CalendarBack Cover

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("Pain" – continued from page 1)

confidently rule out certain entities. The utility of the physical exam comes in providing physical markers (vital signs, pain location, quantity, and response to palpation) which can be followed and charted while a given situation evolves with or without your intervention.

Once a history and physical exam have been carried out— in the setting of a hospital or clinic— certain investigations would now be indicated. Any woman of child-bearing age complaining of abdominal pain would receive a pregnancy test. Usually this involves testing her urine for a hormone produced by a developing embryo.

I think there are very compelling reasons to include a home pregnancy kit (which detects the same biological marker) in wilderness first aid kits for those groups who will be remote enough to make evacuations technically difficult and/or prolonged. Some training of staff in utilizing and managing this modality would be advisable such as how to ensure an adequate sample, for instance. Also of importance is how to counsel a person who tests positive. Ensuring the confidentiality of the test results to the remainder of the group is of utmost concern and must be discussed as well.

A positive pregnancy test on a trip, in the context of abdominal pain with or without spotting, should be considered an ectopic pregnancy until proven otherwise. This is an emergency and in the field would require immediate provisions for the most rapid means of evacuation.

A negative test is also significant. It rules out a pregnancy-related problem and redirects attention to either urinary tract infections or gastro-intestinal problems. In the presence of dysuria (painful urination), frequency (urinating more times than usual), with or without suprapubic pain and fever, you can be somewhat confident that a urinary tract infection is present. The next question is whether the infection is limited to the blad-

der (cystitis) or has ascended to involve one or both kidneys. If there is flank pain (pain in the costo-vertebral angle) then a kidney infection (pyelonephritis) is most likely. In the absence of flank pain, cystitis is most likely. Both require immediate antibiotic treatment with either trimethoprim-sulfamethoxazole (Bactrim or Septra), one pill by mouth two times per day for seven days or Ciprofloxacin, one 500 mg pill by mouth two times per day for five days and forced fluids. Both of these are prescription drugs. A person with an urinary tract infection needs to be monitored for any signs and symptoms of worsening infection (feeling worse, increasing fever, worsening or changing patterns of abdominal pain) and a decision regarding evacuation needs to be made at this point.

If the history, signs, and symptoms are not leading you toward urinary tract infections, then the next major anatomical area to explore is gastro-intestinal problems. A history suggestive of GI-related diseases could include abdominal pain, diarrhea, nausea, vomiting, or blood in the stool. If diarrhea is present and it started on the trip, especially if other people have diarrhea, then you are probably dealing with a viral gastroenteritis. Make sure these people stay hydrated, if necessary using commercially available oral rehydration formulas, since diarrhea can result in dramatic daily losses of either iso-osmotic or hyperosmotic fluid. The major concern in this situation is profound volume depletion (dehydration) which can lead to kidney damage, syncope, and electrolyte abnormalities (which can result in cardiac arrhythmias). Because the vast majority of cases of gastroenteritis are viral, antibiotics are not effective. They can actually make the situation worse.

If nausea and vomiting are the primary and exclusive complaint especially in the context of a known or suspected head injury, assume that the nausea and vomiting are secondary to this trauma. This is an emergency that requires immediate management in a hospital. The quickest evacuation possible should be considered. Another possibility is that the nausea and vomiting is due to some medications the individual is taking. Make sure you ask about any and all drugs (both prescription and over-the-counter) and read the bottles if available.

If abdominal pain with or without these above features is the primary complaint, find out when the pain started, if it has changed in intensity, location, or quality, and what positions are the most and least comfortable. It is also important to note whether the individual has had any prior abdominal surgeries. The major possibilities to keep in mind are appendicitis, diverticulitis, and an intestinal obstruction.

Appendicitis can be difficult to diagnose even in an emergency department. The hallmark of progressing inflammation of the appendix is dull, generalized abdominal pain that is poorly localized. The person may or may not have a fever. As the process continues, the pain becomes increasingly uncomfortable and ultimately sharp pain localizes to the lower right abdomen. By this point the person is unable to walk and unable to be examined. He may be lying still on

The Wilderness Medicine Newsletter is intended as an informational resource only. Neither the *WMN* nor 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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his side with his knees drawn up. If you suspect an appendicitis, seek immediate attention. The complications of an untreated, inflamed appendix are perforation into the abdominal cavity and subsequent systemic infection.

If abdominal pain is of recent onset, in the left lower quadrant, and increasing in intensity with or without blood in the stool, then diverticulitis is a possibility. It is estimated that about 50% of the population over 50

years old have diverticular disease, outpouchings of colonic mucosa at points of weakness in the colonic wall. These outpouchings are prone to infection because they can trap feces and bacteria. Infection of a diverticula, i. e. diverticulitis, is a distinct possibility in the older age group with a pain pattern as described above. There may be nausea and vomiting as well. On exam a palpable mass may be identifiable in the left lower quadrant.

Continued to "Pain" page 7

PEARLS OF ABDOMINAL WISDOM:

The single most common cause of abdominal pain is constipation. It is usually caused by dehydration. The last 4 feet of your intestinal tract is the colon; it reabsorbs the water that was used in the digestive process. If you become dehydrated, then the colon will withdraw more water from the stool, thus making it firmer. Finally, as a result, the bowel is unable to push the stool forward and out.

The contents of the bowel is propelled forward by peristalsis, a coordinate rhythmic contraction of the muscles in the wall of the intestinal tract. If the bowel is unable to push the contents forwards, the strength of the contraction will increase until you feel a cramping sensation. As the contraction increases in strength, the pain increases. The individual suffering from constipation will complain of lower abdominal pain that will come on and slowly build in intensity and severity over a period of 2 - 5 minutes. When the pain reaches maximum intensity, it will disappear. This pain will recur every 5- 15 minutes until the constipation has resolved.

Treatment for constipation is with fluids (to rehydrate the individual and the stool) and a stool softener, such as Milk-o-magnesia. In severe cases the best treatment is to give the individual an enema which usually has to be repeated twice.

The other common source of abdominal pain is kidney stones. Anyone can get a kidney stone but, typically, there is a family history and the individual may have had stones in the past. Kidney stone formation is enhanced by dehydration. The stones form in the calyces of the kidneys where the urine becomes too saturated with solutes, such as calcium and grow in size.

The pain occurs when the stones pass out of the kidney into the narrow ureter that leads to the bladder. The pain can cause nausea and vomiting. The pain is the result of the spasm of an ureter. Described as the worst pain ever experienced, it is usually on one side of the abdomen and may go through to the back. As the stone moves down the ureter, the pain migrates toward the lower abdomen and genitalia.

As the stone passes through the ureter, it tears the lining and may cause blood in the urine. In the backcountry treatment is to force fluids to push the stone out and pain control. Although kidney stones can pass quickly, they

may take days to pass, so evacuation is appropriate.

In summary, here are a few pearls of wisdom to remember when it comes to abdominal pain:

1. The most common cause of abdominal pain is constipation, which is usually due to dehydration. Treat with rehydration and a stool softener. In severe cases an enema may be the best way to cure the problem.
2. Another common cause of abdominal pain is kidney stones, which is also usually due to dehydration.
3. The most common cause of nausea and vomiting is a virus, gastroenteritis, which will spontaneously recover within 24 - 48 hours. The only treatment is frequent small sips of clear liquids to prevent dehydration.
4. The most common cause of diarrhea is viral, which can be effectively treated by forcing liquids to prevent dehydration and Peptobismal.
5. The most common cause of rectal bleeding (bright red blood per rectum) is a minor tear in the mucosa or hemorrhoids. Both are treated with a stool softener or increased fiber in the diet and direct application of witch hazel.
6. If the patient with the abdominal pain has an appetite and bowel sounds, his condition is not an emergency.
7. All of the following conditions require evacuation:
ABDOMINAL PAIN +:
 - a fever > 102.5 or fever and chills.
 - localized abdominal tenderness with referred pain or rebound tenderness.
 - voluminous diarrhea.
 - diarrhea with blood.
 - vomiting every 30 - 60 minutes for > 4 hours.
 - vomiting with blood.
 - no appetite (anorexia) and a silent bowel for > 24 hours.

ORAL FLUIDS AND CAVE RESCUE*

by Keith Conover, M.D., FACEP

Disclaimer: Recommendations for medical treatment in this article are presented for training purposes only. I have attempted to ensure that all recommendations are consistent with current medical practices, but all care provided by cave rescuers should be by the order of a physician. Your physician medical director must set protocols and standing orders, and you must follow them, even if they conflict with the recommendations in this article.

ORAL FLUIDS IN CAVE RESCUE THE ORAL ROUTE

The standard rule for patients 'on the street' is that you never give fluids. There are good reasons for this: you might make the patient more likely to vomit and aspirate (get vomit into the lungs). Even if the patient doesn't vomit in the ambulance, the patient may need surgery; and general anaesthesia with food or fluid in the stomach makes it likely for stomach fluid to regurgitate into the lungs, causing severe lung problems. However, wilderness patients can use the oral route for medication, food, and water, but only under certain conditions.

First, the GI system must be working. If the patient has an ileus, nothing you give by mouth will be absorbed. What is worse, it will sit in the patient's stomach until the patient vomits it back up. At the best, this is unpleasant for everyone, and at the worst, the patient aspirates into the lungs and dies.

After any trauma, it is common for the intestines to go 'on strike.' In medical terms, this is an ileus. When a patient has an ileus (the most common grammatical way to use the term), the contents of the stomach and intestines stay where they are, rather than moving gradually from the beginning to the end, as is the usual case. The coordinated peristaltic movements of the GI tract stop or are replaced by ineffective spasms.

You cannot feed a patient with an ileus. If you give the patient something to eat or drink, it will sit in the patient's stomach until he or she vomits. Even if you don't let the patient eat, gas created by normal bacterial action on the contents of the GI tract tends to cause bloating and vomiting. The standard treatment for those with an ileus, therefore, is to place a nasogastric (NG) tube to allow gas and stomach secretions to drain out without making the patient vomit.

Clues to a patient with an ileus include: (a) the patient is not hungry, and may be nauseated; (b) bowel sounds in the abdomen are absent or markedly decreased; and (c) the patient is not having bowel movements and is not passing gas per rectum.¹

Second, the patient must be alert enough to be able to eat or drink without aspirating. People often say, "The patient must have an intact gag reflex." But, about 30% of normals don't gag, ever, and these people don't spend their life aspirating everything they eat or drink. We just want someone alert enough to have an intact swallowing mechanism.²

Third, don't give oral fluids to someone who is probably going to go to the operating room in the next 6-8 hours. This would include open or severe fractures, abdominal injuries, or severe abdominal pain. Why? Because of the possibility of aspiration as the patient is being put under anaesthesia. If you're more than 6-8 hours from the operating room, howev-

er, you may be able to give fluids up until about 6 hours before the patient is likely to reach the hospital.

If you're going to start your patient on oral fluids, start with small sips of clear fluids. Don't let the patient take large amounts, no matter how thirsty. If the small sips stay down, then gradually give larger amounts.

FLUIDS

The normal minimal need for fluids is about 2 liters/day for a standard-sized adult. Pediatric fluid requirements vary with weight. You can use the following formula to calculate minimal fluid needs based on weight. For the first 10 kilos, add 100cc per kilo per day; for each of the next 10-20 kilos, add 50cc per kilo per day; and for every kilo above 20, add 20 cc per kilo per day.³

0-10 kg	100cc/kg/day
10-20 kg	+50cc/kg/day
20+ kg	+20cc/kg/day

FLUID NEEDS ARE SIGNIFICANTLY INCREASED BY:

- _ fever (which increases insensible perspiration);
- _ bleeding;
- _ vomiting or diarrhea;
- _ swelling in injured areas (including 'third space' losses in the abdomen that may not be visibly obvious); and
- _ increased loss through damaged skin (large abrasions or burns).

The best way to know that fluid replacement is adequate is to see a urine output of 50cc/hr or better. (Pediatric patients: 1 cc/kg/hr.) Even if a Foley catheter in the bladder or a Texas ('condom') catheter is not used, you can carefully measure the patient's urine output by having the patient urinate in a bottle and measuring the urine prior to discarding it. If you then average over a period of several hours, you should have an accurate assessment.

ELECTROLYTES

We need a small amount of sodium and potassium each day. One liter of Ringer's Solution or Ringer's Lactate provides more than enough for basal needs, and just about any diet has enough to meet basal needs. As long as the amounts given aren't excessive, and the kidneys work properly, extra will be excreted. High or low values of sodium or potassium can cause heart and CNS problems but cannot be diagnosed in the field.⁴ Electrolyte losses are increased with:

- _ sweating, which causes loss of both sodium and potassium (e.g., with varying fever or a hot environment);
- _ vomiting and diarrhea, which cause loss of significant amounts of both sodium and potassium; and
- _ burns, bleeding, or third space losses, which decrease the available electrolytes.

CALORIC (ENERGY) NEEDS

A normal adult on garrison duty needs 1700-2000 Kcal (Calories with a big C) each day.⁵

This is increased markedly by strenuous exercise or injury

up to about 4000 Calories a day. Also, fever increases basal metabolic rate about 10% per degree, and energy needs increase correspondingly.

Most people have energy stores enough to last for days to weeks, even if injured.

You cannot give enough through an IV in the field to make a significant difference – a liter of D5W (5% dextrose solution) has 200 Calories, and adding two amps of D50 (50% dextrose solution) to the liter of D5W only brings it up to 400 Calories, only a tenth of the injured patient's needs). However, you should provide what little you can this way. Adding two amps of D50 to every other bag of IV fluid should be a standard treatment for long evacuations with an injured patient.

If you are trying to feed a patient with severe injury or illness, and the patient can tolerate PO (oral) fluids (see above), start with clear fluids with salt and sugar (e.g., Gatorade™ diluted half-and-half with water) because this will be absorbed with minimal energy expenditure. Gradually move to liquids (e.g., soup), then to solid food. You can use commercial liquid feedings such as Ensure®, which are available at drug stores and are often carried by cavers and alpine expeditions. Keep the amount of fat minimal to start, to avoid difficulty with digestion.

Starvation is common among those who have been lost, and starvation causes certain biochemical abnormalities. A decrease in plasma proteins may lead to swelling of the ankles or other body parts. Starvation ketoacidosis may lead to a fruity odor on the breath similar to that in those with diabetic ketoacidosis. The ketoacidosis also leads to variable degrees of confusion and lethargy.[1, 2] 'In all forms of severe under-nutrition, refeeding must be instituted slowly. Overeating was a cause of shock and death among concentration camp victims at the end of World War II.'[3]

PROTEIN NEEDS

The body needs a half-gram of protein a day and more when coping with injury or healing.

You can't give protein through IV in the field, but by giving small amounts of glucose in IV (as described above), you can spare the use of some of the body's own protein. When starving, the body breaks down protein into sugar. The brain, unlike the rest of the body, can't use fat; so, when necessary, the body will always break protein down to make glucose for the brain.[4, 5]

CONCLUSION

Oral fluids may have a very important role in the wilderness or cave rescue patient. If the rescue and evacuation will take a long time, keeping the patient well-hydrated is essential to survival. And, if the patient is fluid-depleted due to cold or heat exposure, injury, or simply being stranded, repleting the fluid losses is a vital part of emergency care. There are several situations in which you should not give oral fluids: surgery likely within the next 6 hours, internal injuries, or an ileus. However, there will likely be situations where the patient has none of these problems, you don't have an IV, or you don't have enough IV fluids to meet the patient's needs. In these cases, oral fluids may be lifesaving.

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About the Author:

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* This article is adapted from materials prepared by the ASRC-CEM Wilderness Emergency Medicine Curriculum Development Project, © 1991, with permission. The Appalachian Search and Rescue Conference and Center for Emergency Medicine of Western Pennsylvania are cooperating to develop a detailed, definitive curriculum for Wilderness EMT training. A textbook based on this material should appear in the future. The Task Group reviewing this material included Sherwood Chetlin, M.D.; Keith Conover, M.D.; Eric Davis, M.D.; William W. Forgey, M.D.; Lorick Fox, Jr.; Stephen A. Gates, M.D.; Murray Gordon, M.D.; Fred Harchelroad, Jr., M.D.; John R. Kihl, R.N.; Michael S. Kuga, EMT; Robert Lasek, M.D.; William Mackreth, EMT-P; Charles Stewart, M.D.; David Thomson, M.D.; Ray Townsend, M.D.; Ricardo Townsend, M.D.; and James A. Wilkerson, M.D.

¹ Farting.

² It's theoretically possible for someone to have a stroke that damages the swallowing mechanism and leaves a patient alert, but the chances of your rescuing such a patient in the wilderness is negligible.

³ Thus, for a 40 kilo child, this would be: 100cc/kg/day x 10 kilos = 1000cc/day, plus 50cc/kg/day x 10 kilos = 500cc/day, plus 20cc/kg/day x 20 kilos = 400cc/day, for a total of 1900cc/day.

⁴ Except possibly some potassium imbalances by seeing certain changes on an EKG.

⁵ The calorie (with a small c) is the amount of energy needed to raise one gram of water one degree Centigrade. However, when capitalized, the word Calorie means kilocalorie. Whenever dietitians are talking about calories, they are always talking about Calories with a capital 'C.' The Calorie, also known as the kilocalorie, is the amount of energy needed to raise a kilogram of water (1000 grams, or a liter) one degree Centigrade. Your basal metabolic rate is about 75 kilocalories an hour, about 3/4 of which comes from your internal organs, and 1/4 from your muscles.



WANTED: LIFE-SAVING STORIES

Life-saving stories are currently being gathered for another New York Times Bestseller *Chicken Soup for the Soul* book. Entitled *Chicken Soup for the Life-Saving Soul*, this volume will be co-authored by Rick Canfield, Joe Woodall, Jack Canfield, and Mark Victor Hansen.

The authors are looking for stories from those who serve at the intersection of life and death on a daily basis: cops, firefighters, paramedics, emergency room doctors and nurses, military personnel, coast guard personnel, emergency medical technicians, life guards, mountain rescue technicians, and even life-saving pets. Additionally, stories are welcomed from those, who but for the assistance of a lifesaver, may not have survived and would like to take a moment to convey a word of thanks.

