

Appalachian Search and Rescue Conference Center for Emergency Medicine of Western Pennsylvania

Wilderness EMT Lesson Plan

Part XI: Bites and Stings

Draft Version 1.6 April 17, 1994 Comments to: Keith Conover, M.D., Task Group IX Leader 36 Robinhood Road Pittsburgh, PA 15220 (412) 561-3413 (H)

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Verbose Outlines

We develop our WEMT Lesson Plans in a **verbose outline format** (what you see here). Why? Because the material is new to enough reviewers that the usual terse (``telegraphic'') lesson plan format might be incomprehensible or misleading.

Our Task Groups use these "verbose" outlines. Each part of the WEMT curriculum (about twenty in all) has a Task Group of five to twenty selected consultants. A Coordinator guides the Task Group in revising the section.

Each Task Group provides references to support its statements and for further reading. They also provide glossary entries for any new terms they introduce. (New, that is, to a reader with basic EMT and SAR training.)

Background material that should appear in the Textbook (see below), but instructors need not present in class, will appear in a small, italic font.

Splitting the Outlines

When the outline satisfies the Task Group, it goes to our **Editorial Board**. This Board includes officers of the Appalachian Search and Rescue Conference and Center for Emergency Medicine of Western Pennsylvania, our two sponsors. It also includes experts in emergency medicine, search and rescue, and education. The Editorial Board reviews the verbose outline, and requests any necessary revisions. Once it is acceptable to the Board, we reformat the outline, into two distinct new versions.

We rewrite the material in the standard lesson plan format, which becomes a terse "telegraphic" outline. This version will be briefly reviewed by the Project Coordinator and then released to the public. It is the result of extensive review and testing, and will be used in all our classes. But, we still publish it as a draft, because we expect many good suggestions from the public. We distribute these drafts as widely as possible. After each year of public review, the Task Groups reviews comments, and submits revisions to the Editorial Board. Once all outlines have withstood a year of public scrutiny, we will prepare a single comprehensive curriculum with a Course Guide. We will continue to review and revise the curriculum regularly.

On to a Textbook

As explained above, once the Editorial Board approves the verbose outline, we split it into two versions. Besides the terse teaching outline, it will also become the basis for a textbook chapter. The Project Coordinator is the textbook Editor-in-Chief, and works closely with the Task Groups to consolidate and revise the verbose outlines into a comprehensive textbook. All who have contributed to the curriculum will be acknowledged as contributors. The textbook will be commercially published when completed. Until the textbook is available, we will distribute the verbose outlines or drafts of the textbook at classes.

Notes: Bites and Stings

This section of the curriculum provides an extension of the EMT's training about poisoning. Specifically, it focuses on common bites and stings that might present in a wilderness patient or in a wilderness search and rescue team member.

Removal of ticks and prevention of insect and arachnid bites are covered in the section on the *The Wilderness Environment*. Treatment of mosquito and similar bites are covered in the dermatology part of the section on *Wilderness Medical Problems*, and animal bites are covered in the wounds part of the section on *Wilderness Surgical Problems*. Anaphylactic reactions to bee stings and other allergens are covered in the section on *Wilderness Medical Problems*.

Educational Objectives

XI. Bites and Stings

A.Educational Objectives

- 1. Rank, in order of their threat to human life, the following envenomations:
- a. Hymenoptera (bees and wasps);
- b. pit vipers; and
- c. coral snakes.
- 2. Outline standard wilderness treatment for bee, wasp, and ant stings, and indicate any clinically important differences between honeybee and wasp stings.
- 3. Describe the geographic distribution, mode of transmission, diagnostic features, and standard medical treatment for suspected Rocky Mountain Spotted Fever.
- 4. Outline the geographic distribution, mode of transmission, diagnostic features, and standard medical treatment for suspected Lyme Disease.
- 5. Describe the means of transmission of tularemia.
- 6. Describe the signs of, cause of, and treatment for tick paralysis.
- Identify the common names of the two most dangerous types of venomous North American spiders; identify the signs and symptoms of their bites, and identify any specific wilderness treatment for their bites.
- 8. Describe the signs and symptoms of North American scorpion stings, and describe appropriate wilderness treatment.
- 9. For coral snakes, outline the geographic distribution, the hazard to humans, and the recommended wilderness treatment for their bites.

- 10. For North American pit vipers, describe:
 - a. a simple means to identify pit vipers;
 - b. the natural history of untreated pit viper bites in healthy people;
 - c. the risks and benefits of capturing or killing snakes to identify them;
 - d. signs and symptoms of an envenomated snake bite;
 - e. appropriate wilderness treatment of envenomated bites, including arguments against unproven or disproven treatments, including cold, lymph constrictors, cut-and-suck, and electric shock;
 - f. any snakebite circumstances that might make you consider an arterial tourniquet or the Australian pressure technique; and
 - g. the role of antivenin in the hospital and in the field.
- 11. Outline the wilderness management of suspected compartment syndrome andgeneralized bleeding when occurring as complications from snakebite.

B.Hymenoptera

- 1. **Background:** The order Hymenoptera includes bees, wasps, hornets, and ants. All can sting humans and cause severe local reactions.
- a. The order Hymenoptera includes some seventy different families of not only bees, wasps, ants, and sawflies, but also many other related insects. Bees comprise six families, and ants one; the family Vespoidea (vespoid wasps) includes the well-known paper wasps, yellowjackets and hornets. Of the vespoid wasps, the species of genus Vespa are called hornets, and species of the genus Vespula are called both hornet and yellowjacket in North America, and wasp in Britain. Of the six families of bees, the family Apidae includes the common carpenter bees, bumblebees, and honeybees. The other Hymenoptera families include much less com-

Hymenoptera

mon types of wasps and wasplike insects. Most Hymenoptera insects have venomous stings.