Tentative chapters include: "How What You Do Has Changed You," "Acts of Kindness," "Acts of Love," "Acts of

Heroism," "Living a Dream," "Overcoming Obstacles," "Going Above and Beyond the Call of Duty," "Life Saving Pets," "Thank You Stories From Those Who Were Saved," and "Life Saving Miracles."

If you have a story you would like to share, please send your submission to:

Joe Woodall and Rick Canfield
Chicken Soup for the Life Saving Soul
PO Box 45419
Phoenix, Arizona 85064-5419

You can also e-mail them at fmtc@primenet.com.

The following excerpt was written by Jack Canfield and Mark V. Hansen and will most likely be included in the book.

Bopsy

The 26-year-old mother stared down at her son who was dying of terminal leukemia. Although her heart was filled with sadness, she also had a strong feeling of determination. Like any parent, she wanted her son to grow up and fulfill all his dreams. Now that was no longer possible. The leukemia would see to that. But she still wanted her son's dreams to come true.

She took her son's hand and asked, "Bopsy, did you ever think about what you wanted to be when you grew up? Did you ever dream and wish about what you would do with your life?"

"Mommy, I always wanted to be a fireman when I grew up."

Mom smiled back and said, "Let's see if we can make your wish come true." Later that day she went to her local fire department in Phoenix, Arizona, where she met Fireman Bob, who had a heart as big as Phoenix. She explained her son's final wish and asked if it might be possible to give her six-year-old son a ride around the block on a fire engine.

Fireman Bob said, "Look, we can do better than that. If you'll have your son ready at seven o'clock Wednesday morning, we'll make him an honorary fireman for the whole day. He can come down to the fire station, eat with us, go out on all the fire calls, the whole nine yards! And, if you'll give us his sizes, we'll get a real fire uniform made for him, with a real fire hat— not a toy one— with the emblem of the Phoenix Fire Department on it, a yellow slicker like we wear and rubber boots. They're all manufactured right here in Phoenix, so we can get them fast."

Three days later fireman Bob picked up Bopsy, dressed him in his fire uniform and escorted him from his hospital bed to the waiting hook and ladder truck. Bopsy got to sit up on the back of the truck and help steer it

back to the fire station. He was in heaven.

There were three fire calls in Phoenix that day and Bopsy got to go out on all three calls. He rode in the different fire engines, the paramedics' van, and even the fire chief's car. He was also videotaped for the local news program.

Having his dream come true, with all the love and attention that was lavished upon him, so deeply touched Bopsy that he lived three months longer than any doctor thought possible.

One night all of his vital signs began to drop dramatically and the head nurse, who believed in the Hospice concept that no one should die alone, began to call family members to the hospital. Then she remembered the day Bopsy had spent as a fireman, so she called the fire chief and asked if it would be possible to send a fireman in uniform to the hospital to be with Bopsy as he made his transition. The chief replied, "We can do better than that. We'll be there in five minutes. Will you please do me a favor? When you hear the sirens screaming and see the lights flashing, will you announce over the PA system that there is not a fire? It's just the fire department coming to see one of its finest members one more time. And will you open the window to his room? Thanks."

About five minutes later a hook and ladder truck arrived at the hospital, extended his ladder up to Bopsy's third floor open window and 14 firemen and two firewomen climbed into Bopsy's room. With his mother's permission, they hugged him and held him and told him how much they loved him.

With his dying breath, Bopsy looked up at the fire chief and said, "Chief, am I really a fireman now?"

"Bopsy, you are," the chief said.

With those words, Bopsy smiled and closed his eyes for the last time.

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Continued from "Pain" page 3

The person with suspected diverticulitis needs to be evacuated as well since the risk of complications of perforation are serious, similar to that of an appendicitis.

Gastro-intestinal obstruction is the final major category of possibilities. Generally, an obstruction is just what it sounds like. By some mechanism, either external to the intestine, or within the intestine itself, the intestine is obstructed and digested food cannot adequately pass. A history suggestive of an obstruction would be one with a prior history of abdominal surgery, ulcer disease, or diverticular disease. Typical physical exam findings depend on the duration of obstruction. These may include severe abdominal pain and distention, fever, and a discernable mass felt on palpation. There may also be nausea, vomiting, and diarrhea. An obstruction, too, is an emergency, and immediate attention is warranted in order to avoid the consequences of perforation of the colon.

Finally, it bears mention that symptoms from the GI tract are quite commonly found, after investigation, to be unrelated to any organic disease. This is now termed Irritable Bowel Syndrome (IBS), and while being considerably frustrating to the individual with it, no abnormalities are ever found after an examination and workup. Large epidemiologic studies suggest that the condition occurs in approximately 15% of the population. There are now distinct diagnostic criteria for IBS. A diagnosis of IBS is made by a gastroenterologist after an appropriate exam and investigations.

One of the lessons I have learned from the situation discussed above was that coming to an understanding of the disease process causing the problem was unrealistic. What might have been reassuring at the time would have been the ability to discriminate between the problem with the potential to become acute and unmanageable from a process that would dissipate.

In the end a decision was made to evacuate this participant to a nearby town where there was a hospital. The evacuation took three days. I remember the paradox of feeling both relief in making the decision as well as anxiety in hoping she would make it to the hospital without becoming much sicker.

This person is fine now. I don't recall that a diagnosis was ever actually made. When I think back on the situation, I remember being terribly concerned about not only how to deal with her pain and discomfort at the moment but also how to manage a turn for the worse, if that had occurred. In hindsight, I am convinced it would have been helpful to have some basic problem-solving thought processes in mind.

About the Author:

Adam Oster has been practicing wilderness medicine since the early 1990's while working with groups such as *Outward Bound* and *Madawaska Kanu Center*. He is currently in his last year of medical studies at the University of Calgary in Calgary, Canada.

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SHEDDING LIGHT ON THE SUNSCREEN CONTROVERSY:

WHAT SUNSCREEN CAN AND CAN'T DO—AND WHY

By Mark F. Naylor, MD

A recent controversy concerning the effectiveness and even the safety of sunscreen has drawn wide attention from national news media as well as from the medical community. Researchers at the Memorial Sloan-Kettering Cancer Center reported in a paper presented at a meeting of the American Association for the Advancement of Science that sunscreen had no protective role against melanoma. They based this conclusion on a meta-analysis of several retrospective sunscreen studies, published primarily in epidemiology journals that had previously received little attention from clinicians. Several of these studies had found a positive correlation between the use of sunscreen and the development of melanoma.

That conclusion has been widely disputed by many members of the American Academy of Dermatology (AAD). At issue was the methodology used in the meta-analysis, with respect to the following issues:

- Most of the studies included in the meta-analysis are outdated. They reported on patients who were using sunscreen before 1980, well before the development of broad-spectrum, sun protection factor (SPF) 15, which is the current minimum standard for effectiveness.
- The long latency period (10 to 20 years) between sun exposure and the first clinical signs of melanoma was overlooked.
- Several of the cited studies inappropriately linked sunscreen use and melanoma because they did not account adequately for melanoma risk factors. Simply put, the people at greatest risk for melanoma are those who sunburn easily, particularly those who with red or blond hair and fair skin. Because they burn easily, these persons are more likely than others to use sunscreens, at least occasionally. Consequently, data collected from sunscreen users may very well indicate a higher-than-average incidence of melanoma; however, the cause is most likely their skin type, previous exposure to sunlight, genetic predisposition, or other factors not related to the use of sunscreen.

While contesting the report's conclusions regarding the effectiveness of sunscreen, spokespersons for the AAD emphasized that sunscreens *alone* do not provide adequate protection against the dangers of sun exposure and must be combined with other measures to be effective. Given the debate over sunscreens, now may be a particularly appropriate time to review the risks of sun exposure and the available protective measures with your patients.

EPIDEMIOLOGY

There is extensive epidemiologic evidence suggesting that melanomas are caused by sunlight. A history of sunburn is the *greatest known environmental risk factor* for the disease.^{1,2} The pattern of distribution of melanoma on the body is also instructive. Those areas most prone to repeated, intense sunburn—the upper back in men, and to some degree women, and the legs in women—are precisely the ones where nodular and superficial spreading melanomas are most likely to develop.

This pattern of development indicates that chronically tanned skin provides some protection against these two most common types of melanoma, probably by reducing the severity of sunburns in these areas. However, nodular and superficial spreading melanomas do occur in these areas, although somewhat less often than one might expect, given the amount of sunlight they receive.

Warn your patients that tanning is basically a response to *damage that has already occurred* because of sun exposure. Tanning is triggered by the metabolites of DNA excision repair, which implies that there is always DNA damage associated with it.^{3,4} Some harmful effects of sun

(continued on next page)

INSIDE:

Dehydration and Associated Environmental Illness 4

Calendar Back Cover

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(*Shedding Light...*—continued)

exposure— including photoaging, lentigo maligna melanoma, basal cell carcinoma, squamous cell carcinoma, and other forms of nonmelanoma skin cancer— are heavily concentrated in chronically exposed, chronically tanned areas. While tanning is a protective response that may decrease somewhat the effects of such exposure, the ongoing damage is cumulative. The best strategy for preventing any form of skin cancer is to minimize that exposure.

Some of the recent controversy about sunscreen use for cancer prevention stems from our lack of precise knowledge concerning the extent to which different wavelengths of ultraviolet radiation may be responsible for melanoma formation. This is important, since sunscreens obviously need to be targeted to cover those regions of the sun's spectra that are most likely to cause cancer.

Given the connection between sunburn and melanoma, there is very compelling indirect evidence that ultraviolet B (UVB) radiation is the principle cause of melanoma in humans; about 90% of the sunburn-causing part of the sun's spectrum is in the UVB range. Moreover, a recent experiment using human skin transplanted into nude mice provided the first direct evidence that UVB radiation can induce premalignant melanocytic hyperplasia and even melanoma on human skin.^{5,6}

The role of ultraviolet A (UVA) radiation in causing melanoma is less certain; most of the solar radiation reaching the earth's surface is UVA radiation, but it is 1,000-fold less effective than UVB radiation in causing skin redness.⁷ There is a fish model of melanoma, which has gathered some support in recent years, that predicts that solar UVA would be the principal cause of melanoma in these fish if they were exposed to sunlight in the way that humans are.^{8,9}

If humans were like fish, the implication is that UVA would be the major causative wavelength of human melanoma. However, since fish are nonmammalian, have a different system of DNA repair than humans, and need much less protection from sun exposure to begin with because they live in water, they are basically a different kettle of fish altogether, and the usefulness of this model is open to question.

PREVENTATIVE MANAGEMENT

Since the development of erythema (e.g. sunburn) seems to be a key etiologic factor in the genesis of melanoma, it makes sense that strategies based on preventing or minimizing sunburn will reduce the likelihood of developing melanoma. Optimal management includes three components: avoidance, protective clothing, and sunscreen.

Avoidance

UVB radiation exposure is greatest when the sun is directly overhead, so it is advisable to avoid outdoor activity around

the noon hour, or more broadly between the hours of 10 am and 4 pm. A good rule of thumb for your patients to remember is that if your shadow is shorter than you are, seek shade. Practically speaking, this means trying to plan outdoor activities, such as gardening, lawn mowing, and playing golf, for early in the morning or late in the afternoon, which also corresponds to the coolest part of the day.

Protective Clothing

Hats are particularly important to use because they can help cover the face and neck, which are exposed to sunlight year-round. It is important to pick one that is completely occlusive to light and has a 2.5- to 3.5-inch brim (or wider) all the way around. Warn your patients that baseball caps provide virtually no protection to the back of the neck and barely cover enough facial skin to make their use worthwhile. Wearing a shirt with long sleeves is also desirable.

A fabric's weave is more important than its weight in determining how much protection from the sun it provides; fairly lightweight clothing can be very protective if it has a tightly woven structure. For instance, a lightweight nylon bicycle jersey protects very well, yet is not uncomfortable to wear. Darker-colored fabrics are generally more occlusive than lighter-colored ones, all other things being equal. On the other hand, even heavy white cotton T-shirts can let through a fair amount of UVA radiation; thin cotton T-shirts can let in a substantial amount of UVB radiation as well.

The ability of the garment to protect the skin from sun exposure decreases with age, because as the garment is worn, it stretches and loses fibers, which increases the spaces between individual threads. Clothing specifically designed to minimize sun exposure is available at specialty stores or direct from the manufacturer. (See text box.)

Sunscreen

While sunscreen use is very important, it should be emphasized that currently available sunscreens are only partially protective and cannot completely block all of the sun's harmful effects. Ideally, sunscreens should be used as a back-up that comes into play when sun avoidance or the use of protective clothing is impractical. They are also a useful preventive measure against unanticipated, and often unrecognized, sun exposure. In my experience, this form of sun exposure is very common, largely because most people do not realize how often they expose themselves to solar radiation. Very often when I am excising a person's first skin cancer lesion, I hear some variation of the following comment: "Doctor, how could I have skin cancer, I never get any sun exposure!" Most whites, particularly those who live in the South or are involved in outdoor occupations, would probably benefit from daily application of a good sunscreen.

Where to Find Protective Clothing Designed to Minimize Sun Exposure

- Better sporting good stores
- Gardening catalogs
- Order direct from manufacturer, e.g.:

Sun Precautions (888-SOLUMBRA;
e-mail: spf30plus@aol.com;
website: <http://www.sunprecautions.com>

Koala Konnection (specifically for children: 888-465-6252;
e-mail: suninfo@koalakon.com

The best sunscreens have a high SPF (at least 30, and preferably 45 or higher) and cover a broad range of ultraviolet wavelengths, including both UVB and UVA. Chemical sunscreens with SPFs of 45 or higher usually are fairly effective in the short UVA range, and newer agents that contain microfine zinc oxide or titanium oxide particulates also give excellent, broad UVA and UVB radiation protection.

Although they provide excellent coverage into the UVA range, newer sunscreens that contain avobenzone should be viewed with some caution, particularly if they also contain methoxycinnamate. Avobenzone tends to break down more rapidly than other sunscreens and, even worse, can degrade methoxycinnamate, one of the most important UVB blockers in many high-SPF sunscreen preparations. If sunscreens containing avobenzone are used, they should be reapplied at least every 2 hours.

Some patients may be reluctant to use sunscreen because they experience a "burning" or "stinging" sensation when they apply it. Advise these patients to use products containing microfine titanium or zinc oxides, which are less likely to cause hypersensitivity.

Although sunscreens have great potential as a means of reducing exposure to UV radiation, their practical effectiveness depends on their proper use. Advise your patients to keep the following points in mind:

- **Overreliance.** Too many people believe that dabbing on a thin layer of SPF 15 sunscreen provides complete protection against sun exposure and neglect other essential protective measures, such as wearing a hat and protective clothing or seeking shade. When extended sun exposure is anticipated, such as during a day at the beach, advise patients to wear protective clothing and use avoidance measures (e.g., a beach umbrella) in addition to the sunscreen.
- **Amount.** The effectiveness of any sunscreen depends on the amount applied. The FDA uses a density level of 2 mg/cm² to rate sunscreen effectiveness. To achieve this level of density when applying sunscreen to an average human face requires 3 to 4 mL, or 1/2 to 1 teaspoon. A recent Danish study found that the average amount applied by people at the beach was 0.5 mg/cm².¹⁰ Application at this density reduces the effectiveness of an SPF 30 sunscreen to that of an SPF 8. If the Danish study reflects the typical practice of sunscreen users, then getting people to use adequate amounts of sunscreen is obviously a major issue.
- **Timing.** Apply sunscreen 20 to 30 minutes before sun exposure, to allow adequate binding to the skin. Application of sunscreen just before exposure greatly reduces its protective effect.
- **Reapplication.** A sunscreen's protection is reduced considerably over time; it can be rubbed, sweated, or washed away. Reapply sunscreen every 2 to 3 hours and after each exposure to water, even when using products advertised as "waterproof" or "water-resistant."

About the Author:

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DEHYDRATION AND ASSOCIATED ENVIRONMENTAL ILLNESS

By Andrea Geremia, (W)EMT-B

Despite thousands of years of holing up in sturdy houses, humans are amazingly resilient and adaptable outdoors. We do have our limits, however, among them extremes of temperature. To protect ourselves from these extremes, we need only be prepared and aware and in possession of ample water and proper clothing. The following provides an overview of prevention, recognition, and treatment of dehydration, heat cramps, heat syncope, and hyperthermia (heatstroke). Given its incredible importance and link to each of the aforementioned conditions, water could be arguably the secret to happiness in the outdoors.

WATER

Just as most people believe themselves to have good judgement, so are most individuals convinced that they drink enough water. To maintain healthy body functions, the average couch potato needs a minimum of one to three liters of water a day. The more active we are, the more water we use and need to replace. A person uses at least half a liter through respiration and one to two liters via urination each day. When actively sweating, we can lose up to three liters an hour.

Failing corresponding input, minor irritations occur. Headaches arise, skin and lips dry out, urine becomes dark and stinky, and fatigue and lethargy ensue. When day-to-day headaches emerge, most people take some analgesics to treat the symptom before considering the cause. Armed with moisturizers and lipsticks, they embalm their dried-out derma, unaware that moisturizing is most effective when emanating from the inside. You know these people, and you want to help them; but like questioning someone's judgement, you tend to avoid commenting on someone's water intake. Unless, of course, you both belong to that rare and curious pocket of individuals known as "athletes" or "outdoor" people, in which case it is likely one of your favorite topics.

Almost two-thirds of a healthy adult's body weight is owed to water. What do our bodies do with all that water? In short, everything. Ten percent of our water is in the blood stream, making healthy blood 85-90% water. Vessels guide blood (water) through the heart, over the lungs to collect oxygen, to the digestive tract to pick up nutrients, by the organs to gather hormones before delivering these packages to individual cells. Then, through a process called perfusion, the blood picks up carbon dioxide and other wastes and sends these things through the kidneys to be sorted and recycled or shipped through the intestinal tract. It is only due to the presence of water that we are able to respire, salivate and digest, generate hormones and new cells, perfuse nutrients and wastes, metabolize (produce energy) and thermoregulate (control body temperature), cushion organs and joints, maintain blood pressure and interstitial fluids, flush our systems, fight infection, and, yes, keep our skin and other membranes soft and supple.