- b. Recently, African fire ants have been moving northward through the southern U.S. Unlike their native brethren, their stings are known to cause severe reactions in humans. Chest pain, dyspnea, and severe local reactions have been reported. Due to climactic intolerance, it is unlikely that fire ants will spread beyond their current range from Texas to North Carolina, except possibly to Virginia or to the Southwest and Pacific coast.¹ Some may develop allergic or anaphylactic reactions to fire ant stings. Another similarity to bee and wasp stings is that with more than twenty stings, people may also develop delayed or severe reactions (see below under Massive Envenomation).
- C. Bees sting only to protect themselves or to defend the hive. Bees are ``eviscerants"; when they sting you, the sting sticks in your skin and the back end of the bee rips off, killing the bee. Wasps use their stings to immobilize their prey. They can sting multiple times with their stings, which causes no damage to the wasp. Bees and wasps seldom attack humans. However, if you hit or sit on bees or wasps, use a nest as a handhold, or otherwise ``attack" them or their nests, they will sting to defend themselves. As with ants, though, there is an Africanized strain of bee that is spreading throughout the U.S. These bees are aggressive, and have been known to attack humans who are near their nests but otherwise not threatening the bee colony. These bees are so aggressive that they have been reported to kill humans, not through allergy, but through the massive number of stings a colony can inflict. Their venom is no more toxic than other bees.²

2. Allergy to Bees

a. The most dangerous of the order Hymenoptera are the bees. This is not because of the toxicity of their venom. It is because we seem to be particularly susceptible to allergic reactions to

bee stings. Relatively often, humans develop fatal anaphylactic reactions to bee stings. As with any allergy, the person must first be sensitized, which occurs with the first sting. We may get a severe but non-anaphylactic generalized allergic reaction from a sting, which serves as a warning of a possible anaphylactic reaction the next time. However, such warnings do not always occur; some people develop ``anaphylactoid" reactions with the first sting. Such reactions are indistinguishable from true anaphylactic reactions.³ Anaphylactic reactions may also occur to wasps, ants, or other Hymenoptera.

- b. People on a class of drugs called beta-blockers (often used to treat hypertension) are likely to suffer a particularly severe anaphylactic reaction if sensitive and stung by a bee; the beta blocker may block the effects of epinephrine in treating anaphylaxis. Those with an allergic reaction to bee stings should probably not be treated with beta blockers.⁴ Calcium channel blockers such as nifedipine (e.g., ProcardiaP, AdalatP) might cause a similar effect. There is reason to think that glucagon may be effective in anaphylaxis with in a patient on a beta blocker even though epinephrine may be ineffective.
- c. After bee sting anaphylaxis, a few people may develop congestive heart failure and pulmonary edema even without pre-existing heart disease.⁵
- d. Treatment of anaphylaxis is covered in the section on *Wilderness Medical Problems*.

3. Stingers

a. Honeybees

- (1) Honeybees almost always leave their stinger in place when they sting; this kills the bee, but assures an effective sting. Bees only use their stingers in defense, unlike wasps that use their stings for hunting.
- (2) Whenever a person is stung, look carefully for an embedded stinger,

with a magnifying lens if needed. You can find a magnifying lens on some Swiss Army knives. Remove the stinger as soon as possible, for it may still be injecting venom after detaching from the bee. If you leave the stinger in, it may act as a foreign body to promote infection.

- (3) Do **not** use tweezers or clamps to remove it; the venom sac is probably still attached, and if you squeeze it, you may inject more venom. Instead, use the tip of a clean needle, scalpel blade, or Swiss Army knife blade to pry it out. Or, you can use a comb, run gently along the skin, to remove stingers.
- (4) It is said that honeybees leave pheromones on those they sting, attracting more bees to sting the person. Therefore, running away from a bee's nest or swarm of bees after a sting is appropriate by intellect as well as by instinct.
- b. Wasps look somewhat like bees; Americans use the common terms hornet and yellowjacket to refer to several species of Hymenoptera that are considered wasps. Unlike the honeybees, these wasps, yellowjackets, and hornets don't leave their stinger impaled in the skin. This means that they can come back and sting again. Wasp stings are often more painful than bee stings.
- c. Any Hymenoptera sting can cause an allergic or anaphylactic reaction. Some people may become allergic to bees and not to wasps, or only to a particular type of wasp.
- 4. Local Reactions to bee, wasp and ant stings may make you very uncomfort-

able. Immediate reactions include pain at the site, and some local swelling. Delayed local reactions occur a day or two after the sting, and may last for a few days. Although local reactions may be hot, red, and swollen, they are seldom actually infected. Fire ants inject a poison (an ``alkaloid necrotizing factor") which causes intense burning, local swelling, and pustules (whiteheads). Other insect stings may occasionally cause small pustules, too. You can manage the reaction with any combination of the following, depending on the severity of the reaction:

- a. a suction device, if used immediately, may reduce the pain (see the section on snakebite, below, for more on suction devices);
- b. cold packs or cold soaks to decrease swelling and pain (but with care not to cause frostbite);
- c. antihistamines to reduce swelling and itching; and
- d. pain medicines or local anesthetics (see the section on *Pharmacology* for more about local treatments for stings).
- e. If you think cellulitis is likely, an antibiotic is appropriate. (Many stings turn the nearby skin very red and hot without any infection. It is possible for a bite to develop cellulitis, but rare.)
- 5. Massive envenomation from many bee or fire ant stings (roughly 40-50) can cause death directly from toxic effects of the venom, even without allergy. Any person with 20 stings or more is likely to develop late reactions up to several days after the stings, and should always be evaluated by a physician. Prehospital treatment is mostly symptomatic.*

^{* ``}Treatment is symptomatic" is a common medical saying. A rough translation is that you may need to provide pain medication, sedation, hydration, nutrition, and good nursing care, but there is no more specific treatment. If the patient stops breathing, or has seizures, you provide

However, there are a few secondary problems that WEMTs can watch for and treat:

- a. If you can, start an IV immediately. Veins may be difficult to find as the patient becomes more ill.
- b. As with a severe allergic reaction: if the patient shows any signs of airway compromise (wheezing, cough, hoarseness, shortness of breath) and you can, intubate the trachea.
- c. Massive hymenopteran envenomation can cause muscle breakdown, hyperkalemia, and kidney failure.

standard prehospital care for these problems.

Monitor the urine output; hydrate orally or by IV to keep the urine output at least 100 cc/hr (4 cc/kg/hr in children). (See the section on *Wilderness Trauma* for more on myoglobinuria.) Hydration will also help minimize hyperkalemia. Because of possible hyperkalemia, fluids without potassium would be best for the first 24 hours.

6. Neurotoxic venoms are found in the stings of some wasps, particularly V. maculata. This wasp is known for being found on good handholds on climbing routes. Climbers stung by such a wasp have reported paresthesias (numbness and



Figure 1: RMSF 1990 cases, by county (from CDC's MMWR)

tingling) in the hand or arm that lasts for several hours. There is no specific treatment; the paresthesias resolve with no residual effects.