Since relatively few people consistently drink as much water as they use, the body is constantly and deftly prioritizing the positioning of available water. An example is the yanking of water from interstitial spaces (microscopic areas between cells) into the blood stream in order to burgeon blood pressure. The same process of trans-location applies to the blood itself, which, as we have stated, is mostly water. Therefore, we readily adapt to less than optimal water intake, making mild dehydration quite common.

DEHYDRATION

When we use more water than we take in, we become dehydrated. Though we only have two basic methods of hydrating—ingestion or intravenous injection—there are numerous ways we lose water. Since water is depleted chiefly through urination, respiration, and perspiration, the more active an individual, the more hydrating is required to maintain normal body function. We pass roughly half a liter of water in excrement on a semi-daily basis. A person can rapidly lose life-threatening amounts of fluid through intense fever, severe or persistent vomiting or diarrhea, and the weeping of burns. Oh yes, we also cry—especially when we're too exhausted from dehydration to finish the race or reach the summit, (being two percent dehydrated [down about one and one-half liters] drops performance off by around 20%). Hence the active interest in water.

Given that we constantly adapt to various levels of water in our systems, dehydration is a continuum, often cumulative over days, with a downward trend recognizable by a predictable set of signs and symptoms. The composition of blood is continually in flux, owing to the amount of water available. When water levels drop too low, blood thickens and blood pressure, due to sheer lack of volume, drops. This inhibits cell function, since nutrients and waste can't pass through cell walls as efficiently without adequate water content or blood pressure. As the body searches for energy, we experience a sluggish effect; we also have headaches, dizziness or light-headedness with the loss of blood pressure as less oxygen gets to the brain. When brains cells are impaired as such, we also tend to get mildly confused and/or cranky. This disgruntling effect is perhaps the most clearly recognizable to the trip leader and is to be avoided at all costs. Mention to your charges that they shouldn't wait to drink until they're thirsty or have a dry mouth, as the thirst mechanism is a response to moderate dehydration. We don't feel thirsty until we're down about one and one-half liters and have already lost a sizeable portion of endurance. At this point, the pituitary gland at the base of the brain stimulates our thirst and signals production of an antidiuretic hormone in order to retain as much fluid as possible. Urine becomes minimal, dark and odoriferous, where in a healthy and hydrated individual it is clear, copious, and relatively odor-free. Since urination is not as frequent in water-

depleted individuals, these people are more susceptible to urinary tract infections. Further, water gets sucked from the walls of the intestinal tract, which are highly porous areas, and excrement becomes harder and harder to pass. Constipation follows for the unenviable person who does not hydrate quickly enough. When someone complains of a headache, fatigue, dizziness or lightheadedness, has chapped lips or skin, and becomes strangely cranky or mildly confused, strongly suspect dehydration and have him drink a liter of water over the course of thirty minutes, then continue with several more liters over the next few hours. Furthermore, make sure this person gets salt in his drink or diet to prevent "water intoxication" or hyponatremia.

Prevention, (which is treatment), includes pro-active education of your outdoor companions, good knowledge of the area and water sources where you'll be traveling, two methods of water purification, frequent group-wide water breaks, excessively watery meals (as often happens by mistake in any case), multiple water toasts, convenient tube hydration systems, and constant modeling by the leader of proper hydration habits. Any tricks you pick up to get others to drink are worth a try. Also remember that prevention includes salt—NaCl or sodium chloride—because it is the sodium—the "Na"—that holds the water in the body.

Sometimes, and usually when some other ailment is involved, severe dehydration sets in, which is marked by weakness, sunken eyes, rapid and weak pulse, rapid and shallow breathing, and anxiety. Ideally no one in your group will get to this point, but it can happen. With food poisoning or infections of one's gastrointestinal tract, vomiting and diarrhea are the body's natural way to clear the system. Facilitating the body's natural systemic flushing by replacing lost fluids with equal amounts of water is the surest way to help. Nauseated patients present a greater challenge in that when they drink, they often vomit. This can be worked around by giving a mere teaspoon of water every few minutes or so or by having them suck on a (preferably clean) moistened t-shirt. If the dehydration stems from loss of plasma due to burned skin, be sure to cover the burn site with a moist, occlusive dressing (e.g. Saran Wrap) to prevent the evaporation of weeping, which can easily amount to one liter per hour. In all instances of dehydration, we are concerned with the potential development of shock, a life-threatening and barely manageable condition, often not treatable in the field. If you suspect severe dehydration is imminent, immediately evacuate the patient. As long as resources are ample and the patients can drink, eat, and are experiencing only signs and symptoms of mild or moderate dehydration, they are treatable in the field.

* "Water Intoxification" is a current buzzword in the outdoor industry. It refers to situations where a severely dehydrated individual is rehydrated with "free" water, that is, water alone without electrolyte replacement. As a result there is a dilutional drop in sodium (natrium) causing hyponatremia which can lead to seizures, coma, and even cardiac arrest. This can be avoided by rehydrating with an electrolyte solution such as one tablespoon of sugar and one teaspoon of salt per liter of water. This can also be accomplished by eating something salty like pretzels, peanuts, or potato chips during the rehydration process.

HEAT EXHAUSTION

To complicate matters, when we sweat, we don't lose just water, we also lose electrolytes, particularly sodium chloride. When salts are in solution, they break down into electrolytes known as chloride, phosphates, bicarbonate, potassium, magnesium, calcium, and sodium. Electrolytes are found in varying concentrations in and around cells and in the blood. Humans cannot function without electrolytes present in certain concentrations on either side of individual cells. These concentrations are maintained by continual movement of electrolytes into or out of each cell. Without these narrow limits of electrolyte presence, cells cannot perfuse, a body cannot convert energy to usable forms, and the brain cannot send out nerve impulses. Without enough potassium, for example, the heart will not beat normally. When there is an excess of salts in the blood, our body responds by prompting our thirst mechanism. We then drink which dilutes the blood; extra salt is filtered through the kidneys and into our urine.

Normally, we replace lost electrolytes through the food we eat, as there is no shortage of salt in a healthy American diet. When we sweat in a profuse or prolonged manner, however, we lose electrolytes more quickly than can be accessed from our body's reserves, leaving ourselves somewhat impaired unless or until electrolytes are replaced. Heat exhaustion often occurs in people unaccustomed to heat, since they sweat more and lose more sodium chloride in their sweat than normal until they acclimate.

The signs and symptoms of heat exhaustion mirror those of dehydration, with the additional unpleasantness of nausea and/or vomiting. Often the patient's skin feels cool and clammy, despite her sweating, since fluid has been robbed from the extremities and brought to the core in an attempt to keep blood pressure sufficient for vital organs. She might feel flu-ish and have chills due to the cells' incapacity to thermoregulate. The heart and respiratory rates will be slightly elevated as the body tries to get blood and oxygen to the brain. Resting in the shade with a big, sugary beverage, some tasty, salty snacks, and the feet elevated will make anyone, especially the heat-exhausted patient, feel better.

This is the same treatment for so-called heat cramps, which are knotted muscles or "charley horses." They are a sign of stressed muscle cells due to overexertion and salt depletion.

Heat cramps tend to occur in the absence of sufficient fluids and electrolytes and with a slight elevation in body core temperature (around 101 degrees F).

Heat syncope, or fainting, is a response to loss of blood pressure, and often accompanies dehydration or heat exhaustion. In hot weather, the body dilates vessels in the extremities in order to get more blood to the surface to be cooled. If we stand still for a while without muscle contractions aiding the movement of blood, or if we kneel, sit, or squat for a length of time, blood can pool in the extremities. This sometimes causes a brief but noticeable decrease in blood pressure, especially when we rise from the low position. Since brain cells—just like all cells—rely on blood pressure to get oxygen, there is a temporary loss of consciousness. In the presence of ample fluids, this condition is less likely to occur.

Both heat syncope and heat exhaustion are self-correcting,
(continued on page 6)

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(Dehydration...— continued)

in that eventually and without treatment, the victim either collapses from fatigue or faints, dropping to a level surface and allowing the heart to get blood back to the brain. Ideally, this person will then get to a cool, shady spot to eat, drink, and rest. Barring proper treatment, he will likely sleep for a while, giving the body time to access stored electrolytes and water. He should recover within twenty-four hours and should resume activity cautiously. He may feel hung-over and dehydrated, but okay, as long as there is no underlying illness.

So what should heat-exhausted folks eat or drink? Water, of course, is vital; make sure it is potable. Adding some salt to the water will provide sufficient electrolytes, though these patients might find the taste offensive. Taste enhancements such as Kool Aid or Tang take care of that, while providing welcome sugar. You can feed them carbohydrates: good old raisins and peanuts, a health nut bar, pretzels; whatever you have with you. Just be sure that there is corresponding water intake, to aid absorption. In recent years, sports drinks have become popular, even among non-perspiring individuals. These beverages contain various amounts and combinations of carbohydrates, vitamins, minerals, and electrolytes. Unless you are exerting yourself in a very hard and/or sustained manner, have not been eating properly, or are very sick, these drinks are a bit of overkill, but they work well for these purposes. Because of the attempt to market them as a variety of lemonade to the general public, these beverages are concentrated. One cup full-strength will help combat nausea, but otherwise dilute them with equal parts water; in this form they are readily absorbed by the stomach lining and are convenient for staving off or treating heat exhaustion or when dealing with something like cholera. (You can lose up to a quart of water per hour through the diarrhea associated with cholera, and because fluids in this case are coming from the intestinal walls, they are rich in electrolytes.)

Heat exhaustion is an issue of insufficient fluids and electrolytes and not a direct function of outdoor temperature. It can occur in any season or temperature. Though heat exhaustion is commonly confused with heatstroke, it is not generally life-threatening. Continued loss of electrolytes and fluids can lead to shock and organ damage, but unless there is some other accompanying illness, most individuals will recover completely simply by doing what the body demands. Obviously, the hotter it is outside, the more the body sweats to try to cool itself, but body core temperature is raised only a few degrees, if at all. If we have sufficient electrolytes and water on board, no matter how hot it gets, we will not get heat exhaustion. Heatstroke is another matter, however.

REGULATION OF TEMPERATURE AND HEATSTROKE

To understand heatstroke, it is important to discern how humans gain and lose heat. External heat sources such as stoves and the sun produce some heat for us; our only internal source is metabolism. Each of us has our basal metabolic rate, meaning we burn a certain amount of calories each day, even if we watch Jerry Springer reruns the whole time. Whenever we exert ourselves through muscle action (and this includes shivering), there is an additional and directly propor-

tional burning of calories, which is our exertional metabolic rate. Metabolism is best known as the calorie burner or energy provider, and this energy takes the form of heat.

Our most direct way to conserve heat lies in the transfer of blood from extremities to our core, where in cold conditions, heat is most needed. There exist a multitude of ways to lose heat, however. Being warm objects in a cold universe, we are continually emitting heat through radiation. We conduct our heat into other, cooler objects every time we come in contact with them, which is why we wear insulating layers in cooler weather. When we breathe and sweat, the transfer of liquid into gas via evaporation sloughs much of our heat, which works against us in colder weather. Herein lies the beauty of the wicking layer, which moves sweat away from our skin (water conducts heat faster than air) and breaks up the water so it will evaporate faster, leaving us drier. In warm weather, evaporation is our friend, since the brain cools the body by signaling it to sweat. The drier the air, the greater the evaporation and hence, the greater the cooling effect. Conversely, the higher the humidity, the less the evaporation and the hotter we stay. Finally, whenever a substance brushes past us, we lose through convection the layer of air which we have heated around us. This substance is usually water or air, which is why we consider the wind chill factor when gauging temperature. The faster our insulating layer is whipped from us, the more heat we lose trying to replace it. Hence the importance of the wind layer. The principle of convection also explains why we fan our heat-injured patients.

The human body is constantly adapting to changes in temperature, striving to maintain its core at about 98.6 degrees F. Our functional extremes are only four degrees either way, and life extremes are between 90 and 107 degrees F. The thermoregulatory system depends upon vasodilation and vasoconstriction of the capillary beds in the skin and sweat. The evaporation of sweat accounts for 90% of our cooling ability. We have nerves in our skin called thermoreceptors which recognize a rise in temperature and alert the brain. The brain then calls for the sweat glands to start up sweat production and sends more blood out to the extremities to be cooled via radiation, conduction, and convection, which are aided by external means such as air conditioners and swimming pools. If body core temperature rises too high, despite internal and external heat loss mechanisms, heatstroke ensues.

HEATSTROKE

Heatstroke is a severe rise in body core temperature due to excessive heat production without adequate dissipation, and with a high likelihood of resultant permanent brain damage or death. The first type is known as "classic heatstroke," and tends to afflict the elderly, infirm, and very young, since their defense mechanisms can be limited during heatwaves. Classic heatstroke is seen in city dwellers without air conditioning or other effective means of cooling. As they over sweat to keep cool, over a period of days of increasing dehydration and heat exhausting, they become incapacitated, and eventually die when their body core temperatures rise too high. The onset of symptoms is slow, often from days to weeks, and the victim's skin is red, hot, and dry. We are not likely to see this form in the backcountry, though treatment is the same.

The kind of heatstroke we usually see outdoors is "exertional heatstroke," which occurs through overexertion and overexposure to sun and heat. Exertional heatstroke can take just twenty minutes from onset to death. It typically occurs in temperatures greater than 90 degrees F, and with greater than 70% humidity, when sweating is unproductive due to lack of evaporation. Much of the time, these patients have fluid on board and are sweating; however, more often, their sweat is simply not evaporating well enough to dissipate the heat, or they have become dehydrated and are not producing enough sweat. Therefore, their skin is often red, hot, and wet or dry.

The number one sign of heatstroke is an abrupt and dramatic change in level of consciousness. The sharp downward trend of personality changes starts with disorientation, extreme irritability, and hallucinations, and is quickly followed by loss of consciousness, seizures (often upon cooling) and coma. When body core temperature reaches 105 degrees F, things start cooking in the brain. At 107 degrees F the brain dies.

Proper emergency treatment for heatstroke is to immediately and aggressively cool the patient by whatever means are available. Remove all clothing, cover the patient with wet cotton, and fan vigorously. Be sure to place the patient on wet granite or in the coolest spot you can find. Focus cooling efforts on the head, neck, hands, and feet and vigorously massage limbs to circulate cooler blood back inside. Ice water is great, but not always available. Placing the victim in an open body of water is not a substitute because the water has to evaporate in order to have a cooling effect. When the core temperature has been lowered, let the patient rest, but implement a rapid carry-out evacuation. Permanent effects of heatstroke include kidney damage and the losses of range of motion, coordination, and ability to thermoregulate, so this patient will need to get to a hospital as soon as possible, even if she appears to be fine. Remember, in order for sweat or water to cool, it has to evaporate.

CONCLUSION

Prevention of all these conditions centers on awareness of food and water intake, amount of exertion, and weather. Regardless of the temperature or activity, it is essential to keep hydrated, eat well, protect against the sun via hats, sunscreen, and shade, and to avoid overexertion. These precautions will go a long way toward insuring a safe and enjoyable time outside, and are certainly much easier than treating resultant illness and injury.

Finally, though we are not focusing on cold-related injuries here, it is worth mentioning that the vast majority of the individuals taken out of the backcountry for hypothermia are dehydrated. As stated, in order to metabolize and create internal heat, the body requires food, water, and oxygen, so don't ignore hydration practices in colder weather. After all, when body core temperature drops, the first thing to go is judgement, and though most of us consider ourselves to have good judgement, it is important for us look out for one another to avoid life-threatening situations.



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LEADERSHIP IN THE PREVENTION OF BACKCOUNTRY INJURIES AND ILLNESSES

By Sue Barnes, (W)EMT-B

Congratulations! You've just accepted a job leading a group of people into the wilderness for a day, a week, a month, or more. Your workplace requires you to take a first aid course to treat injuries or illnesses you may encounter in the backcountry. With any luck, this course will focus specifically on wilderness aspects of first aid and may address, to some degree, the importance leadership plays in wilderness emergencies. The question is, do you have any idea of the importance of leadership in preventing problems from occurring in a wilderness setting?

Wilderness emergencies can cause physical and emotional pain and stress, delay an activity, prevent participation in an activity, or even create a situation in which the individual(s) must be evacuated or the trip ended. Many injuries or illnesses can often be prevented through education and good role-modeling by the leader(s) involved. This article primarily focuses on preventing problems through two things – education and leadership – rather than addressing treatment options once a problem has occurred.

There are some important things of which to be aware when taking people into the backcountry. First, never assume that an individual understands the consequences that can be brought on by small errors in judgment in a wilderness setting. An individual with little or no experience may not understand the potential for problems created by not drinking enough water, not putting a hat on when chilled, not stretching prior to an activity, and so on.... Seasoned backcountry travelers often learn to avoid problems through previous experiences (either theirs or someone else's). Program participants or friends joining you for a trip into the wild often do so with an expectation that you will keep them safe. To achieve this, good leadership and education are key.

Secondly, people, particularly adults, generally do not want to complain or hold up a group. Complaining is often perceived as interrupting the flow of activity, and the individual would prefer to suck up and deal with the pain or discomfort rather than make a move toward fixing the problem. Going hand-in-hand with this concept is the fact that everyone has an ego, and, admit it or not, most would hate to be labeled as "wimps" or "weaklings" because they are

experiencing some sort of difficulty. So again, rather than saying something, they tend toward keeping quiet and coping the best they can. In many cases this reticence can cause a minor problem to become more significant. It also has the potential to create difficulties not only for the patient but for the entire group. Pre-trip education will help to rectify some of these misconceptions by allowing participants to have a better understanding of what can happen if problems aren't caught and treated early.

Thirdly, most people will model their behavior after someone they admire or respect. And guess what - that's you, leader! If you provide a good example for others to follow, you'll be rewarded with healthy, happy people who will want to come back for more.

With the above information in hand, let's start off with the basics of prevention.