C.Ticks

- 1. Many diseases may be spread by ticks. For instance, North Asian tick typhus, Mediterranean spotted fever (Mediterranean area, South Africa, and India), and Queensland tick typhus (Australia) are all similar to Rocky Mountain Spotted fever, and transmitted by tick bites. In the U.S., relapsing fever is found on the North Rim of the Grand Canyon and some caves in the Southwest.^{6,7} However, our discussion here will be limited to those tick-related problems that are widespread in North America, and thus likely to be encountered by those doing wilderness search and rescue: RMSF, Lyme Disease, tularemia, and tick paralysis.
- 2. **Prevention:** The only way to get Rocky Mountain Spotted Fever, Lyme Disease, or Tick Paralysis is from a tick bite; by avoiding tick bites, you can avoid these diseases. (The section on *The Wilderness Environment* gives information on preventing tick attachment, and on removing ticks.)
- 3. Rocky Mountain Spotted Fever (RMSF)
- a. Background: Rocky Mountain Spotted Fever is caused by Rickettsia rickettsii, and is transmitted to humans only by the bite of certain ticks. Contrary to its name, RMSF is much more common in Virginia and North Carolina than in the Rocky Mountains, though it is found throughout most of the U.S. It is, as the name would lead you to suspect, characterized by a spotty macular (that is, non-palpable) red rash and high fever. However, the classical syndrome is not all that common (sudden onset, high spiking fever, severe headache, myalgias, weakness, and a rash beginning on the extremities, including palms and soles, then

spreading to the trunk). Often, the picture is confused by gradual onset, nonproductive cough, nausea, vomiting, diarrhea, and abdominal pain; a significant minority of patients never notice a rash. Ninety five percent of cases occur in the warm months between April and September (when people and ticks are in the woods together). RMSF is most common in children and wilderness travelers. In 1990, 651 cases were reported in the U.S.

- b. **Course:** The normal course is about two weeks of severe illness. Anyone with sudden fever and rash should get medical evaluation without delay, as RMSF and related diseases may be fatal.
- c. **Recognition:** RMSF is not likely to occur while still in the wilderness: the incubation period is 2-7 days. However, WEMTs and others involved in outdoor recreation, especially in the mid-Appalachian region, are more likely to contract the disease than others. If someone who was in the mid-Appalachian woods a week ago, especially someone who had a tick attached, develops symptoms of the disease, get him or her to a physician immediately, and mention the possibility of RMSF.
- d. **Treatment:** If a team member may have RMSF, and it will be a long time until reaching medical care, the antibiotics tetracycline or doxycycline are the usual treatment; DON'T give sulfonamide antibiotics such as SeptraP or BactrimP, as they might make the disease worse.⁸

4. Lyme Disease

a. Background: Lyme Disease is the most common tick-borne infection. In 1989, 8333 cases were reported. Lyme disease is named after the Connecticut town where the disease was first discovered. It is caused by bacteria called spirochetes (because they look like little spirals under the microscope), Borrelia burgdorferi. The immature deer ticks (Ixodes species) that transmit Lyme Disease are very common in some areas; it is said that welltended lawns in Westchester County, NY, average one infected tick per square meter. These ticks are small, about the size of a pencil point. Like RMSF, Lyme Disease is transmitted by the bite of a particular kind of tick. Unlike RMSF, it has a longer and more drawn-out course, and can cause chronic disease.

- b. Geographic Area: Lyme disease is found primarily in the northeast and northern Midwest of North America, and along the Pacific coast as far north as British Columbia. The disease spreads as far south as the mid-Appalachians and North Carolina. Lyme Disease is also found in Asia. Scandinavia, and Europe.
- c. Characteristics of Lyme Disease: Lyme Disease occurs in varying forms, but can be usefully divided into early and late phases. The early phase includes two stages: first, local infection at the bite (the ``Erythema Migrans" rash), and symptoms of spread throughout the body. The late phase involves persistent disease, primarily in skin, heart, joints, or central nervous system. Only a fraction of those who develop the first phase go on to develop the second phase. Some people may develop persistent disease without ever noticing the symptoms of the first phase. Some people may develop an infection without noticing any symptoms.⁹
- (1) The early phase includes localized infection. Erythema Migrans, a red circular rash, starts at the tick-bite and spreads over days to weeks. The ringlike rash is usually about 3 inches across at 2 weeks.

- (2) During the early phase, some people will develop symptoms of widespread infection. Rash similar to Erythema Migrans may appear in many places on the skin. Intermittent symptoms similar to encephalitis (brain infection) or meningitis are common: severe headache and neck stiffness. The patient may also develop malaise, fatigue, and muscle and joint pains. In most people, these symptoms go away in about 3-4 weeks.
- (3) The late phase is characterized by persistent infection. In the U.S., about 1/5 of those with infection will have persistent disease. Of these, over half will have a form of arthritis similar to rheumatoid arthritis, with swollen, hot joints, particularly the knees. (This was how the disease was discovered. Mothers near the town of Lyme, Connecticut pestered public health officials to find out why so many of their children were developing what looked like rheumatoid arthritis.) Others will have encephalitis and meningitis, similar to the early phase, and may have paralysis of various cranial or peripheral nerves. Some problems (in less than 1/10 of those with persistent disease) are thought to be autoimmune: abnormalities of cardiac conduction (heart blocks) and inflammation of the heart muscle.
- d. **Diagnosis and Treatment:** Lyme disease is readily treatable with antibiotics, especially when detected early. If a member of a search and rescue team (or anyone, for that matter), especially someone who has been bitten by a tick, develops a rash similar to Erythema Migrans, or develops arthritis or heart block at a young age, that person should see a physician for possible Lyme disease.¹⁰ Blood tests for Lyme disease, while available, are not highly reliable. Therefore, a careful his-

tory and physical exam are very important in the diagnosis of Lyme disease.¹¹

5. Tularemia

- a. Tularemia is caused by the gram-negative bacterium Francisella tularensis. Tularemia is traditionally thought of as a disease of rabbits. It is actually carried by many wild mammals. It can be transmitted by tick, and it can cause serious disease in humans. If infection occurs through the skin, ulceroglandular tularemia develops in about two days. The bite (or other site of inoculation) forms an abscess and then ulcerates. The patient develops a high fever and enlarged lymph nodes in the neck, armpit, and groin. Severe headache and enlargement of the liver and spleen are common. Variant forms of tularemia involve the eyes or lungs, sometimes with few other symptoms. In 1990, 152 cases were reported in the U.S.
- b. There is no particular field treatment for tularemia, except that tetracycline, if available, may be effective, though not as effective as the streptomycin that is used in a hospital.¹²
- 6. Tick Paralysis is a rare form of ascending paralysis: paralysis that starts at the feet and works its way upward. It can be fatal, if the paralysis reaches as high as the muscles of respiration, and if someone doesn't provide artificial respiration. It is caused by a chemical secreted in the saliva of one particular kind of female tick. If you find and remove the tick, the paralysis disappears within a day or so.⁶