Be aware of any physical problems and treatment procedures that might be necessary before the trip departure date. Make sure participants have completed a thorough medical questionnaire. After reviewing this information (preferably with the organization's or trip's medical director), discuss conditions with the participants. Ask them to bring extras of essential medications such as insulin for the diabetic, an additional "rescue" inhaler (such as albuterol) for the asthmatic, or epinephrine and antihistamines for someone who has a severe allergic reaction to something that he may be exposed to during the outing. Hopefully, the participant will never need the additional medication, but having the extra supply available and stored separately (usually one with the participant and one with the leader) will act as insurance against damage, loss, or inaccessibility at a time when the person really needs it.

(continued on next page)

INSIDE:

- "Lost Proofing"
How to avoid getting lost. . .6
- K-9 Search & Rescue7
- CalendarBack Cover

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("Leadership..." - continued)

Never overestimate the capabilities of your group. This is quite important, as a leader should have capabilities which exceed the group she is leading. Given this higher skill base, a leader can sometimes forget the limited skills and abilities of trip participants. Because of this, the group may be unnecessarily ushered into hazardous terrain or conditions totally inappropriate to their skill level. Avoid this by setting goals prior to the trip based on the skill levels within the group. It is always possible to challenge a group and still maintain good health and safety. It just requires forethought.

Know your personal limits and be willing to stop before you reach them. Remember that you are responsible for the safety of others. You jeopardize group safety when you push yourself to the absolute limit of your capabilities. Save that for a time when you are not in a leadership role.

Think safety and get your group thinking the same way! Before engaging in any outdoor activity, observe your environment. Look up, look down, look all around. Use your senses (except possibly taste) to assure that your "playground" is as safe as possible. Every environment will present its own set of problems - steep terrain, high winds, extremes of temperature, avalanche potential, class IV rapids. You are in the backcountry seeking adventure, but as a leader, you must also maintain the safety of the group while calculating the risks involved in the adventure. Always keep an eye on the weather and be prepared to turn back if conditions warrant it.

There are a myriad of protective pieces of equipment designed for the outdoor adventurer - use them and use them properly. Climbing helmets, personal flotation devices (PFD), biking helmets, etc. were created to keep the users safe. While many people complain about protective equipment being too hot, too restrictive, too cumbersome, or the one time you will need a piece of equipment is the one time you don't have it or aren't using it. Use equipment designed for the activity you are engaged in. A climbing helmet and a bicycle helmet are each designed differently to accept a force typically incurred in that sport. Do not cross over safety equipment and use it for an unintended purpose. Properly adjust protective equipment to fit the wearer. Ill-fitting or improper fastening of protective devices such as a PFD or biking helmet will do little to maintain the safety of the individual wearing it. Educate participants on the need for safety equipment, its proper sizing and use, and, above all, set a good example by using the equipment appropriately yourself.

Lay down the ground rules early and often in regards to backcountry sanitation: Don't eat poop!!!! While the statement itself is an attention-grabber, the results of doing the same are a real pain. Washing hands after a bowel movement or passing urine is essential to maintaining the health of all group participants. Microscopic pieces of feces may get under the fingernails of the individual, who may then pass on that bacteria to others, especially through the preparation or sharing of food. For this reason, hand washing must be done prior to all meals and meal preparations. While waterless hand sanitation products will do in a pinch, biodegradable soap and water should be used whenever possible. When sharing food coming from a single bag, pour the food out for individual servings rather than having people place their

hands in the bag to retrieve food. Avoid sharing water bottles, personal utensils, lip balm, etc.- it's a great way to spread germs. Communal food pots, dishes, and utensils must be washed and sanitized (through boiling or a chlorine rinse/air dry method) each time they are used. Personal dishes and utensils should have the same done at least once a day. Eat hot foods immediately after preparation, and prepare just enough to meet your needs. Because bacterial growth on food can multiply quickly between 45 F to 140 F (7 C to 60 C), leftovers should be discarded unless they can be immediately cooled and maintained at less than 40 F. Reheating the leftovers may kill the bacteria but will not usually destroy the nasty toxins created by the bacteria. Reheating could lead to dire consequences as a vicious tummy bug rips through group members' bellies.

Properly dispose of feces using outhouses, catholes, or other appropriate means for the area in which you travel. Different environments lacking organic soil or having temperature extremes will likely have other methods for disposing of human waste. Check in guidebooks or with local outing clubs to determine the recommended means of waste disposal.

Speaking of human waste, children and adults alike may not know how to "go to the bathroom" in the great outdoors. Education regarding site selection (at least 200 ft. from a water source or trail), coupled with some appropriate demonstrations of squatting, leaning from a tree, etc., will go a long way toward relieving one's anxiety and downright fear of pooping or peeing in the wild. If you are stymied on how to convey this information to other people, I'd recommend you read the book "How to Shit in the Woods" by Kathleen Meyer. This takes a serious, yet humorous approach to addressing the poo-poo issues.

Because of feces and fecal contamination, all water consumed in the backcountry should be disinfected. This can be accomplished through boiling, use of halogens (iodine and chlorine), or via filtration using a water filter. All three methods are appropriate, providing that use guidelines are followed carefully. Educate yourself and participants on proper use. Each method has its pros and cons, and all should be considered carefully prior to choosing the primary method for any outing. Always be prepared to have at least one "backup" method to use just in case something goes wrong. (Examples: the fire won't start due to dampness, the iodine tablets absorbed all the humidity and are now useless, or the filter matrix was dropped and is now cracked.)

Common mistakes made in disinfecting water include, but are not limited to, the following:

Boiling: not bringing the water to a full, rolling boil before using. **Halogens:** too much organic matter in the water, lengthening the exposure time, and possibly requiring the use of more iodine or chlorine; not following the manufacturer's directions closely, especially in regards to contact time; not wetting the threads of water bottles once the halogen is in solution to allow for disinfection of this area; adding flavoring too early, before the halogen has time to take effect.

Filters: contaminating the out-take hose with unfiltered water; improper care and storage of a filter between uses, encouraging the growth of bacteria; not replacing the filter cartridge after recommended maximum filtered liters has been

reached; using a damaged or cracked filter; using a filter that doesn't do what you want it to do. Again, educating yourself before you purchase a filter will keep you safer in the long run.

The subject of water leads directly into the issue of hydration in the backcountry. I like to say that dehydration is the root of all evil in the backcountry, because so many problems in a wilderness environment can stem from the lack of sufficient water in our bodies. In order for all the cells in our body to function properly, we must maintain a certain amount of water (5-6 liters in an adult) in our system. Being a couch potato and channel surfing using a remote control for a day requires an adult human being to take in a minimum of 1-2 liters of water in a 24-hour period. Being active in the backcountry may require a minimum of 2-3 liters per hour to maintain proper fluid levels. The body's need for water will also increase in drier or colder climates and at higher altitudes. Without enough water on board, the ability of the brain to process information slows, decision-making skills dull, irritability increases, muscles fatigue and cramp more easily, and defense mechanisms do not function properly. People put themselves at increased risk for injuries, no matter how minor, simply because they need more water.

The solution to this is easy: drink water and lots of it. It is difficult, but essential, to maintain good hydration levels for each group member in the backcountry. Achieving acceptable levels requires good observation and leadership skills as well as explanations of the plethora of problems that could occur from dehydration. Suggestions for encouraging your group to drink water include topping off your fluid levels before starting the day—lots of water is lost at night during sleep; taking frequent water breaks; doing occasional water level checks on the water bottles to see if folks are drinking; playing 'drinking' games, such as frequent toasts to the weather, environment, group members, etc.; and, of course, modeling good hydration habits.

To conserve fluid loss, you may also need to adapt the group's activity patterns to adjust to the environment you are in. An example would be to curb water loss by traveling during the cooler parts of the day and resting during the hottest times to conserve fluids. Another method to conserve water loss is to minimize or avoid the use of caffeinated products and alcohol while in the backcountry. These products encourage water loss in the body by stimulating urine production.

Because sweating plays a significant role in fluid loss in a wilderness setting, electrolytes will also need to be replaced. This can easily be done through eating snacks. Most foods we eat contain at least a small amount of sodium—enough to replace that lost through sweating. Electrolyte replacement drinks contain too much sugar and sodium when commercially prepared, which slows the absorption of the electrolytes from the stomach. Therefore, electrolyte replacement drinks should be diluted to a 4:1 solution if used—four parts water to one part drink preparation.

By teaching people the signs and symptoms of dehydration, the side effects caused by dehydration, and the methods used to avoid dehydration, you are bringing them one step closer to self-sufficiency and significantly closer to safety in the wilderness.

Dehydration and electrolyte loss play a huge role in heat-related injuries. Heat cramps, heat exhaustion, and heat stroke will always involve these two problems to some degree, so prevention and education will be major deterrents to the development of heat injuries. Leadership issues also center on allowing participants to acclimatize to the environment they are in. Individuals coming from a cooler or more moderate climate usually need to adapt to a hotter environment over the course of several days before their bodies can work at peak efficiency. They are more susceptible to heat injuries during this time. Good hydration and nutrition plus frequent rests can aid adaptation to the new environment.

The same can be said for cold injuries. Hypothermia and frostbite can be prevented to a great extent by good hydration, constant nibbling to keep up energy levels, and many short breaks to recoup. Hypothermia has very subtle and insidious roots. Good observation skills and a general understanding of each participant's personality traits will help a leader to recognize the onset of hypothermia sooner. Recognition can also be aided by teaching participants to recognize in each other the subtle, as well as more obvious, signs of this problem. A leader has an obligation to be persistent in the treatment of suspected hypothermia problems. Because the onset is insidious and loss of sound judgment is one of the first signs of hypothermia, the patient may resist treatment measures such as putting on a hat, drinking water, or eating food. Use your powers of persuasion to convince the patient otherwise. Good education begins with explaining the signs and symptoms of hypothermia, methods of treatment, and, more importantly, types of prevention. In addition to good nutrition and hydration, teach information about clothing types and the use of a layering system. Be sure to mention that hypothermia creates the most problems during times of the year when we don't expect to be cold or wet. In the spring, summer, or fall people are less likely to be prepared with the proper clothing needed to meet the challenge of changing weather and environmental problems.

Frostbite tends to occur in exposed areas, such as ears, nose, cheeks, fingers, and toes. In addition to the prevention techniques used for hypothermia, donning protective clothing will help to shield most of these exposed areas from the wind which accelerates the freezing action. Avoid wearing constrictive clothing, such as those with elastic bands around the wrists or ankles, or too many clothes, especially in regard to the feet. Either action may restrict the blood flow to that extremity, thus increasing the likelihood of frostbite. Teach participants that recognition and early treatment of frostbite—cold, numb sensation with white blotches or a waxy appearance over the affected part—will help to prevent further damage.

Altitude illness and, in particular, acute mountain sickness (AMS) is a common problem which often begins somewhere between 8,000 to 10,000 feet or higher. AMS is a physiological response the body has to less oxygen in the air. The higher you go, the less oxygen you take into your body on each breath. To take in the same amount of oxygen that you would at sea level, you will need to breathe twice as much at 18,000 feet.

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("Leadership..." - continued)

Given the right conditions, most people will acclimatize to higher altitudes. During the acclimatization process, which could last from a few days to a few weeks (depending on how high you plan to go), it's crucial to keep well-hydrated. Much fluid is lost to humidifying the air you breathe; higher altitudes mean colder, drier air, so you are breathing more often to take in the same amount of oxygen, and your body is going through a complex physiological process to adapt to the environment. Given this, it is easy to see that dehydration is a common problem at higher altitudes and this leads to AMS. Common signs of acute mountain sickness include headache, dizziness, malaise, nausea, vomiting, loss of appetite, shortness of breath, tingling sensation in the hands and feet, and disturbance of natural sleep patterns. An increase in the severity of these signs and symptoms or the development of more serious problems such as high altitude pulmonary edema (HAPE) or high altitude cerebral edema (HACE) demands immediate descent to a lower altitude where symptoms were not present. Indecision or total disregard for the signs and continuing higher could lead to the death of the individual.

Proper planning, education, and prevention will help to keep the group safe. Factor in a reasonable amount of time to allow people to acclimatize. Educate people on the signs and symptoms of altitude illnesses and their treatments. Encourage honesty from participants so they will admit to feeling bad. This will help you to adapt group activities accordingly.

With regard to prevention, high altitude injury or illness usually results from too rapid an ascent (typically over 8,000 ft.) and associated dehydration. Overexertion and cold exacerbate the problems. Maintaining good hydration is key. Limit your intake of diuretics such as coffee, tea, and cocoa. Frequent rests during the acclimatization process will help to minimize the possibilities of developing AMS. It is a good rule to gain no more than 1,000 feet of sleeping altitude while the body adapts. For example, you can climb from 10,000 to 12,000 feet in one day but return to 11,000 feet to sleep at night. This not only tells the body that you are going higher and it needs to be prepared, but also allows the body the time and ease to make those changes (creating more red blood cells to carry more oxygen) under less stressful conditions. Plan a high carbohydrate diet (your body can digest these easier and more quickly). Avoid eating proteins and fats at night, reserving them for rest days when your body can more readily digest them. By being in good physical condition prior to the trip, participants will use their muscles more efficiently, thereby conserving both energy and fluids during acclimatization.

Strains and sprains are among the most common medical problems occurring in the backcountry, but these problems can often be prevented through good leadership. Both strains and sprains are overuse injuries and occur when an individual exceeds the normal stretching limit of a muscle, ligament, or tendon. Common sprains include those to the ankle, knee, or wrist. Common strained areas include the back, forearm, elbow, and Achilles tendon. Knowing frequently injured areas, leaders should plan and execute warm-up stretches prior to

any activity. Warm and limber muscles, ligaments, and tendons are less prone to injury. Before and during the activity good nutrition and (you guessed it) good hydration will provide the musculoskeletal system with what it needs to perform well. Periodic breaks throughout the activity will minimize chances of overuse. Cool-down stretches at the end of an activity will also help to reduce soreness later on. No matter what the age, everyone should warm up prior to engaging in moderate or strenuous physical activity. If a sprain or strain does occur, immediate treatment using rest, ice, compression, and elevation will help to minimize further injury and may allow the person to stay in the backcountry and resume the activity within a day or two. Prevention through good taping methods or use of a compression bandage or other type of brace is also appropriate. This will aid in supporting a current or previously injured area, reducing the likelihood of additional injury.

Burns are injuries that are quite often preventable. The most common burn in the backcountry usually comes in the form of a sunburn. Sunburns are painful, inhibit movement, cause permanent damage to skin pigmentation, and can lead to skin cancer in later years. Using sunscreen allows people to stay in the sun longer. The more fair the participant's skin, the higher the skin protection factor (SPF) that should be used. Even those who tan well should use sunscreen to minimize harmful exposure to the sun's rays. A minimum of SPF 15 should be applied frequently, especially after swimming and high exertion activities (even if the product claims to be waterproof and/or sweatproof). A wide-brimmed hat will also aid in protecting the scalp, face, and eyes from damaging rays.

Eyes can sustain burns to the cornea or conjunctiva through sun reflecting off a bright surface. Although termed snowblindness, the resultant injury can be caused by sun reflecting off water as well as snow. Not only is snowblindness extremely painful (it feels like someone threw sand in your eyes), it can cause short-term blindness and may cause permanent damage to the eyes. This condition can be prevented by wearing good sunglasses that filter ultraviolet radiation. Getting glasses with side blinders, such as glacier glasses, will help to reduce the amount of light the eyes receive even further. If someone has lost sunglasses, you can fashion a temporary pair using cardboard, paper, duct tape, or whatever is available and putting slits in them. Both sunglasses and sunscreen should be worn on cloudy days as well as clear ones.

The other place people tend to sustain burns in the wilderness is the backcountry kitchen. Establishing guidelines for how a "kitchen" is set up and used will minimize the risk of injury to everyone in the group. Reduce the number of cooks to the least number needed to achieve the task. Establish a "line of safety" when cooking. Only the cooks may cross the line once a stove has been lit. The temptation to cross that line is great when people are hungry, so establish another area well away from the cook site for people and snacks. Only stand or crouch while cooking; never sit down. This will allow a quicker escape if cooking food or water gets knocked over. If cooking on a picnic table, remember that they are notoriously tippy, as is a big pot filled with water precariously balanced on a small stove. Do not allow anyone to sit at the

table while cooking or while a hot pot is resting on the stove. When using the ground as a base for the stove, you will want the area to be as flat as possible. When a campfire is burning, everyone needs to be cautious in moving around it so they don't accidentally trip and fall into the flames.

Pay attention to clothing worn while cooking. Avoid wearing items that can melt quickly, such as polypropylene or fleece. Push sleeves up, remove gloves or mittens, etc. when lighting and working near an open flame. Always wear close-toed shoes around the kitchen to protect feet if something hot should get spilled. Stoves can be somewhat unpredictable at times, so when lighting them, keep face and hair away from the unit to avoid their being torched should the stove decide to flare. On a related matter, cooking can also lead to accidental lacerations while preparing food. Proper training in the use of knives and other utensils, especially with children and young adults, may prevent cuts. Also, section off an area where food may be prepared without lots of "hungry hands seeking food gratification."

Soft tissue injuries, minor cuts and scrapes, are fairly common in the backcountry. While many cannot be prevented, treatment will reduce the probability that infection will occur. Aggressively scrub and clean the wound using soap and drinking-quality water, followed by clean dressings. Keep a close watch for signs of infection, repeating the same process over again should infection rear its ugly head. Explain the signs of infection to your patient, so he can also keep watch over his own wound. Soft tissue injuries must not be taken for granted in the backcountry because it is harder to get and keep a wound clean. By treating the injury thoroughly, you'll minimize the chance of infection and possibly evacuation (due to infection) caused by that injury.

Good personal hygiene will go a long way toward preventing infection, soft tissue or otherwise, in individuals. Wash hands, scrub fingernails, brush teeth, and clean the body daily. Body washing and thorough drying will help reduce the risks of urinary tract infections, vaginitis, jock itch, and athlete's foot by discouraging the growth of bacteria.