D.Spiders

1. **Background:** Most spiders have a venomous bite that causes a local reaction of itching, swelling, and pain; these may be treated as described in the subsec-

tion on dermatology in the Wilderness Medical Problems section. The two types of spiders whose bites may have serious consequences are the black widow (Latrodectus mactans) and related spiders, and the brown recluse (Loxosceles reclusa) and related recluse spiders (Loxosceles species). Many other species of spiders (e.g., Phidipus sp.) cause a locally painful bite, sometimes with a small blister or tiny necrotic area. Recognizing widow and recluse spiders is a useful but not necessary skill for WEMTs. We will therefore not present information on how to recognize these spiders, except to mention that widow spiders are small black webbuilding spiders noted for hourglass markings on their abdomens, and recluse spiders are large non-web-building brownish spiders with violin-shaped markings on the dorsum (back) of their abdominal segments.

- 2. **Prevention:** Most recluse spider bites occur when a person sits on one. Wearing thick pants should prevent bites. If wearing shorts, sit on a pad or your pack. Black widow spiders are known for living under rocks and in woodpiles. When handling firewood or picking up rocks, wear leather gloves. Black widow spiders are also known for lurking under the seats of outhouses. A careful inspection may be in order before being seated.
- 3. Black Widow Spiders: The black widow bite usually causes a sharp, brief pain. The reaction starts in fifteen minutes to an hour, and lasts for a few hours. This reaction includes chills, vomiting, leg and abdominal pain, sweating, and cramps. Death is rare, but patients may be very sick for up to 24 hours. The abdominal pain may be so severe it seems like an acute abdomen. You may need to give IV pain medications, or to treat muscle spasms with muscle relaxants such as diazepam (e.g., ValiumÞ).

(Intravenous calcium gluconate is also sometimes given to ease the cramps of a black widow bite, but is generally given only with careful monitoring for effects on the heart.) Otherwise, treatment is symptomatic.¹³

- 4. **Recluse Spiders:** The bite of a recluse spider is generally reported as painless, but some areas of North America have recluse spiders with painful bites. A local reaction sometimes follows. The bite becomes painful, and blisters and oozes for several hours. Sometimes, the blistering may progress to local tissue destruction and an ulcer. In severe cases, the ulcer may continue to get bigger, and may require medical treatment. Rarely, systemic reactions are reported, with chills, vomiting, joint pains, and blood-related abnormalities.
 - a. **Diagnosis:** Diagnosing a recluse bite is difficult, unless you see a spider bite and can identify it as a recluse spider. Many spider bites cause a small local blister, or local redness, and may then be mis-diagnosed as ``brown recluse" bites.
- b. **Treatment:** Recent research shows that recluse bites are made worse by heat and better by cold. (One of the destructive enzymes in the venom is much more effective at warm temperatures.) Therefore the field treatment of choice is cold packs to the bite.¹⁴ Since cold applications also reduce pain from any painful bite, applying a cold pack to any spider bite seems appropriate. Don't apply heat!
- C. Definitive treatment of recluse bites remains controversial. Some surgeons recommend excising (cutting out) the bite to prevent worsening local necrosis. However, a study found that using medical treatment alone worked better than medical treatment and early surgical excision. Medical treatment included antibiotics and the medicine dapsone.¹⁵
- d. Tegenaria agrestis, a spider found in Idaho, Oregon, and Washington, has been reported to

cause necrotic areas and systemic symptoms similar to the bite of the recluse spider.¹⁶ At a recent meeting of the Wilderness Medical Society, Dr. Jim Blackman, of Boise, Idaho, reported on a patient with a suspected Tegenaria agrestis bite. The patient had both systemic symptoms and a necrotic area. When given dapsone, the patient improved; when the dapsone was withdrawn, the patient got worse again. It is not known if cold packs are an appropriate field treatment for the bite of this

E.Scorpions

spider.

- 1. **Background:** In the Southwest, scorpions are a significant venomous hazard. In the U.S. in 1985, more people were hospitalized for scorpion stings than for snakebite.
- 2. **Prevention:** Members of search and rescue teams in this area know to take precautions to avoid scorpion stings, such as keeping boots upside down at night, shaking out boots and clothing before putting them on, wearing leather gloves and long-sleeved shirts when climbing routes where scorpions might be or working with objects on the ground, and using well-screened tents or bivouac sacs.
- 3. **Diagnosis:** Most scorpion stings cause local reactions similar to a beesting.
- 4. **Treatment:** Treatment is the same as for a beesting. Using a suction device seems reasonable, but there are as yet no scientific studies to support or reject its use. The pain usually goes away in about 4 hours regardless.
- 5. Centuroides Scorpions: The Centruroides species of scorpions contain about eight species that are dangerous to man. These scorpions contain a neurotoxic venom that causes pain, tachycardia, muscle spasms, muscle twitching, convulsions, and a decreased

level of consciousness. One physician describes this as ``break dancing in bed." The only treatment for this is general supportive measures: bag-mask ventilation or intubation as needed, and Valium^b for seizures. An antivenin is available in Arizona, but some guestion its value, and it is not approved by the Food and Drug Administration.¹⁷

F. Coral Snakes

- 1. Background: Coral snakes are the only North American Elapidae, and are related to the deadly cobras and kraits. They are found in the southeastern part of Virginia (the Great Dismal Swamp) and areas further south. Coral snakes are small and not aggressive. They have a small mouth, with small fangs, and must chew to inject their venom, which is not nearly so powerful as that of their overseas cousins.
- 2. **Prevention:** Almost all coral snake bites occur to the fingers, when children or intoxicated adults are handling a coral snake.
- 3. Diagnosis: You can remember the coloration of this small snake by the old ditty ``Red on yellow, kill a fellow; red on black, venom lack." Coral snake venom is primarily neurotoxic. It causes little localized tissue destruction. Symptoms include tremor, numbness and weakness of the extremities, and nausea and vomiting.
- 4. Treatment: Coral snake envenomation is rarely life-threatening; the exceptions would be small children and those with severe underlying medical problems. Using a suction device (see below) is unlikely to cause any harm and is worth trying. If the patient is very young, very old, or very ill, using the Australian treatment would be appropriate (see below). Otherwise, there is no specific

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prehospital care for victims of coral snake envenomation.

5. Since bites from coral snakes are rare, the remainder of the snakebite discussion will be confined to pit vipers.

G.Pit Vipers

1. Background

- a. Almost all injuries and deaths from wild venomous snakes (in the US) are due to the Crotalidae or pit vipers: various rattlesnakes, the copperhead, the water moccasin (cottonmouth), and the rare Massasaugua.^{18,19} Pit vipers are so-named because they have a special heat-sensitive organ in a pit on their heads. For field identification of a snake, the simplest technique is to look at the eyes; pit vipers have elliptical pupils, while other North American snakes have round pupils. Pit vipers also have very angular, triangular heads, compared to the more rounded heads of other snakes.
- b. The venom of pit vipers contains a variety of different toxins, and the amount and type of venom varies with factors including the species, the season, and even the snake's diet. However, the venoms are similar enough to be treated the same.
- c. Also, a careful distinction must be made at the outset: first aid for snakebite depends on the time until the victim can be brought to a medical facility with antivenin. Proper first aid in a city park five minutes from the local Emergency Department is not necessarily proper first aid in the mountains five hours or five days from the local Emergency Department.
- d. Poisonous snakebite is highly associated with intoxication. And, poisonous snakebites in the U.S. are rarely fatal. Therefore, outdoor enthusiasts who exercise reasonable caution have little

to fear. Wilderness search and rescue team members may be at more risk due to the nature of SAR tasks.^{20,21}

2. **Prevention:** Most pit viper bites are a result of stupid behavior or intoxication. Don't play with wild snakes, even ones reputedly non-poisonous (see below). Snakes are generally active only during relatively warm weather, so be more cautious during warm months. If, given the weather and location, pit vipers are a potential danger, you may want to wear leather gloves while climbing, at least on the easier routes.

3. Diagnosis

a. Obtaining the Snake: If the snake is an exotic one, you can help by bringing the snake to the Emergency Deidentification. partment for (Information on exotic antivenins can be obtained from your local Poison Control Center.) However, attempts to kill or capture the snake may cause more bites. You must remember, too. that a snake's head can deliver venomous bites for a considerable time after being cut off. Treatment of domestic pit viper bites is based more on clinical signs than on the exact species of snake.¹⁹ And, since a single antivenin is used for all domestic pit viper venoms, identifying a domestic snake is of minor importance compared to the dangers of persuading the snake to accompany you to the hospital.

b. Determining Envenomation

(1) The first step in the management of any domestic snakebite is to determine if it is envenomated. If the snake is non-poisonous, the bite will not be envenomated (but see below). If you can't find the snake, can't identify it, or know it to be venomous, you must carefully observe for signs of local envenomation: marked swelling, pain, and ecchymosis at the bite, usually within a few minutes to an hour.¹⁸

- (2) Paresthesias in the fingers and toes. a feeling of severe anxiety (``impending doom"), nausea, vomiting, abdominal pain and an unusual taste in the mouth are reported in many envenomated bites. In particular, some Mojave rattlesnakes (Crotalus scutulatus scutulatus), found in the southwest, may produce systemic toxicity (e.g., paresthesias) with little local reaction at the bite itself.²² If a person develops significant systemic signs after a bite, even if there is little local reaction, treat as if envenomated. Sometimes, you may find it hard to tell whether the person is showing signs of systemic toxicity or just panic. Simple anxiety after a bite may cause nausea, abdominal pain, or tingling extremities from hyperventilation, so use caution in interpreting these symptoms as representing envenomation. Anxiety seldom causes an unusual taste in the mouth, however, so this may be the most useful symptom to ask about. If you avoid the dangerous treatments described below, you will cause no harm by treating as if envenomated.
- (3) If you find signs and symptoms of envenomation, you know the bite is envenomated; if not, the bite is probably not seriously envenomated, even if delivered by a venomous snake. About a third of all reported pit viper bites are **not** noticeably envenomated; the actual frequency of envenomation may even be less, as some nonenvenomated bites are probably not reported.¹⁹
- (4) Rarely, a snakebite victim may not show any signs of envenomation for three or four hours. Some bites may show no signs of envenomation except for continued bleeding from the bite wound. One report notes a delay of ten hours in the appearance of signs of envenomation.²³ Thus, you should assure that all potiential en-

venomated bites are observed for about twelve hours before deciding that they are not envenomated. Or, make sure that the patient will have access to medical care if the bite shows signs of envenomation later.

- (5) Some ``non-poisonous" North American snakes have venom that can cause a painful local reaction, but no systemic symptoms. Such bites are reported from ringneck, hognose, and garter snakes.²⁴ There is no specific treatment, though using a suction device seems reasonable.
- (6) If you determine the bite is envenomated, then, and only then, do you need to consider specific first aid treatment for poisonous snakebite. However, any animal bite is a contaminated puncture wound and needs proper medical treatment, including standard wound care, and evacuation for a tetanus booster if it has been more than five years since the victim's last tetanus immunization.²⁵ (See the section on Wilderness Surgical Problems for more on animal bites.)