Speaking of feet, we come to the bottom of this stack of advice: take care of your tootsies! Whether hiking, boating, climbing, skiing, or biking, healthy feet are essential to the continued mobilization of your outing. Footwear, often taken for granted, protects a very valuable and vital asset - our feet. Not only does footwear keep your tootsies safe from the sun, sharp rocks, and sharp pieces of glass and metal, but it also protects against parasites such as hookworm by preventing their entrance into the body. Footwear should be appropriate for the activity in which you are engaged and should fit properly. Poor-fitting shoes or boots can lead to blisters.

Blisters can be prevented through a number of things, proper fitting shoes being one of them. Wearing two pairs of socks, one thicker, one thinner, with hiking boots will help to minimize friction between the skin and the boot. Breaking boots in prior to a trip by wearing them around while home allows time for the boots to conform to the shape of the foot. It also alerts the wearer to any problem spots prior to using the boots on the trail. If boots are not comfortable in the store or at home, they certainly won't be comfortable under more rugged terrain or when you're carrying additional weight.

Explain to participants how a "hot spot" feels—a red, warm, sore, or painful area where skin is being rubbed. It is important that a hot spot be treated immediately to prevent further damage to the skin. Create a moleskin doughnut and use athletic tape or even duct tape to protect the area from further harm. After explaining a hot spot and beginning your hike, stop about a half-hour into the hike. As a leader, you should make a big production out of a hot spot you "think" you might have. Take off your pack, pull out your first aid kit, water bottle, a snack. Take your time looking at your feet closely and treating your (real or imagined) hot spot. In essence, through modeling, you are letting everyone in your group know that it's okay to stop and treat hot spots before they become blisters. By the time you are done, there will likely be at least one or two people looking at their feet and treating real hot spots.

While on the subject of feet, let's talk about immersion foot. Immersion foot (a.k.a. trenchfoot) is a non-freezing cold injury caused by extended immersion (usually twelve or more hours) in a very moist or wet environment. The conditions do not need to be extremely cold for immersion foot to occur; the water (or sweat) that the feet are in simply needs to be cooler than the surrounding skin temperature. Therefore, this is a common injury in all environments from tropical to cooler settings. A normal response to persistently cold, wet skin is the vasoconstriction of capillary circulation, which in turn restricts blood and oxygen flow to the skin. On the short term, immersion foot causes swelling, pain, and mild tissue damage. Long-term exposure to cold, wet conditions without treatment will lead to significant pain and swelling, major tissue loss and nerve damage, possible amputation, and long-term disability. Since signs and symptoms of Immersion foot do not appear until the feet begin to warm and the damage is done, it is essential to prevent this problem before it begins.

While it is not unusual for feet to get wet from sweat or immersion during many outdoor activities, it is crucial to get feet dry at the end of the day. Set an example by taking off your shoes and socks, drying your feet, applying powder, and massaging your feet to get circulation moving again. If you know your feet will be wet for an extended time, consider also applying this process during lunch or breaks in your activities. Feet need to be kept dry and warm for the night - never sleep in damp or wet socks. Happy feet are the "sole" of a backcountry journey - keep them happy, and they'll keep you and your group happy!

Basic leadership guidelines for keeping folks safe in the wilderness include being perceptive to changes in individual needs, meeting those needs in a safe manner, keeping in mind that there is little that is more precious than a human life, and thinking and acting wisely to protect that important commodity. While most of the information provided in this article might seem like common sense, leaders introducing people to new outdoor experiences often overlook these details. By employing the techniques mentioned above, you will not only provide a safe and healthy experience for participants and friends, but you will also reduce the likelihood of having to perform first aid in the backcountry. Teach your students well, and they will reward you by preventing illness and injury from occurring. And that translates into more time for fun for everyone!

"LOST PROOFING"

HOW TO AVOID GETTING LOST, AND, IF LOST, HOW TO BE SAFE AND HELP YOURSELF TO BE FOUND

By Nancy Lyons

The difference between being confused about where you are in the woods and being lost in the woods is the difference between calm and panic. Preplanning works. You can prepare yourself, your hiking companions, your children, campers, school children, or adults for how to avoid getting lost, how to be safe, and how to help searchers find you if you become lost. But most group leaders don't take the time to include interactive discussions of how or why people get lost. Getting the group to ask and answer "what if" scenarios helps each group member see the big picture so that safety protocols make sense.

There are two major categories of lost people - mentally-able and mentally-impaired. You'll need to approach lost-proofing differently for each group.

Because the mentally-able can reason- meaning they have the ability to plan and respond appropriately to the environment- you can help them develop self-protection and self-help strategies. For the mentally-impaired there is limited self-help training that is useful. Their lost-proofing depends on constant supervision by the mentally-able.

The mentally-able get lost because:

- they overestimate their abilities;
- they underestimate the area in which they are hiking (difficulty, distance, weather);
- they aren't familiar with the area and don't have navigational aids that they know how to use (map, compass, GPS);
- when they make a mistake, they panic which puts them in life-threatening situations.

As a parent, hiking partner, or group leader you can "lost-proof" yourself and your companions by developing lost-proofing protocols for every outdoor group activity. Of course, to get everyone to follow these protocols, they must be more than a bunch of rules "from above." You can spark people's imagination if you take the time at the beginning of every group venture to "huddle" and get the group to play the "what if" game.

To play the "what if" game, create an accident or lost person scenario that could actually occur on this group's outing. Tell everyone that they are the team leaders and have to figure out how to handle this event. Here's an example of a situation that actually happened to my husband and me on what we thought was going to be a simple 3-hour mountain hike a number of years ago:

After 40 minutes of hiking, you tell your hiking partner that you need to pee and are just going off the trail into the bushes. You assume he'll wait on the trail for you. When you get back to the trail, he isn't there. You call his name- no answer. You start hiking up the trail because that's the direction you were headed. After hiking for 5 minutes, you still don't see your partner, so you stand there for a few minutes. Some folks are coming up the trail behind you. You interview them to see if they have seen your hiking partner. They haven't. So you continue hiking uphill. Still no partner. Now you interview the next group of hikers coming downhill. They haven't seen him either.

Now ask everyone to decide what this person should do. Let a discussion follow with your group members determining how to manage this lost-person incident. Once they realize that each member of the group needs to agree to a few rules, you can

introduce your "lost-proofing" protocols. Unless people confront the "what ifs" that trigger the life-threatening decisions, they won't buy into the sensible restrictions that individual or group outdoor activities demand. As we know, there is nothing common about common sense.

What should be included in your group's lost-proofing protocols? There are three elements for which everyone needs responses: prevention, lost person self-help, and searcher response:

Prevention protocols:

- Everyone has an assigned "buddy." (Selection of activity partners is an art this article can't cover. For hiking activities, be sure partners are fairly equal in physical ability.)
- Always have your assigned partner in sight or sound.
- Everyone carries 2 lost-person protection tools - a large trash bag for wet and cold protection and a whistle. (In this article it is assumed that everyone is carrying all necessary clothes, food, and water and is wearing a watch and footwear appropriate to the activity planned.)
- Everyone has a map and knows the activity "plan" which includes the establishment of a base.
- Only the team leader can change the activity "plan."
- If the team leader changes the activity "plan," everyone needs to be briefed about the new plan.
- Everyone pledges to follow the "30-minute rule" which requires each group member to turn around and head back to base if they have been out of contact with their activity buddy for more than 30 minutes. (You can set any time limit that is appropriate to your activity.)
- Whistle contact protocol: If you are lost, blow three long blasts every 2 minutes. If you are searching for a lost person, you blow one long blast every 2 minutes.

Self-help action plan if you become separated or lost:

- If you become separated from your buddy on a known trail, you should wait on the trail for 30 minutes and then follow the "30 minute rule" by heading back to the agreed-on meeting place.
- If you get lost in the woods, STOP moving immediately, and stay where you are blowing your whistle for three short blasts every 2 minutes.
- Between whistle blasts begin building a dry, comforting nest (shelter/home). Choose a mid-height tree (don't nest under the tallest tree because of lightning). If possible, find protection from the weather, but stay near an open space in the event that finding you includes air searching.
- Begin keeping dry now!

All this nest-building activity gives the rational, action-oriented person something to do that is useful and doesn't lead to panic decisions. Most lost adults and older children don't want to be humiliated by having to be found. They don't like not being in control. They don't want to depend on other people finding them. So their first response to being lost is to rush around searching for a way to get out. This fosters panic, risks injury, and moves them further away from searchers.

Keep in mind that once you are lost, you should stop immediately. If your group has been following its protocols, you will be within whistle contact of your buddy. **You will, therefore, be found quickly if you stop immediately.**

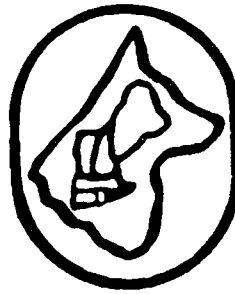
Protocols for responding to a lost group member:

- Immediately mark the place the missing person was last seen (known as the PLS). Use surveyor's flagging or some article of clothing.
- Blow a single long blast on your whistle every 2 minutes.
- If you are alone, stay at the PLS and try to make whistle contact for 30 minutes. Interview any hikers going up or down the trail to see if they have seen your missing person. Ask them to interview other hikers as they continue up and down. If they meet your buddy, have them tell him to return to the meeting place agreed on in your plan.
- After 30 minutes, go for help. Do not leave the PLS until it is clearly marked and can be found by the trained searchers. Check the time you left the PLS so that when you brief the search responders, you will be able to tell them how long it will take searchers to get to the PLS.
- If you are hiking with other people, leave one person at the PLS (point last seen) who will continue to blow a long single whistle blast and then listen for the three-whistle-blast response. (Have your compass ready so if you hear the three whistle blasts you can get an accurate compass bearing on the sound.)
- Send someone to find the group leader to inform her of the situation. Send someone further along the trail in the known direction of travel until the searcher is just within whistle contact of the person at the PLS. Have this searcher also blow a single whistle blast every 2 minutes.
- All searchers from your group should agree to meet again at the PLS after 30 minutes of searching. Everyone then waits at the PLS until the team leader arrives.
- If possible two people remain at the PLS while the team leader and others return to base to contact help.

We all know that practicing is the only way to develop the physical and mental skills needed by athletes, musicians, dancers, surgeons, and so on. To give calm, reasoned responses to new situations, you must practice by playing the "what if" game. In the sports' coaching world this type of practice is called visualizing. The athlete imagines every aspect of how he is going to perform and/or respond. Creating "what if" scenarios and developing smart responses with other group members is the best protection against panic. Panic happens when you can't think of what to do. Knowing what to do and knowing that all your group members know what to do is the best protection against the life-threatening mistakes of panic behavior.

The best first response to being lost is to stop, pull out your whistle, and begin to make yourself a warm, dry nest. W.S. Kals, author of the Sierra Club's Land Navigation Handbook, was worried about what might go wrong as his 10-year-old daughter was planning to fly across the country alone. So he asked her, "What will you do if something comes up that we haven't discussed?" She replied (as any lost-proofed person should do), "I'll stop to think what an intelligent person would do in my place."

About the author: Nancy Lyon is a freelance copywriter and owner of a desktop publishing business. She is the president of the New England K-9 Search and Rescue team and handler of three search dogs: Sage, Keeper, and Trace. Nancy has participated in over 150 searches throughout New England with her dogs. As a member of several search and rescue associations, Nancy keeps abreast of new developments in tracking and searching techniques. She shares her experiences in search and rescue with all audiences— from preschools to public service departments. In her free time she also enjoys hiking, horseback riding, cross country skiing and snowshoeing.



About New England K-9 Search & Rescue

New England K-9 Search and Rescue is an all-volunteer hasty response search and rescue organization that combines the unique talents of human and dog. The 16-member team includes 10 certified air scent dog/handler teams, field assistants, and two communications officers. All New England K-9 air scent dog/handler teams are trained to find the "out-of-place" human whether alive or dead. Working near their handler, off lead, the dog constantly checks the air for human scent. The missing person could be injured in brush, hidden among rocks, buried under debris, or drowned in lake or river. The body of the missing person, whether alive or dead, constantly emits microscopic particles bearing "human" scent. Millions of these particles become airborne and are carried by the wind for considerable distances. The air scenting dog is trained to locate the source of this scent. It is the handler's job to grid search the assigned area so that if the victim is there, his scent will reach the dog. This means searching into the wind and accounting for how terrain and weather will affect the dog's scent picture. NE K-9 SAR responds to nearly 30 searches every year in the states of New Hampshire and Vermont. For more information about New England K-9, feel free to send an e-mail to Nancy Lyon at nlyon@tds.net.

Wilderness Medicine Newsletter is intended as an informational resource only. Neither the *WMN* nor 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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Jan. 15-26, '01 Conway, NH (603-447-6711)

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Oct. 16 - Nov. 10 Conway, NH (603-447-6711)
Nov. 12 - Dec. 8 Conway, NH (603-447-6711)
Jan. 2-26 Conway, NH (603-447-6711)
Jan. 8 - Feb. 2, '01 Nantahala, NC (888-662-1662x355)

Wilderness First Responder

Aug. 21- 29 Hurricane Island, ME (800-341-1744)
Aug. 24 - Sept. 1 Brevard Col., NC (828-883-8014)
Aug. 25 - Sept. 3 Lyndon State, VT (802-626-6346)
Sept. 7-15 HIOBS, Manatee, FL (800-341-1744)
Sept. 11-19 HIOBS, Baltimore, MD (410-448-1721)
Sept. 11-22 Conway, NH (603-447-6711)
Oct. 10-20 HIOBS, Newry, ME (800-341-1744)
Oct. 12-20 NC Outward Bound, NC (828-299-3366x120)
Oct. 23 - Nov. 3 AMC, Pinkham, NH (603-466-2721)
Oct. 30 - Nov. 7 Mohican Outdoor, NJ (908-362-5670)
Dec. 1-9 Schooner Ernestina, MA (508-992-4900)
Dec. 9-17 YMCA Greenville, NC (864-836-3291)
Dec. 9-20 Hulbert Out. Ctr., VT (802-333-3405)
Dec. 15-23 Highcountry Outfitters, TN (404-814-0999)
Dec. 27 - Jan 5, '01 Shaver's Creek, PA (814-863-2000)

Wilderness First Responder Review

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Sept. 16-17 HIOBS, Manatee, FL (800-341-1744)
Sept. 28-29 Conway, NH (603-447-6711)
Oct. 21-22 HIOBS, Newry, ME (800-341-1744)
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Dec. 13-17 Conway, NH (603-447-6711)

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Nov. 27 - Dec. 8 Conway, NH (603-447-6711)

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Aug. 26-27 Pocasset, ME (508-564-6484)
Sept. 9-10 Mohican Outdoor, NJ (908-362-5670)
Sept. 16-17 Penn State, PA (814-865-2472)
Sept. 23-24 Pine Ridge Adv. Ctr., VT (802-434-5294)
Sept. 30 - Oct. 1 Middlebury Col., VT (802-443-5264)
Oct. 21-22 UNH Outing Club, NH (603-862-2145)
Oct. 21-22 AMC, NH (603-466-2721)
Oct. 28-29 Monmouth Parks, NJ (732-842-4000x4296)
Nov. 4-5 AMC Boston @ SOLO, NH (978-448-8016)
Nov. 4-5 Highcountry Outfitters, TN (404-814-0999)
Nov. 4-5 Dartmouth Outing Club, NH (603-646-3512)
Nov. 10-12 Hulbert Out. Ctr., VT (802-333-3405)
Nov. 11-12 St. Michael's Col., VT (802-654-2614)
Nov. 11-12 Earthtreks, MD (800-CLIMBUP)
Nov. 18-19 Green Mtn. Club, VT (802-244-7037)
Nov. 18-19 Landmark, NC (828-293-5384)
Dec. 2-3 AMC- Naragansett, RI (401-942-7343)

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High Angle Rescue Level 2

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Confined Space Rescue

Sept. 16-17 Conway, NH (603-447-6711)

Avalanche Awareness

Mar. 3-4, '01 AMC Pinkham, NH (603-466-2721)



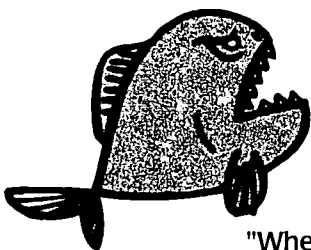
Wilderness Medicine Newsletter

FOR THE RECOGNITION, TREATMENT, AND PREVENTION OF WILDERNESS EMERGENCIES

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STONEFISH and SEA SNAKES and JELLYFISH, oh my!

By Jeanne Twehous, WEMT

"Whenever I find myself growing grim about the mouth; whenever it is a damp, drizzly November in my soul—then I account it high time to get to sea as soon as I can."

While most of us aren't as poetic as Herman Melville about the "gray days" in our lives, we can still relate to the "damp, drizzly November" bit—literally if not figuratively. Which is why, when those cold gray days of winter hit, we head to the tropics. That usually means basking on sandy beaches and backstroking in balmy waters. Unfortunately, it may also mean nasty bites and stings from the creatures that swim those same seas. It's not that the Portuguese Man-of-War stalks you (it can't even swim); nor does the Blue-Ringed Octopus lay in wait for you in tidal pools. It's just that the oceans are home to so many creatures that when you vacation in their environs, you're likely to meet a few. If you're a snorkeler or scuba diver searching for rarely-seen marine life, those encounters can be thrilling. But they can also be devastating—if not deadly. Even the so-called "mild" envenomations from marine animals are likely to make you wish you'd stayed on the beach. Whether you find yourself exploring the murky depths or are simply a wader from way back, it might be wise to know the creatures that inhabit the waters you tread, how they can hurt you, and what you can do about it.