4. Snakebite Treatment

- a. **State of the Art:** The snakebite first aid literature is rife with misinformation and superstition. However, by a careful review of the literature, and by consulting with recognized experts, you can find a consensus on the field treatment of pit viper bites. Unfortunately, many erroneous and harmful first aid treatments still appear in publications for the lay public. You, as a WEMT, can play an important part in education of the public about snakebite first aid.
- b. **Summary:** Because of the still-remaining controversy about snakebite treatment, the following paragraphs present detailed information about the reasons for the recommended treatment. It also provides a detailed dis-

cussion of harmful and useless, yet popular, treatments. Therefore, here is a brief summary of the **correct** wilderness treatment of envenomated pit viper bites:

- (1) **Don't** use cold.
- (2) **Don't** use lymph constrictors or tourniquets.
- (3) Don't use electric shocks.
- (4) Don't give alcohol.
- (5) **Don't** let the person walk out if you can evacuate the person.
- (6) **Do** use suction (i.e., a suction device) if within the first few minutes after the bite, but **don't** cut unless you perform surgery on a regular basis.
- (7) Do use a splint for comfort.
- c. Cold Treatment: Pit viper venom is not inactivated by the cold. One purpose of the venom is to predigest dead (and therefore cooling) animals. The venom causes immediate damage and spreads through lymphatic channels and directly through the tissue, destroying tissue as it goes. Variable amounts of the toxins are absorbed into blood vessels and lymphatics, leading to the systemic symptoms. The primary danger from North American poisonous snakebites is not death, but severe damage to tissue and limbs: death from a North American pit viper bite is rare²⁶. A major cause of tissue damage, is, paradoxically, improper treatment by first-aiders (and sometimes by physicians). For instance, one home remedy for snakebite is to pack the limb in ice. (One first aider even packed the limb in dry ice!) Another first aider, rather than using the cutand-suck method, used the bite-andsuck method, causing a large human bite. A few years ago, ``snakebite kits," consisting of a lymph constrictor and cold packs, were widely available. These practices are mentioned only to condemn them, as there are no studies

to support the contention that cold improves snakebite outcome. There is good evidence that cold makes the effects of the venom much worse, and indeed there are cases where non-envenomated limbs have been packed in ice and lost due to frostbite.^{27,28}

- d. Stasis TreatmentsåRest, Splinting, and Lymph Constrictors: Many first aid textbooks still call for the snakebite victim to rest and be carried out to a road rather than walking out, for the affected limb to be splinted at the level of the heart, and for a lymph constrictor to be placed on the extremity between the bite and the heart. The purpose of all these measures (and the now-discredited use of cold packs) is to retard the spread of venom, and thereby minimize systemic effects. With the extremely poisonous reptiles found in South America, Asia, and Australia, this makes sense. (But see below on the ``Australian" methods for better stasis treatments.) However, the systemic effects of North American pit viper bites are usually limited to nausea, vomiting, malaise, and sometimes a decrease in platelets. They are rarely life-threatening, except for the very young, the very old, and those with severe medical problems. The major problem is loss of tissue and scarring, resulting in crippling deformities. Therefore, in the North American wilderness, trying to hold the venom at the site makes little sense, except when antivenin will be available in a short time, or when the envenomation is life-threatening.
- (1) Walk Out or Carry-out? Theoretically, exercise will increase absorption of venom from the bite, and may increase symptoms by other mechanisms. If you have a person in the backcountry with an envenomated bite, you should probably not let him or her walk out, but should get or make a litter and carry the person

out. One study has shown greater mortality in exercising animals compared to resting controls.²⁹ However, the amount of venom injected into these animals was so large as to simulate a human with many simultaneous bites, and is suspect for this reason. Another retrospective clinical study reported less-complicated hospital courses in those with lower activity levels after envenomation.³⁰ If someone in the backcountry has an envenomated bite, and you don't have enough people for a carry-out. you must choose between camping and waiting out the effects of the bite. or trying to walk out. The choice is not just a medical one; you must consider other factors, including food, shelter, weather, terrain, and distance to the road. As far as medical considerations, the sicker the patient, the better it would be to camp rather than walk.

- (2) Splinting: There are no good studies about splinting of a bitten extremity. However, the pain relief afforded by splinting recommends it even if there is no effect on mortality or morbidity. Splinting below the level of the heart would theoretically promote swelling, which is already a problem with snakebites. Splinting above the heart, though it might decrease swelling, also decreases the blood pressure. and therefore might make a compartment syndrome worse. Therefore, some experts recommend splinting at the level of the heart, though others say that the level makes little difference.
- (3) Lymph Constrictors and Tourniquets
 - (a) Theoretically, a true lymph constrictor might be of minor benefit, as it might retard absorption of the venom, minimizing systemic reactions at the cost of worsening local damage. However, there are no

good studies showing a decrease in North American pit viper bite morbidity or mortality due to use of a lymph constrictor, and at least one animal study has shown it to be of no benefit.³⁰

- (b) Variations of the lymph constrictor are to apply a venous tourniquet, which will worsen the local injury, or an arterial tourniquet, which could easily cause loss of the limb. An arterial tourniquet might be appropriate to sacrifice a limb to save a life, if you have someone with multiple envenomated bites. However, you should make such a decision only after careful consideration, especially since the incidence of such immediately lifethreatening bites in the US is so small. Also, in such a situation, the Australian pressure treatment might be better than a tourniquet (see below).
- (c) Another problem is that many firstaiders, even though they are trying to apply a lymph constrictor, end up with a venous or arterial tourniquet. Few lay people understand what the lymphatic system is, much less how much pressure a lymphatic constrictor requires. Snakebite victims (many from non-poisonous snakes) have come into Emergency Departments with arterial or venous tourniquets in place. And, there is no evidence that even properly-applied lymph constrictors help North American pit viper bites. Therefore, we should completely expunge the idea of lymph constrictors from the first aid treatment of domestic snakebite.³¹
- (d) As a Wilderness EMT, you should know about the lymphatic system. You know that arteries carry blood from the heart out to the tissue capillaries, and that veins carry blood back to the heart. However,

there is a third set of vessels: the lymphatics. The lymphatic vessels originate in the spaces between the cells, where they pick up the clear fluid (lymph) that leaks through the capillary walls. At junctions of the lymphatic vessels are lymph nodes (lymph glands). These filter out bacteria and other foreign material. Lymph nodes are also factories for white blood cells. In response to an infection, they enlarge to increase their production of white blood cells. They are found in many places, especially in the neck, armpit, and groin. You can often tell where an infection started by noting which groups of lymph nodes are swollen. For instance, lymph from the right leg drains through the lymph nodes in the right groin, and enlargement of these nodes is a clue to a likely infection in the right leg. Lymph nodes are ``factories" for certain kinds of white blood cells, and enlarge in response to infections. The large lymphatic ducts drain back into the major veins inside the chest.

(e) John Sullivan, a leading expert on pit viper bites from the University of Arizona, recommends the following: If you find a person with a constricting band already in place, and you can start an IV, start the IV so you can give fluid if the pressure drops, and then remove the constricting band. However, Michael Callahan, a researcher involved more with Eastern pit vipers, which have more systemic toxicity, thinks that a lymph constrictor may still be appropriate, and that the low death rate from pit viper bites has more to do with early antivenin treatment than with lack of systemic toxicity. To confuse the issue further, Findlay Russell, another well-known expert, and from the same University of Arizona as John Sullivan, thinks that a lymph constrictor might be appropriate in some cases of domestic pit viper bite. For an educated professional such as a Wilderness EMT, the risk of applying a lymph constrictor wrong is less than with a lay person.