THINGS THAT ENVENOMATE

Worldwide, there are an estimated 50,000 marine envenomations of humans each year (that's only the recorded ones, where the victim seeks medical help). All have the potential to induce severe localized pain; some have the potential to induce death. As with any toxin introduced into the body, the reaction to a marine envenomation will vary from person to person and depends on several factors: 1) the nature of the venom (its specific virulence); 2) the amount of venom introduced into the body (the more venom, the more

chance for a severe—perhaps lethal—reaction); 3) the site of the envenomation on the body (the closer to the torso and head, the more dangerous); and 4) the specific sensitivity of the individual to that specific venom (age and physical condition influence sensitivity). Sometimes, small variations in the structure of the venom protein molecule induced by either heat or acidic/basic conditions can alter the virulence of the venom. For some venoms, then, the application of heat or vinegar (mildly acidic) or dilute ammonia (mildly basic) to the wound site is sufficient to change or denature the structure of the venom and reduce its toxicity. This is important to keep in mind when considering treatment for certain types of envenomations. Also keep in mind the need for tetanus prophylaxis with marine bites and stings as well as the importance of prevention by wearing full wetsuits (and gloves if handling things) when snorkeling and diving.

INVERTEBRATES

The culprits responsible for most marine envenomations—and probably deaths belong to a group of invertebrates called the Coelenterates. (This term is sometimes used interchangeably with Cnidaria although they are not exactly one and the same. "Coelenterate" will be used throughout this article since it is the more commonly



INSIDE:

- Malne First Aid Kits 4
- When the Shark Bites 7
- Calendar Back Cover

(continued on next page)

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("Stonefish...oh my!"—continued)

recognized term. There are approximately 10,000 species in this invertebrate group, and it contains the largest number of venomous marine organisms. More than 100 are a threat to humans; some can cause death in as little as 3-5 minutes. Included in the Coelenterate group are the hard and soft corals, anemones, hydroids, jellyfish, and box jellyfish. The identifying characteristic of the Coelenterate is the possession of stinging cells, called nematocysts. These cells are most abundant on the tentacles and mouth parts of the animals though some jellyfish have them on the upper surface of the bell (body) and some sea anemones have clusters on their body columns. The nematocyst is the 'business end' of the Coelenterate and can best be described as a harpoon on a thread coiled inside the cell and attached to a venom-filled reservoir. The triggering mechanism that allows the stinging cell to discharge is activated by a combination of mechanical and chemical stimuli, though, most often it discharges on contact—usually with an unsuspecting swimmer or diver. Contact causes the harpoon to uncoil and shoot into the skin, injecting the venom. In some Coelenterates, such as the Portuguese Man-of-War, each tentacle can contain as many as 750,000 to 1,000,000 nematocysts. (Remember that the more venom that is injected into the victim, the more likely he is to have a severe reaction.)

All Coelenterates that have nematocysts are potentially harmful. Some, like the hard corals, have a venom that is fairly innocuous to humans unless it is introduced directly into the wounds they leave when they cut you with their razor-sharp calcium carbonate skeleton. Responsible for the construction of the superstructure of reefs and atolls, it is this "skeleton" that often attracts snorkelers and divers. Since the venom that the hard corals secrete is mostly harmless, what is of greater concern are the severe lacerations they create and the potential for infection. First aid treatment calls for washing the wounds with soap and water, flushing liberally with freshwater, and then applying hydrogen peroxide to these sites to allow the bubbling action to remove any coral fragments in the wounds. Rewash with fresh water and dress. Repeat this process twice daily and watch for signs and symptoms of infection.

Sea Anemones are typically large singular polyps with colorful, flower-like bodies that attach to reefs and rocks. Their venom varies in virulence with the most dangerous generally inhabiting Indo-Pacific waters (which usually includes the waters of Australia

and southeast Asia and the many islands that lie in between). This seems to be a fairly common trait among marine creatures . . . with exceptions, of course. The Branching Anemone—one of the most dangerous—can be found in the Atlantic. Mild localized reactions to most sea anemone stings generally consist of painful welts at the site. Reactions from the more venomous anemones include systemic reactions of headache, nausea, vomiting, fever/chills, and abdominal pain. First aid treatment for anemone stings is the same as that for most envenomations from nematocysts:

1. Remove the victim from the water in case of systemic reactions.
2. Remove tentacles from the skin by rinsing the wound with seawater—using freshwater or ice or rubbing can cause more nematocysts to fire, resulting in a more severe envenomation (rescuers should be careful not to contact tentacles with bare skin).

3. Rinse the affected area liberally with vinegar (acetic acid 5%), and then soak for about 30 minutes with a vinegar compress. The purpose of applying vinegar is to prevent the firing of undischarged nematocysts and, consequently, the injection of more venom into the victim. Vinegar will not decrease the pain or diminish the effects of the venom already injected; it will only stop the injection

of further venom. Some alternatives—such as 40% isopropyl alcohol—are recommended in some cases but not all (e.g., vinegar is solely recommended for box jelly stings; the alcohol may encourage further discharge). Other suggestions have been gasoline, ammonia, baking soda, olive oil, sugar, urine, papaya juice, meat tenderizer, and liquor. Some treatments, like meat tenderizer, can cause contact dermatitis in children and sensitive individuals; some may cause the additional discharge of nematocysts. Others have not been tested enough to give them much validity.

4. Localized pain can be treated with ice packs after the area has been liberally washed with vinegar.
5. Remove any embedded nematocysts by applying a paste of sand or mud—made with seawater, not freshwater—and scrape the victim's skin with a sharp edge (a clam shell will do in a pinch). Reapply vinegar for up to 15 minutes.
6. Local anesthetic ointments—like hydrocortisone—can be useful in alleviating pain and itching.
7. For envenomations from marine animals that are known to be severe to lethal, pressure-immobilization bandages are often

EMERGENCY ASSISTANCE

The Divers Alert Network is a nonprofit organization that provides medical information and advice and maintains a 24-hour emergency telephone line for diving-related accidents including marine envenomations:

DAN USA Emergencies—919-684-8111
DAN USA Diving Medical Information Line—919-684-2948 x222
DAN Australasia Emergencies—1-800-088-200
(within Australia)
DAN Australasia Emergencies—61-8-373-5312
(outside of Australia)
DAN Europe Emergencies—41-1-383-1111
DAN Japan Emergencies—81-3-3812-4999

recommended to sequester the venom in the area of the bite/sting (even though this might increase pain and skin damage). Bandages should be placed over the site and as much of the adjoining body part as possible, especially the proximal portion nearest the torso. This technique should not be used until after the application of the vinegar.

Another common Coelenterate is the hydroid, which exhibits both the sedentary (anchored) polyp body type in the form of Stinging Hydroids (resembling feathers and ferns) and Fire Corals (resembling the hard corals) and the free-swimming medusal body type. The most common example of the latter is the Portuguese Man-of-War. Though it closely resembles a jellyfish, it is a colonial, free-floating hydroid. What looks like the main body of the creature is actually a floating colony of several different types of polyps. The tentacles, which are densely covered with nematocysts, hang from the float and can reach 60 to 90 feet in length. Often by the time a hapless victim sees the float, contact with the tentacles has already occurred. The Man-of-War is a circumtropical species, common in the warm waters of the Atlantic, the Pacific (where it is sometimes called the Bluebottle), and the Indian Oceans. It is the larger Atlantic specimens, though, that probably represent more of a threat to humans. Very common in the Florida Keys and throughout Central Florida waters, they can sometimes be found on temperate coasts when large flotillas are transported by warm tropical currents and washed ashore by storms or onshore winds. Occasionally, they are carried by the Gulf Stream current as far north as the Bay of Fundy in Canada. Since they have no ability to propel themselves, they are completely at the mercy of winds, tides, and currents.

When the Man-of-War envenomates a human, pain is the most prominent feature along with localized skin lesions that have a "string of beads" appearance—discrete welts surrounded by redness. Swelling and blistering of the skin can also occur. Some victims describe the contact as feeling like a red hot piece of wire is touching their skin. Systemic reactions, most often seen in children and the elderly, include fever/chills, headache, nausea, vomiting, abdominal pain, muscle cramps, respiratory distress. In rare cases, cardiac arrest has occurred. The standard first aid treatment advised for any coelenterate envenomation is recommended although some references advise against the vinegar treatment with no explanation of why. One of the most important things to remember about the Portuguese Man-of-War is that it can still inflict painful, venomous stings for weeks after it has washed up on shore and the tentacles have dried out on the sand. This makes it particularly dangerous for curious children playing on the beach.

The true jellyfish (of which there are about 250 species) are solitary organisms that are free-floating and

inhabit the coastal waters of the world from cold polar waters throughout the temperate zones to warm tropical seas. Their transparent bells may be flattened and plate-like or bowl-shaped in appearance. The tentacles, which contain the nematocysts, hang from the margins of the bell, surrounding the mouth; the number of tentacles varies with the species. Jellyfish are swimmers—albeit weak ones. Like the Man-of-War, they are mostly at the mercy of wind, waves, and tides. When they do swim, propelling themselves by contractions of the bell, it is generally to go deeper into the water, as they are light-sensitive creatures. Like the Man-of-War, jellyfish envenomation is the result of skin's contact with the tentacles. Reactions to stings vary from very mild to severe, mostly depending on the species. Pain, burning, and blistering of the skin are the milder, localized symptoms with more severe reactions being systemic in nature—headache, fever/chills, respiratory distress, and paralysis. Some, like the Lion's Mane Jellyfish (surface floaters, found in temperate waters of both the Atlantic and Pacific) are highly toxic and have caused death.

The box jellyfish are some of the most venomous organisms in the sea. Worldwide, there are about 30 deaths a year due to jellyfish with only 6 species being responsible. Three of those species are box jellyfish. These creatures have a box-shaped bell (no frill at the margins like true jellyfish have); each of the lower corners of the bell has a lobe to which one or more tentacles is attached. Although there are Atlantic species, the most virulent are the Indo-Pacific species. The most venomous jellyfish in the world—and some would say the most dangerous creature in the world, land or sea—is the Flecker's Box Jellyfish (sometimes mistakenly called the Sea Wasp; the Sea Wasp can indeed be dangerous but its stinging potential is less than 1% that of Flecker's). Flecker's Box Jellyfish can kill in 3-5 minutes, and one reference noted in as little as 30 seconds. Since 1900, this species has been credited with over 70 human deaths in tropical Australian waters alone where it is very prevalent. It has been estimated that an average Flecker's Box Jellyfish can possess 5 billion nematocysts on its tentacles. It is a fast swimmer (up to 5 ft/sec. for short bursts) and can change directions abruptly. The venom of this species attacks the human body in three distinct ways: 1) by causing severe skin death that results in permanent scarring (if you survive); 2) by destroying blood vessels; and 3) by producing muscle spasms so severe that the heart muscle cannot relax and refill with blood before the next beat. It is the only jellyfish for which an antivenin has been developed, though there is seldom time to use it before death occurs. (There is some evidence that suggests that its antivenin has proven useful with envenomations by other Indo-Pacific box jellyfish species.)

(continued on next page)

Manufactured First Aid Kits for the Marine Environment:

Adventure Medical Kits (1-800-324-3517)

www.adventuremedicalkits.com

Comprehensive Aquatic
Fundamentals Aquatic
Personal Aquatic

Atwater-Carey Kits - WPC Brands (1-800-558-6614)

www.wpcbrands.com

Marine Kit

Outdoor Research (1-888-4-ORGEAR) www.orgear.com

Saltwater Medical Kit

Suggestions for Home-made First Aid kits for the Marine Environment:

For Wound Management

10 cc syringe with plastic tip catheter
Povidone iodine
Hydrogen peroxide
Wound closure strips
Butterfly bandages
Tincture of Benzoin
Neosporin
Scalpel
Latex gloves

For Bandaging:

4' X 4' Nu-Gauze (sterile)
4' X 4: Gauze
Cravats
Aquaphor
2" Cling Wrap
4" Ace Wrap
Waterproof tape
Moleskin

Helpful Tools:

Shaving cream & razor
Sam splint
Trauma sheers
Splinter forceps
Hypothermia thermometer (86-97F)
Hyperthermia thermometer (96-107F)
Sawyer Extractor
Blood pressure cuff
Stethoscope
Space blanket
Chemical Heatpacks
Sunscreen (15-30 SPF)
Vinegar

Medications:

Tylenol
Advil
Aspirin
Benedryl
Mylanta
Dristan
Tinactin
Pepto Bismol
Aloe vera
Activated charcoal
Anakit
Rubbing alcohol
Calamine lotion or
Cortisone cream

Final Thoughts on First Aid Kits:

Regardless of what kind of kit you choose to pack and take with you, make sure you know how to use each and every item in the kit. Carry medical resource numbers and first aid instructions in your first aid kit. And, most importantly, get the medical training you need before you go.

vomiting, difficulty breathing—all of which could have serious consequences if the victim was still in the water. Since symptoms may persist for up to 12 hours, get the victim out of the water as soon as possible and call it a day (some ill effects may last for days).

OTHER INVERTEBRATES

Mollusks are an invertebrate that envenomate by means other than nematocysts. Though there are many species, only two classes are potentially hazardous to man: the cone snails and the octopus. Snails make up the largest number of mollusk species—about 500 species have been identified worldwide. Commonly found in tropical or subtropical waters of both the Indo-Pacific and Atlantic regions, they range in size from 2-6 inches. The cone's envenomation apparatus is composed of a muscular venom bulb, a venom duct, a radula sac (for storage of teeth), and a muscular proboscis. The small teeth found in most snails have been modified into hollow, harpoon-shaped barbs in cones. This harpoon-shaped barb is filled with venom as the tooth matures in the sac. When the cone is hunting its prey, one tooth is passed from the sac into the pharynx to the mouth and is finally passed to the tip of the proboscis. When prey comes within range, the tooth is thrust from the proboscis into the body wall of the prey. Venom is released into the wound upon penetration. The muscular venom bulb forces additional venom out of the venom duct, through the sac, into the mouth and proboscis, and into the prey. Cone venom paralyzes its prey. Cone species of the Indo-Pacific area (the Geographer cone, the Striated cone) specifically can be lethal; most others cause moderate to severe symptoms. Initial symptoms include localized pain and a burning sensation that is followed by numbness and a tingling sensation that can spread outward from the wound to involve the entire limb and then the entire body. Often, victims experience tingling sensation in the lips, tongue, and mouth. More severe symptoms include dizziness, nausea and vomiting, blurred vision, difficulty speaking and swallowing, lack of coordination, disturbances of vision and hearing, paralysis, respiratory difficulty, coma, and, occasionally, cardiac arrest. The venom is so toxic that the best treatment recommended is sequestration of the venom by a pressure-immobilization bandage. There is no anti-venin.

The other mollusk of concern is the octopus. All octopus can bite and all have envenomation apparatus and are, therefore, potentially dangerous to humans. The bite from a Blue-Ringed Octopus can be fatal. The envenomation apparatus of most octopus' is usually 2 pairs of salivary glands that secrete venom into the mouth cavity and a strong pair of chitinous jaws that look like an inverted parrot's beak. The beak is used to tear flesh so it is located ventrally at the center of the arms, near the mouth, and the venom is introduced into the victim at the time of the bite through two small puncture wounds inflicted by the beak. Bites from most

Another box jellyfish that deserves mention is the Irukandji—one of the smallest of the jellyfish at 1 inch high by 3/4 inch wide. The danger of the Irukandji (found in Australian waters north to Indonesia and west to Fiji) lies not in its lethality—no deaths have been reported from its sting. The danger is that the initial symptoms (intense localized pain followed quickly by small reddish bumps at the site) abate shortly after the sting, leading the victim to believe the worst is over and, perhaps, encouraging him to return to the water. However, often within 20 minutes (and up to 2 hours), the victim begins to experience more serious systemic symptoms—acute abdominal pain, chest and back pain, rashes and pains in the limbs, severe headache,

octopus species initially produce a burning or tingling sensation. The pain is first localized to the site but later radiates to the entire extremity. Bleeding from the puncture wounds may be profuse because of the anticoagulants in the saliva of the octopus. Redness and swelling are also common at the bite site. Other symptoms can include intense itching at the site, numbness of the mouth, lips, and tongue, blurred vision, dizziness, vomiting, and difficulty swallowing and speaking. With most species, death is rare—except for the bites of the Blue-Ringed Octopus whose habitat is—you guessed it—the Indo-Pacific region (especially Australian waters). They inhabit both rocky areas with high wave action and sheltered tidal areas—which means tidal pools. The Blue-Ringed Octopus is named for the light blue rings found on the yellowish/brown bodies. These rings greatly enlarge and become an iridescent blue when the animals are frightened, provoked, or removed from the water. The Southern Blue-Ringed octopus is only 4 inches from arm tip to arm tip while its Northern cousin is double that size. Bites from either can be initially painless, and the only evidence may be bleeding or small puncture wounds. Within minutes, though, numbness or tingling is felt in the lips and tongue, and there is a rapid onset of respiratory difficulty. Vision becomes blurred, there is dizziness, nausea and vomiting, difficulty speaking and swallowing, muscular weakness, and loss of motor control that can progress to complete paralysis. Victims die from respiratory failure due the paralysis of respiratory muscles. Death can occur in less than 5 minutes. Recommended treatment is the pressure-immobilization bandage as there is no anti-venin available.

VERTEBRATES

The venomous creatures of concern in the marine vertebrate world are the stingrays (not all rays are venomous; those that are, are called stingrays), bony fishes, and sea snakes. Of this group, the stingrays are responsible for the greatest number of venomous fish stings to man (as many as 1,500 annually in the U.S. alone) because they inhabit the shallow coastal waters that are also commonly frequented by man. Stingrays often conceal themselves by lying partially buried in sand and sediment—an excellent camouflage for them, bad news for you. All it takes is the pressure of a human foot on the dorsal surface of the stingray to cause the animal to thrust its tail forward and upward, inflicting a deep laceration or puncture wound to the foot, ankle, or calf of its victim. On the tail of the stingray is one or more large serrated spines covered by a layer of venom-secreting tissues that encourage venom to flow into the wound. Though fatalities are rare, they have occurred from envenomations on the torso or neck region and from blood loss from severe lacerations (it is not unusual for lacerations to be 13-17 cm in length). Signs and symptoms generally include pain, not only from the

physical sting of the spine penetration but additionally when the venom is released into the wound. Systemic symptoms are rare but can include systemic reactions (vomiting, diarrhea, sweating, tachycardia, and muscular paralysis). The best way to avoid these creatures is by doing the "stingray shuffle"—dragging your feet through sand and sediment instead of picking them up—whenever you are wading in shallow coastal waters.

Treatment for a stingray envenomation is the same as for all fish envenomations: wash the wound immediately to flush the venom from the wound (can be fresh or seawater), and then immerse the affected part in hot—not scalding—water (if hot water is not available, chemical heat packs can be used). Fish venom is thermolabile—it is inactivated by heat—and applying heat as soon as possible may prevent a severe systemic reaction. The soak should be continued for a minimum of 30 minutes (up to 90 minutes). In addition to inactivating the venom, the heat often helps alleviate pain, in some cases, almost immediately. If the pain returns later, continue soaking in hot water. While you are doing the initial soak, gently remove any spines that were embedded.

Among the bony fishes, the ones most potentially dangerous to humans are the scorpion fishes. About 2 dozen species are responsible for over 300 envenomations in the North Atlantic to the Caribbean Sea; over 350 species inhabit the Indo-Pacific area (especially from the east coast of Africa to the Red Sea and eastward to Australia and Indonesia) where stings are much more serious and can be lethal. Venom glands can be found at the base of the numerous dorsal, anal, and pelvic spines. Scorpionfish, like stingrays often bury themselves in shallow coastal area. Most envenomations will produce localized pain, redness, swelling and possibly headache, nausea, vomiting, diarrhea, and general fatigue. Some species, like the stonefish, can induce excruciating pain that can last for days, anxiety, tremors, abdominal pain, seizures, paralysis, congestive heart failure and, of course, . . . death. If the sting doesn't kill you, recovery from a stonefish envenomation may take several months. First aid treatment is the same as for all venomous fishes (see above). Other stinging fishes (such as the Weeverfish, Rabbitfish, Stargazers, Sea Catfish and Eel-Tailed Catfish) cause immediate severe pain that usually subsides within 24 hours. Swelling may persist for days.

Sea snakes are creatures that nightmares are made of. But though they are highly venomous, they rarely bite. They are very curious creatures, however, and they may try to "taste" divers with their tongues—a very disconcerting action that can cause divers to react aggressively towards them thus provoking an attack. Sea snakes are widely distributed in tropical and temperate waters of both the Indian and Pacific Oceans. The Atlantic, Mediterranean Sea, and the Red Sea are all devoid of any sea snakes. Like other venomous snakes, sea snakes don't always envenomate when they bite (only a small percentage of people bitten are actually

envenomated). There is a surprisingly low incidence of serious poisoning from sea snakes relative to the lethality of their venom (some species can produce enough venom in one bite to kill over 20 humans.) Initially, bites are fairly inconspicuous—painless and without swelling—unlike venomous fish stings which generally induce immediate and excruciating pain. If envenomated, though, within about 30 minutes (and up to 4 hours), the victim will experience muscle pain and stiffness, general weakness, dry mouth, difficulty swallowing and speaking, inability to open the mouth fully or sit up because of intense pain, constant thirst, periodic sweating, vomiting and headaches, myoglobinuria (red-brown urine) within 3-6 hours, possible respiratory failure, coma, cardiac arrest, or acute renal failure. Victims of fatal envenomations usually die within 24 hours—unless they can get to medical help where an anti-venin is available within the first few hours. Recommended treatment (besides the anti-venin) is the use of a pressure-immobilization bandage over the site and as much of the adjoining body part as possible, especially the proximal portion nearest the torso.

And the list goes on Things like sea cucumbers, sponges, sea stars, urchins, and many others too numerous to mention also inhabit the oceans of the world. While some are, indeed, potentially dangerous to humans, they are all magnificent and intriguing creatures. So when the tropical breezes and beaches begin to beckon and you find yourself day-dreaming of swimming with the dolphins, go ahead and book the ticket. Just beware when you're wading in the surf and surfing in the waves. And, if you're inclined to plumb the depths with either snorkel or tank, be sure to protect yourself with full body armor in the form of wet or dry suits (including gloves). Swim softly and carry a big bottle of vinegar.

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• WHEN THE SHARK BITES •

Just because something doesn't inject a toxin into you doesn't mean that it's not dangerous. Things that sink their teeth into you—venom or no—can still hurt, maim, or kill you. The biggest dangers with these types of injuries are profuse bleeding (leading to shock) and the potential for infection (humans don't deal well with marine bacteria, and we run a high risk of infection with all marine bites). While there are probably many ocean creatures that might enjoy a taste of human flesh, the majority of marine bites come from the following creatures:

Sharks: Though there are over 300 different species of sharks, but it is only about 30 species that are responsible for most attacks on humans—the Great White being at the top of the list (Hammerhead, Tiger, and Mako are others). Sharks are carnivorous creatures but their preferred diet is not humans—they would rather feast on sea turtles, squid, penguins, seals and stingrays. Still, worldwide, there are about 50-100 shark attacks annually and about 6-10 deaths (most commonly from blood loss). Research on shark attacks shows that most attacks on humans are of the "hit & run" type rather than a shark looking for a meal. (Most victims are bitten only once and the majority of wounds involve only the upper teeth [the lower teeth are generally used first in feeding as they are designed to fasten onto and hold prey so the upper teeth can do the cutting.]) That's small consolation, though, if you happen to be one of the unlucky statistics and your leg is now dangling by a thread (leg injuries are the most common with shark attacks, followed by hands and arms as the victim tries to defend himself). And you'll take no comfort in the fact that sharks have keen olfactory and gustatory chemoreceptors, giving them supreme powers of perception when it comes to detecting blood (or urine, for that matter) in water (1 part blood in 100 million parts water, in some cases). That's because up to 2/3 of a shark's brain can be devoted to smell alone. Though most victims are attacked by a single shark, the smell (and taste) of blood in the water can attract other sharks in the area. Sharks also have sensitive hearing and can detect prey under water from a distance of 3,000 feet so, don't thrash about and make lots of noise. Sharks are also attracted to bright, contrasting, and reflective objects.

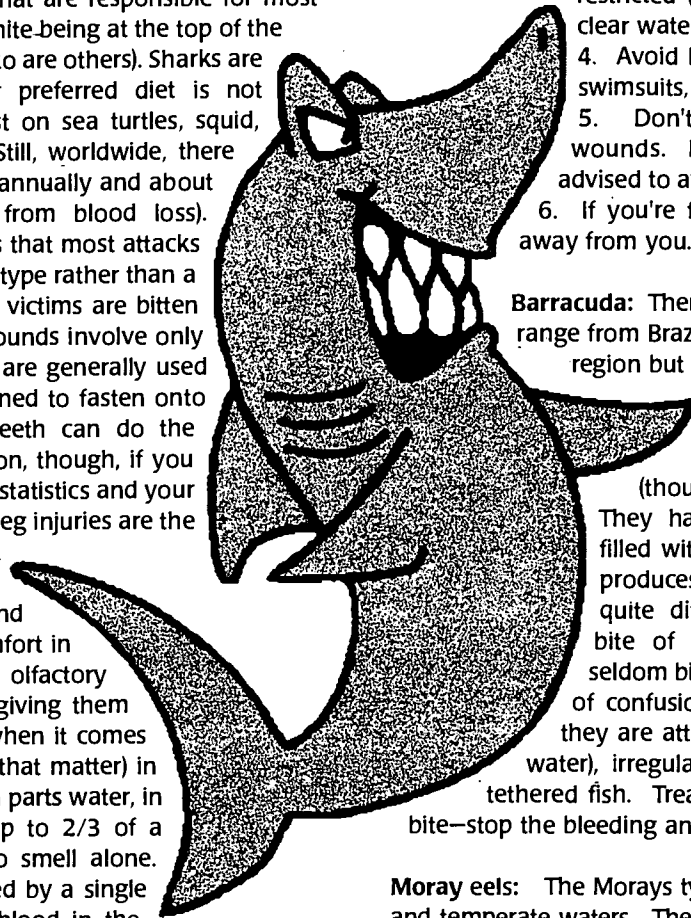
What do you do if an attack is imminent? It's akin to facing down a grizzly. The traditional advice is to leave the water with slow, purposeful movements (no thrashing, remember), facing the shark, if possible. If it attacks, blunt blows to the

eyes and gills are your best bet; some say to the snout, as well, though it is dangerously close to those many rows of razor-sharp teeth. If bitten, the most you can hope to do is to stem the tide of blood and get to medical care. If far from care, once you've stopped the bleeding and thoroughly cleaned the wound, do not close up the wounds completely because the risk of infection is high. Better yet, follow some general guidelines and prevent encounters in the first place:

1. Let the sharks have their space—don't go surfing, swimming, or diving in shark-infested areas.
2. Stay in groups—you're more intimidating that way.
3. Avoid murky waters, drop-offs, any place where vision is restricted (though half of attacks happen in clear water).
4. Avoid bright shiny colors when choosing swimsuits, dry/wet suits—flat black is best.
5. Don't go into the water with open wounds. Menstruating women are also advised to avoid areas of known shark activity.
6. If you're fishing, keep tethered fish far, far away from you.

Barracuda: There are 22 species of barracuda that range from Brazil to Florida and in the Indo-Pacific region but only the Great Barracuda has been implicated in human attacks. Barracudas are solitary swimmers, about 1.5 meters long (though they can get up to 2.5 meters). They have an elongated narrow mouth filled with large knifelike teeth whose bite produces a straight or v-shaped laceration—quite different from the crescent-shaped bite of the shark. Barracudas actually seldom bite, but when they do, it is often out of confusion in murky waters. Like sharks, they are attracted to noise (commotion in the water), irregular movements, shiny objects, and tethered fish. Treatment is the same as for a shark bite—stop the bleeding and treat for shock.

Moray eels: The Morays typically live in tropical, sub-tropical, and temperate waters. They may attain lengths of 3.5 meters and diameters greater than 35 cm. They are muscular, powerful, savage bottom dwellers residing in holes or crevices or under rocks or coral—divers exploring coral beds are common victims of Moray eel bites. Morays usually avoid confrontation unless provoked and are easily intimidated. When they do bite, they inflict severe puncture wounds (often multiple) with their long, sharp, fang-like teeth. They have the tenacity of a bulldog and a vise-like grip and you may have to break their jaws or decapitate them to release them. Treatment for wounds is the same as for shark or barracuda bites.



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GOT THE TRAVEL BUG?

By Sue Barnes, (W)EMT-B

Got the travel bug? Each year millions of people travel throughout the globe in search of adventure, education, and unique cultural opportunities. Though most people are not "boldly going where no man has gone before," many are stepping out of their usual elements to experience a different way of life. Traveling to foreign lands can be an exciting, rich, and rewarding experience, providing the traveler prepares for the journey. Over the next few issues of the *Wilderness Medicine Newsletter* we will explore health issues that are of concern to the traveler: what you shouldn't leave home without, and what you shouldn't return home with. Different regions of the world will be targeted to alert travelers to health problems that may exist there.

Don't Leave Home Without It

Let's start off with the basics. Traveling abroad, particularly to developing countries, requires some advanced preparation to keep you safe and healthy. First off, educate yourself. Where you are going and why you are going there - business, pleasure, or both - will determine the types of vaccines needed. The Centers for Disease Control and Prevention (CDC), based in Atlanta, Georgia, maintains an extensive web site to disseminate information about health issues worldwide. This web site (www.cdc.gov) provides information on prevalence of diseases and in what countries they will be found, appropriate vaccinations, and tips on prevention of accidents and illnesses while traveling. Once you know where you're going, access this site to see what vaccinations are required and/or recommended. With this information in hand, make an appointment with your health care provider at least 4-6 weeks prior to your trip. This will allow time to get the appropriate immunizations, some of which may not be given simultaneously.

Health Care & Insurance: Travel to remote areas, or within developing nations, may present significant difficulties in obtaining appropriate medical care when needed. Remote areas may even make access difficult or impossible; it may take several days to arrive at a medical facility. Non-industrialized and poorer countries have limited medical facilities and supplies, possibly requiring evacuation to a city

within the country, or even to another country. Since your health insurance may not cover you in a foreign country, you may be required to purchase additional travel medical insurance. If you lack medical insurance coverage, no matter what the reason, be prepared to prove that you have the financial resources to pay for medical care. In many countries, medical treatment may not be rendered without this proof. Also, there may be circumstances when evacuation insurance may be appropriate, especially if you will be involved in high-risk activities. The U.S. State Department's web site provides information on the availability of medical care within individual countries. Be sure you visit this site long before you go.

You may also want to consider taking a wilderness medicine or travel medicine course prior to your departure so that you are personally prepared for medical emergencies. There are many reputable schools throughout the U.S. which offer programs in wilderness and travel medicine (buyer beware), and there has been much literature written on the subject. The library or Internet would be the best places to explore these options. Along the same lines, choose a reputable guiding service and know what kind of medical training the guides have.

You should also consider carrying a personal first aid kit appropriate to the needs of your trip. The kit should be oriented to the nature of any planned activities, the climates and environments in which you may find yourself, and include any prescribed medications

necessary. Wilderness medicine or travel medicine books are usually the best sources for a list of first aid supplies specific to a traveler's needs. Carry only first aid supplies that you know and understand how to use. In using medication of any type - prescription or
(continued on next page)

INSIDE:

Recommended Vaccines/Immunizations ...2

Don't Get Bugged In Bed ...6

CalendarBack Cover

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("Got The Travel Bug" - continued)

over-the-counter (OTC) medications such as aspirin or acetaminophen - be sure to have a clear understanding of any contraindications or side effects caused by its use. Also, medications may alter the way the body copes with extreme heat, cold, or altitude. Check with your physician or pharmacist before leaving. Be forewarned that drugs with abuse potential (such as Morphine and Valium) can cause significant problems with customs' officials, even if carried with a valid prescription.

Have a list of phone numbers and addresses of U.S. Embassies and/or U.S. Consulates for the areas in which you will be traveling. The U.S. State Department can provide this information. Acquiring this in advance can be a tremendous help in an emergency situation. Embassies or Consulates can assist in providing emergency support to travelers abroad.

Last on the "Don't Leave Home Without It" list is appropriate equipment and clothing. Sometimes you can obtain everything you need once you arrive at your destination. Often you arrive to find that what you need and must have is not available. If you are not absolutely sure that you can buy specific items at your destination, bring all essential items with you. Specifically, you should include water filters, water purification tablets, insect repellent, sunscreen, protective clothing, etc. (more on these later) which may be crucial to maintaining good health.

On the Road: Problems and Prevention

Sanitation standards are often significantly lower in underdeveloped countries than to what you may be accustomed. Poverty, overcrowded conditions, and political and social upheaval may all contribute to unsanitary conditions. Contamination of food and water sources can lead to diseases such as traveler's diarrhea, cholera, typhoid, and hepatitis A, just to name a few. Airborne droplets from someone's cough or sneeze may carry tuberculosis or influenza. Mosquitoes carry malaria and yellow fever. Ticks, worms and other icky, crawly things can give you a whole host of not-so-fun stuff that will give anyone "the willies." The following is a list of illnesses endemic to many parts of the

world. The descriptions include the mode(s) of transportation, signs and symptoms of the disease, and treatment.

Illnesses

Traveler's Diarrhea (TD) is the most common ailment affecting world travelers. The infections are usually caused by bacteria but may also be caused by viruses and protozoa. The risk of getting traveler's diarrhea varies depending on your destination. High-risk destinations include most of the developing countries of Central America, Africa, the Middle

East, and Asia (East, Southeast, and the Indian subcontinent). Intermediate-risk destinations include most of the Southern European countries (Eastern and Western) and a few Caribbean islands. There is no vaccine for traveler's diarrhea.

Traveler's Diarrhea is slightly more common in young adults than in older people. Possibly, this is due to a lack of acquired immunity, more adventurous travel styles, and/or different eating habits. The onset of TD is usually within the first week of travel, but it may occur at any time during the visit and even after returning home. TD is acquired through ingestion of fecally contaminated food or water. Symptoms of traveler's diarrhea include four to five loose or watery bowel movements per day; this typically lasts a few days. Associated symptoms include abdominal cramps, nausea, bloating, urgency, fever, and malaise. Treatment: bismuth subsalicylate preparation, the active ingredient in Pepto-Bismol, may be taken to decrease the frequency of stools and shorten the duration of the illness. The dose of Pepto-Bismol is 1 oz.

liquid, or two tablets taken every 30 minutes for eight doses. No more than 8 doses should be given in a 24-hour period, and the treatment is limited to a total of 48 hours. This treatment should be avoided by persons with aspirin allergy, renal insufficiency, gout, and by those who are taking anticoagulants, probenecid, or methotrexate.

Most cases of diarrhea are self-limiting and only require simple replacement of the fluids and electrolytes lost. This is best achieved by use of oral rehydration solutions such as World Health Organization (WHO) Oral Rehydration Salts (ORS). Interestingly, this solution is appropriate for treating as well as preventing diarrhea. ORS packets are available at stores or

Generally Recommended Vaccines/Immunizations

- **All Common Childhood Vaccines**, including mumps, measles, rubella and polio.
- **Hepatitis A Vaccine** prevents one of the most common waterborne and food-borne illnesses. Hepatitis A will make you sick for 2-3 weeks and ruin a trip. The vaccine is recommended for all ages.
- **Hepatitis B**, if you might be exposed to blood (such as a health care worker), have sexual contact with the local population, are staying 6 months or more, or may be exposed through medical treatment. Hepatitis B vaccine is now recommended for all infants and children ages 11-12 years who did not receive the series as infants.
- **Rabies**, if there's a likelihood of exposure to wild or domestic animals through your work or recreation.
- **Tetanus-diphtheria** booster as needed. (The vaccine is good for 10 years.)
- **Polio Vaccine**, a one-time, injectable booster dose, is recommended to all adults.
- **Influenza**. Influenza can be prevalent year-round in many parts of the world. The vaccine changes yearly and is recommended for those more susceptible to the illness, such as the elderly, people who are chronically ill, or those with asthma or other respiratory diseases. Health care workers and those traveling to areas with an influenza epidemic should also get the shot.