(f) A lymph constrictor should just barely indent the skin. If you can easily insert two fingers under a constricting band, there is little danger of it acting as a venous or arterial tourniquet. If the veins are swollen below the lymph constrictor, it is too tight. Until further information is available, the official recommendation of this Curriculum is not to use a lymph constrictor. (``First, do no harm.") Regardless, what you do as a WEMT is dependent on the preference of your medical director.

e. The Cut-and-Suck and Suction Methods

(1) Problems with Cut-and-Suck: The cut-and-suck method of treating snakebite has been well-known for a long time (at least 3000 years). It even forms the basis for several wellworn jokes, none of which we can repeat here. The cut-and-suck method can be reasonably effective at removing venom if you use it in the first few minutes. However, it may cause severe damage if you don't do it exactly right. And, people do it wrong so often that it is probably responsible for more trauma than the snakebites themselves. Methods such as a suction device are equally effective without the danger of cutting, and so the cut-and-suck method now has no place in the first aid treatment of snakebite by the public.* To emphasize the point, and to give you ammunition if you find yourself in a heated discussion with an aficionado of the cut-and-suck method, we will present the detailed reasoning behind the recommendation not to cut and suck. To skip ahead to the bottom line, you can say ``OK, cut-and-suck **could** be a reasonable treatment **if** you're a plastic surgeon, **if** you have a definitely envenomated bite, **if** you're in the backcountry, and **if** you have something like one of the older suction cup snake bite kits but not a Sawyer Extractorß." (See below for more on the Sawyer Extractorß.)

- (2) Cut-and-Suck
 - (a) The cut-and-suck method, like a suction device, would only be effective within the first half-hour of the bite, and only at the site of venom deposition. (Some first aiders have employed incisions all over a swollen arm after a snakebite, with a predictable surgeon's bill for reconstruction of the arm.)
 - (b) Incisions, if you were to make them, should never be deeper than the venom (about 1/8-1/4 inch). Deeper incisions would likely cause damage, and the venom is usually just under the skin.
 - (c) Sucking with your mouth would not poison you; even if you had a cut on the lips or mouth, you wouldn't absorb enough venom to cause any effects, and any venom you swallow would be inactivated by your stomach acids and enzymes. However, your mouth is filled with bacteria, and applying it to an incision guarantees a terrible wound infection. (You've effectively changed a relatively clean reptile bite into a human bite.)

^{*} There might be some justification for cutting by trained personnel such as WEMTs, but the chances are small that a WEMT will encounter a snakebite in the first 30 minutes without a suction device. Because of this, and to emphasize the dangers of cut-and-suck to anyone who sees this material, we do not teach WEMTs to use the cut-and-suck method.

- (d) Cross-shaped (cruciate) incisions were recommended at one time, but this would damage the blood supply to the ``corners" of the skin at the incision. Incisions, if they were to be made at all, should be linear and oriented along the length of the limb (axial) to avoid damage to the blood vessels, nerves, and tendons that traverse the length of the limb. (Transverse or crossshaped incisions would be much more likely to cause damage.) In areas where there are many vital structures lying immediately under the skin, even linear incisions could cut vital structures. Such areas include the hand, wrist, foot, ankle, face, and neck.
- (e) Again: while incision might increase the amount of venom you can extract over what you might extract just with a suction device, the risk of damage to vital structures makes it inappropriate for first aiders or WEMTs. The only conceivable exception might be if you are a surgeon or emergency physician who makes incisions on a regular basis and you are intimately familiar with the anatomy involved. And, this would only be appropriate if you find a patient immediately after a snakebite, and have one of the older suction cup snakebite kits instead of a suction device like the Sawyer Extractor.³²
- (f) One snakebite expert has suggested that cutting may cause enough bleeding to interfere with the pump seal on the suction device. This may be a significant problem, considering the coagulopathy

(bleeding problems) caused by pit viper bites. This coagulopathy may make cutting unnecessary.

(3) Suction Devices

- (a) The Sawyer Extractorß is a light, inexpensive commercial suction device that develops a very high suction (750 millibars).* Thus, you can use it to effectively remove venom (up to 30% when you use it in the first few minutes after the bite) with no need for cutting. It may be, at present, the only potentially effective field treatment for snakebite. Doubtless equally effective competing devices will soon appear. It is clearly more effective than the suction cups of the old Cutterß snakebite kit.
- (b) There is no point in continuing suction for more than 30 minutes. No significant amount of venom can be recovered after this.
- (c) A device called the Sting-X-tractorß is marketed for insect bites, but not for snakebite.** It is lighter and smaller than the Sawyer Extractorß, but develops significantly less suction (about half, by a quick estimate). It apparently does not develop enough suction to remove snake venom.
- (d) An improvised alternative would be to use an ambulance or high-suction portable suction unit, with some surgical lubricant or electrode gel to make a good seal.
- f. **The Australian Treatment:** In Australia, highly-toxic bites are more common than in the U.S. The venom of Australian snakes is deadly but causes little local tissue damage. For such

^{*} Information is available from Sawyer Products; P.O. Box 188; Safety Harbor, FL 34695; 1-813-725-1177.

^{**} Tec Laboratories, Inc.; Box 1958; Albany, OR 97321; 1-800-ITCHING.

snakebites, an arterial tourniquet might be lifesaving. However, because of the pain and damage caused by an arterial tourniquet, Australians searched for better first aid treatments. These ``Australian" techniques use less-painful methods to immobilize venom at the site of the snakebite. The CSL" technique, named after Commonwealth Serum Laboratories. where the principal researchers work, is simple: use an elastic bandage or roller gauze, wrapping firmly but not tightly (pressure of 55 mmHg) proximally most of the way up the arm or leg, then immobilize the limb in a splint. This decreases the blood flow in the area around the bite, theoretically limiting both the spread and absorption of the venom. This might then permit the victim to survive until you can get antivenin.^{33,34,35} Another group of Australians argue that using a firm pressure dressing over the bite (pressure of 70 mmHg) works better than an elastic bandage, and have done experiments in humans that support this.^{36,37} One animal experiment seemed to show that the CSL treatment worked for North American rattlesnake bites,³⁸ but Dr. Findlay Russell of the University of Arizona savs he has seen a number of patients whose rattlesnake bites were made much worse by this treatment. Therefore, the best evidence is that for North American pit vipers, this method causes severe local tissue damage and you should not use it unless willing to sacrifice the limb to save a life. If you are on a disaster response to a country with very poisonous snakes, you might use the CSL treatment for envenomated bites.

g. Electric Shock treatments for snakebites are useless. The few studies that showed positive effect are flawed.³⁹ There are now good studies that show electric shocks to be useless.^{40,38,41} As some lecturers put it: ``Electric shocks were tried on snakebite back when electricity was first discovered. It didn't work then, and it doesn't work now."