Depending on where you are going, the following vaccines are also recommended: **typhoid, yellow fever, meningococcal vaccine, pneumococcal vaccine, and Japanese encephalitis**. These vaccines will be discussed in future articles when addressed specific regions of the world.

pharmacies in almost all developing countries. Follow instructions on the packet carefully. Another ready source of electrolyte replacement comes from adding extra water when cooking rice. Once the rice is done cooking, drink the remaining rice water. This helps greatly to replace the salts lost due to diarrhea.

Travelers who develop diarrhea with three or more loose bowel movements in an 8-hour period, especially if associated with nausea, vomiting, abdominal cramps, fever, or blood in the stools, may benefit from antimicrobial medication such as TMP/SMX, or ciprofloxacin. (These are prescription medications and may only be obtained through a health care provider.) Nausea and vomiting without diarrhea should be treated with antimicrobial drugs. Whenever possible, travelers should consult a physician rather than attempt self-medication if the diarrhea is severe or does not resolve within several days; if there is blood and/or mucus in the stool; if fever occurs with shaking chills; or if there is dehydration with persistent diarrhea.

Cholera is an acute intestinal infection that occurs in many developing countries. The disease is spread through ingesting food or water contaminated directly or indirectly by feces or vomit from infected persons. Persons with severe cholera can die of hypovolemic shock within a few hours after onset. The shock is due to massive dehydration and electrolyte loss through profuse diarrhea and, to a lesser extent, through vomiting. While the risk to U.S. travelers is extremely low, the disease may be very prevalent in local populations where you will be. Although a cholera vaccine does exist, it is no longer available in the United States. The vaccine is not recommended because of the brief and incomplete immunity it creates. No cholera vaccine is required for entry or exit in any country.

Treatment for cholera involves rehydration with ORS or, in most severe cases, with intravenous solutions until the patient is able to drink fluids. Treatment with antibiotics (usually tetracycline or doxycycline) will decrease the duration of the illness and the excretion of live cholera bacteria. Antibiotics will also decrease the volume of fluid lost but are not necessary for successful treatment. In addition to the precautions listed below, it may be helpful to know this: the organism causing cholera can grow well in some foods such as rice but will not grow or survive in very acidic foods, including carbonated beverages. Heat (boiling) will destroy it.

Hepatitis A is a highly contagious viral illness that primarily affects the liver and spreads the same way that cholera does. While the illness is rarely fatal, the infected person is likely to be sick for 2-3 weeks with nausea, vomiting, lethargy, joint pain, itching, and jaundice (yellowing of the whites of the eyes and skin). The treatment includes rest and fluids. The Hepatitis A vaccine provides active immunity and is strongly recommended to most travelers going to developing nations. A booster is required six months after the initial injection and every ten years. Preventative food and water measures should also be exercised.

Influenza, or the flu, is a viral disease spread through direct or indirect contact or through airborne means. Flu symptoms can range from moderate to severe and usually last one to two weeks. Signs and symptoms include nausea, vomiting, diarrhea, headache, muscle aches and pains, low-grade fever, coughing, and respiratory tract infections. Pneumonia can be a complication of the flu, and the patient must be monitored closely. Influenza is treated with rest and drinking plenty of fluids. Acetaminophen, ibuprofen, or aspirin may be taken to reduce pain and lower fever.

Malaria is a serious and sometimes fatal disease caused by a parasite, and transmitted via mosquito bites. WHO estimates that there are 300-500 million cases of malaria yearly, and more than one million people die annually of the disease. Malaria is found in temperate and tropical climates, including the United States. For most people, signs of the sickness begin ten days to four weeks after infection. Symptoms of malaria include fever and flu-like illness, including shaking chills, headache, muscle aches, and fatigue. Nausea, vomiting, and diarrhea may also occur. Malaria may cause anemia and jaundice because of the loss of red blood cells. One type of malaria may cause kidney failure, seizures, mental confusion, coma, and death. Malaria cannot be cured with prescription drugs, but it can be driven into remission. The type of drugs and length of treatment depend on which kind of malaria is diagnosed, where the patient was infected, the patient's age, and how severely ill the patient is at the start of treatment.

There are four different types of prophylactic drugs that may be taken to prevent malaria. The type of medication used varies, depending on where you are going. In certain regions the parasites have developed a resistance to some of these drugs. Dosages vary, but all require follow-up dose(s) once you return home from your trip. This is because malaria can "hide" in the liver (where drugs will have no effect on it) and re-enter the bloodstream at a later time. Be sure to take all anti-malarial medication prescribed to you. Consult with a physician to find the anti-malarial medication that is appropriate for you. Protection from insect bites are your best defense against malaria. See the suggestions later in this article.

Tuberculosis (TB) is most frequently associated with lung infections. Infected airborne droplets transmit tuberculosis when an infected person coughs or sneezes repeatedly. The air droplets are inhaled by an unsuspecting individual, leading to the development of tuberculosis. The bacteria may also be transmitted, though less likely, through unpasteurized milk or milk products. Once the infection settles into the lungs, it sets up shop and develops small tubercles, which later calcify. In many, this is as far as the disease progresses and the person may not know he has TB. Or, the tuberculosis may lay dormant for years before showing evidence of any problems. On the other hand, a secondary infection can develop and wreak havoc on the respiratory system. TB is treated with antibiotics, though some strains are now resistant to the drugs' effects.

(continued on next page)

("Got the Travel Bug" - continued)

A vaccine (BCG) for tuberculosis does exist but is not recommended in the U.S. and other industrialized countries. The vaccine is not particularly effective, and, once received, the patient will always test positive for TB, whether she has the disease or not. For that reason, it is suggested that those traveling to regions with known outbreaks of tuberculosis be tested for TB prior to departure, and again upon their return home. To avoid getting TB, avoid spending time in overcrowded, closed-in areas such as hospitals, buses, or trains.

Typhoid Fever is an acute, life-threatening febrile illness caused by bacteria. It is transmitted through food and water contaminated by the urine and feces of infected people. A person with typhoid fever will present with signs and symptoms such as headache, fever, chills, loss of appetite, constipation, back and abdominal pain, and nosebleeds. After a week, reddish splotches may occur in some patients. Treatment includes rest, fluids, and antibiotics.

There are three types of vaccines for typhoid, with all three showing protection rates of 50%-80% for recipients. The vaccine is strongly recommended for those traveling to high-risk areas (developing countries) such as the Indian subcontinent, Asia, Africa, and Latin America. Your doctor will choose the type of vaccine appropriate for you. Because the vaccine is not 100% effective, preventative measures should still be observed.

Yellow Fever, a viral infection, is spread through mosquito bites. Signs and symptoms include fever, jaundice, vomiting of black, "coffee ground"-type blood, "foamy" urine, delirium, seizures, and coma. Approximately ten percent of those developing the disease will die. Treatment includes bed rest, fluids, and antipyretics -preferably acetaminophen (Tylenol). The yellow fever vaccine is 95% effective, and is strongly recommended for those traveling to areas of infection. Be aware that many countries that do not have yellow fever in residence may require a certificate of vaccination if you are traveling directly from a known country of infection. If you intend to travel in this manner, it is best to receive the vaccine before you leave the U.S., as medical supplies, such as needles, in developing countries may be "recycled." Check the CDC web site for the latest updates to yellow fever hot spots.

Prevention

Now that you've been "exposed" to some of the more common illnesses, you can see that traveling would be a heck of a lot more fun without getting one of them. You can greatly reduce the chance of contracting one of these maladies by following some basic precautions like washing your hands frequently with soap and potable water. This will reduce your chances of spreading any diseases you may accidentally "pick up".

Foods should be selected with care. Both cooked and uncooked foods may be contaminated if improperly handled. Eat only thoroughly cooked foods such as meats, chicken, fish, and vegetables. Only eat vegetables and fruit raw if you can peel them yourself. Avoid salads, which may be contaminated



with bacteria from the soil or washed with non-potable water. Avoid dairy products that are not pasteurized. There's a saying that goes, "Boil it, cook it, peel it, or forget it." Heed this well.

The place where food is prepared appears to be an important variable in the spread of disease, with private homes, restaurants, and street vendors listed in order of increasing risk. Food preparation rules may be marginal or non-existent for street vendors in many parts of the world, so avoid eating any food prepared by them. If your options are limited, or you simply must sample the local street fare, here are some rules to live by: 1) Eat only food that is piping hot -bacteria begins to grow as soon as food begins to cool. 2) Bring your own cup or bowl and have the vendor serve the food in it. Otherwise, the vendor is likely to use a bowl that was used by a previous diner and possibly cleaned with spit and a dirty shirtsleeve. 3) Bring your own spoon for the same reason listed above.

Drink only bottled (and sealed) or boiled water or carbonated drinks in cans or sealed bottles. Avoid tap water, fountain drinks, and ice. Water may also be filtered through an "absolute 1-micron or less" filter and chemically treated with iodine tincture or tablets or bleach. (Water filters alone are unable to remove most tiny viruses.) When using chemical treatments, allow more reaction time if the water is cloudy or very cold. Do not brush your teeth with tap water in areas where water is contaminated.

Fend off invaders from above (mosquitoes) and below (biting insects, worms) by wearing a long sleeve shirt and long pants during times when they are most prevalent. Use insect repellent. You may use permethrin, an insecticide, on any clothing, but it is ineffective when used directly on your skin. The CDC recommends the use of DEET (diethylmethyltoluamide) directly on your skin, 30-35% strength for adults and 6-10% for children. Always sleep under

mosquito netting when appropriate. Never go barefoot – always wear some sort of footwear.

Swimming in contaminated water may result in skin, eye, ear and certain intestinal infections, particularly if the swimmer's head is submerged. Generally for infectious disease prevention, only pools that contain chlorinated water can be considered safe places to swim. Swimmers should avoid beaches that might be contaminated with human sewage or with dog feces. Wading or swimming should be avoided in freshwater streams, canals, and lakes because they could be infested with the snail hosts of schistosomiasis or contaminated urine from animals infected with leptospira. Biting and stinging fish, corals, and jellyfish may be hazardous to the swimmer. Remember, never swim alone or when under the influence of alcohol or drugs, and never dive head first into an unfamiliar body of water.

Injuries, especially those from motor vehicle accidents, pose the greatest risk of serious disability or loss of life to international travelers. Motor vehicle crashes may result from a variety of factors, including inadequate roadway design, hazardous conditions, lack of appropriate vehicles and vehicle maintenance, unskilled or inexperienced drivers, inattention to pedestrians and cyclists, or impairment due to alcohol or drug use. To minimize chances of injury, walk and drive defensively. Avoid travel at night if possible. Always use safety equipment when available, such as seatbelts and bike helmets.

Environmental changes such as extremely hot or extremely cold environments or significant changes in altitude, either high or low (diving), present their own hazards and challenges. It is not within the scope of this article to address these issues. There have been many articles and books written on these subjects which will provide ample information.

Travel Tips to Avoid Getting Sick

Avoid eating food purchased from street vendors.
Drink only beverages bottled and sealed, boiled or filtered and chemically treated.
Keep your water bottle to yourself. (No sharing).
Don't consume unpasteurized dairy products.
Eat only thoroughly cooked foods; fruits and vegetables must be peeled or cooked.
Wash hands often with soap and potable water.
Practice safe sex.
Always wear shoes.
Avoid swimming in fresh water. Salt water is usually safer.
Wear appropriate clothing and insect repellent to avoid insect bites.
Sleep under mosquito netting.
Wear sunscreen or sunblock in high altitude or tropical areas.
Continue anti-malarial medications for required time post-trip.

Don't Bring It Back With You

Many illnesses such as malaria, tuberculosis, and tapeworm will not show themselves until long after you're back home. Once you've returned home, be alert to changes in your health. Anyone going to a developing country and becoming ill with a fever or flu-like illness while traveling, and up to one year after returning home, should immediately seek professional medical care. You should not only tell your health care provider where you have been traveling, but also of any known diseases in those areas visited.

Certain illnesses (anthrax is one) may be carried in a piece of animal hide or other trinkets made by local people and brought back home as a souvenir. The CDC, WHO, and U.S. Department of State web sites will often post warnings in regard to these dangers. Do a quick search just prior to departure abroad so you'll have the most current information relating to this.

Lastly, tiny critters such as bed bugs or scabies can hitch a ride on your skin, clothing, or belongings. Needless to say, this will drive you crazy, not to mention possibly infesting your home with long-standing, unwelcomed guests. Using permethrin (see above) on your clothes and bedding will help to ward off undesirable hitch-hikers, as will washing all bedding before hopping on the plane ride home.

There will be more information on health risks in specific regions of the world in upcoming issues of the *Wilderness Medicine Newsletter*. Until then, happy travels!

Resources

The following resources were tremendously helpful in organizing this article:

Internet websites:

Center for Disease Control – www.cdc.com/travel/travel.html

World Health Organization – www.who.org

Department of State, Bureau of Consular affairs – <http://travel.state.gov>

National Center for Infectious Diseases- <http://www.cdc.gov.ncidod/index.htm>

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Don't Get Bugged In Bed

By Chris Lourigan, (W)EMT-B

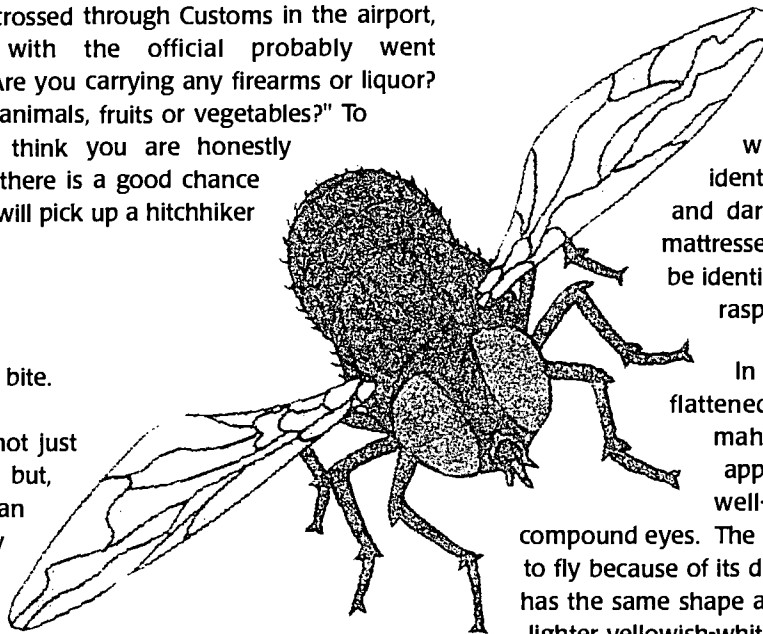
If you have ever crossed through Customs in the airport, your conversation with the official probably went something like this: "Are you carrying any firearms or liquor? Are you carrying any animals, fruits or vegetables?" To these questions you think you are honestly answering, "No." But, there is a good chance that if you travel, you will pick up a hitchhiker or two.

Good night.
Sleep tight.
Don't let the bed bugs bite.

Unfortunately this is not just a cute nursery rhyme, but, instead, bed bugs are an all too possible reality if you do any backcountry or world travel. If you grew up before the development and widespread use of modern insecticides such as DDT, you would understand how true the rhyme could ring. The use of DDT virtually eradicated bed bug infestations. But, unfortunately, since 1995 and the ban on DDT, the bed bug seems to be finding itself on the hit list of pest management professionals worldwide. Where are these "bed fellows" coming from?

Researchers believe bed bugs originally preyed upon animals and then moved on to cave-dwelling humans. In medieval England, bed bugs were initially an upper class plight. Since the female bed bug needs temperatures of at least 55 degrees Fahrenheit (preferably ranging from 70 to 82 degrees Fahrenheit) to breed, the well-heated stone homes of the upper class were a haven for bed bugs. But as housing quality improved in the eighteenth and nineteenth centuries, the distribution of this pest became more universal. Today bed bugs can be found in birds' nests, chicken coops, bat caves, and human dwellings. As humans today tend to be the most mobile animal on the planet, we also carry them with us in our clothing, baggage, and bedding. Currently in the United States, bed bugs are wreaking havoc throughout the hospitality industry, particularly in youth hostels and inns which are frequented by world travelers. More and more hostels and camps are banning the use of sleeping bags in an effort to thwart the bugs.

Bed bugs feed upon the blood of their prey leaving small, hard, ite welts on the skin that can itch severely. These bites



commonly become inflamed and possibly infected from scratching. Fortunately, bed bugs have not been documented as carrying diseases within humans. Infestations can be identified in a number of ways. Blood stains and dark spots of excreta can be found on mattresses and bed sheets. Bed bugs also can be identified by a musty, fermented odor of red raspberries from the bug's oily excretions.

In a mature state, the bed bug has a flattened oval body that is rusty red to mahogany in color. The body is approximately 0.2 of an inch long with two well-developed antennae and small compound eyes. The bed bug does have wings but is unable to fly because of its diminished size. The immature bed bug has the same shape as the adult but is smaller in size and a lighter yellowish-white color.

The female bed bug looks for a rough surface like cracks and crevices in the wall, behind wallpaper, under carpeting and in mattress seams to lay her eggs. She lays 200 to 500 eggs and coats them with a sticky cement-like substance to hold them in place. The eggs are 0.04 of an inch in size and collect in batches of 10 to 50. The nymph, emerging from the egg within one to three weeks, is ready for its first blood meal and undergoes five more molting stages before it reaches maturity.

While bed bugs can be amazingly resilient and pestilent, they are not without their shortcomings. They are temperature sensitive, so heating to 99 degrees Fahrenheit or cooling below 48 degrees Fahrenheit will kill them. Chemical control can be used as well. Pyrethroids, a residual insecticide, can be used in cracks and crevices. Permethrin, an insecticide made from the chrysanthemum plant, is non-toxic to humans because it cannot be absorbed through the skin, so it may be applied to clothing.

So... while traveling, prevention is truly the best means of dealing with bed bugs. Routine laundering of bedding and clothing pre- and post-trip is essential. Also, remember to frequently inspect your clothing and baggage for any signs of infestation and deal with it immediately.

Don't get bugged whether you are in bed or not.

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