- h. Antivenin: Many cases of envenomated snakebite don't need antivenin, and there is a high incidence or anaphylaxis from antivenin. The minimum dose is 10 vials of antivenin, it costs about \$100 a vial, and it has a short shelf life, especially in a pack. Thus, antivenin is rarely carried in the wilderness. However, if transporting a snakebite victim who may need antivenin, call ahead to let the Emergency Department know. The hospital may need to call elsewhere to get antivenin, and advance notice may speed the arrival of antivenin.
- i. The WMS Position Statement on Snakebite The Wilderness Medical Society, at its 1986 meeting, discussed snakebite (among other problems) and recommended flatly that the cutand-suck method not be used. This recommendation also appears in the 1989 WMS position statements. The WMS position on lymphatic constrictors is ambiguous.

5. Complications

- a. During a wilderness evacuation, two possible complications of a pit viper bite are **compartment syndrome**, which is covered in the *Wilderness Trauma* section, and bleeding from a low platelet count.
- b. Pit viper venom can mimic compartment syndrome. A tense, swollen, pale and exquisitely tender muscular compartment with evidence of muscle destruction is classic for compartment syndrome. However, the same appearance can come from direct toxic effects of a pit viper bite with **no** significant increase in compartment pressure, and with **no** need for a fasciotomy. Most snakebitten limbs that look like they have compartment

syndrome probably do not. Therefore, for snakebites, there is little need for a fasciotomy in the wilderness.⁴²

- c. Clinical observations of Dr. John Sullivan, a leading expert on pit viper envenomations, suggests that giving IV mannitol makes a possible compartment syndrome improve markedly. Mannitol is a standard medication for any advanced wilderness medical kit. It is unlikely to do any harm. So, it is likely that Wilderness Command Physicians will provide orders for mannitol for possible compartment syndrome, whether from snakebite or from other trauma.
- d. Snakebite venom causes a variety of systemic symptoms, most of which are unpleasant but not life-threatening. One of the most common complications, however, is a decreased platelet count, which may lead to bleeding. While there is no therapy for this in the wilderness, you should ensure that snakebite victims do **not** take aspirin, which decreases platelet stickiness. Nonsteroidal antiinflammatory drugs (NSAID's) such as ibuprofen also may decrease platelet stickiness slightly, so avoid these, too. Acetaminophen and narcotics should cause no problems with bleeding and are appropriate analgesics for snakebite.

6. General Comments on Snakebite Treatment

- a. Have the patient lie down and relax; give no alcohol. (It causes vasodilation and may speed venom absorption.) Remind the patient (and yourself) that the fatality rate even for **untreated** pit viper bites is extremely low.
- b. Any snakebite is a contaminated puncture wound, and you must treat it as such. (See the discussion of soft tissue injuries in the *Wilderness Surgical Problems* section.)
- c. Only a few snakebites are from poisonous snakes, and only a certain

number of bites by poisonous snakes leave venom in the skin or muscle (are **envenomated bites**); only those bites that are from poisonous snakes and that are envenomated need treatment for snakebite poisoning.

- d. There are only two types of poisonous snakes found living in the United States, though other types of exotic poisonous snake may be found in zoos and in private collections. Certain exotic poisonous snakes may be quite deadly (mamba, cobra), and these bites must be treated as per instructions from a regional poison control center; generally this will involve transport to a major medical facility where a specific antitoxin (``antivenin") may be administered.
- e. The major risk from snakebite is loss of a limb, and erroneous treatments such as packing in ice have resulted in more loss of limbs than from snakebite itself; this is particularly tragic when limbs have been lost to frostbite because of a non-envenomated bite.
- f. Pit viper venom is injected through half-inch long fangs; if there are no fang marks, it is most unlikely that any venom was injected. Even if there are fang marks, venom may not be injected. If there is no severe local reaction of pain, swelling, and tenderness, then the bite was probably not envenomated, and need not be treated as a poisonous snakebite.
- g. The swelling of an envenomated snakebite causes loss of fluid, similar to a burn. The venom may cause breakdown of muscle, which might cause kidney problems (myoglobinuria). Thus, you should provide snakebite victims with adequate fluid replacement. Myoglobinuria is discussed in the section on *Burns and Lightning*, and fluid balance and oral hydration are discussed in the section on *Principles of General Medicine*.

H.Other Bites and Stings

- 1. There are many more venomous animals than we could include in this section.
 - a. Some of the ``non-poisonous" snakes found in the U.S. can actually deliver small amounts of venom with their bites. However, none is likely to cause severe enough problems for you, as a WEMT, to need to deal with.
- b. Many insects and arachnids can inflict painful or irritating stings. These dermatologic discomforts are discussed in the section on *Wilderness Medical Problems*.
- 2. Outside of North America, there are many poisonous spiders, insects, snakes, and other reptiles. Unlike those in the U.S., some of these foreign venoms may be deadly in seconds. If you are sent to a foreign country, you should obtain a complete briefing on venomous animals there and how to recognize and treat their bites and stings.
- 3. Marine envenomations are covered in EMT and EMT-P classes, and we have little to add related to wilderness rescue. We will review two basic principles:
- a. Most marine venoms are destroyed by heat. Soak the affected extremity in hot water (110æF=43æC).
- b. Nematocysts are found in the tentacles of jellyfish and Portuguese Men of War. If you must care for someone with nematocyst-laden tentacles on the skin, avoid triggering more of the nematocysts: rinse with sea water, vinegar, alcohol, papain as found in meat tenderizer, ammonia, or sodium bicarbonate solution (baking soda). Don't rinse with fresh water; this will trigger the nematocysts and cause more stings. Apply shaving cream, if you have it, and shave with a razor or

sharp knife to remove the nematocysts.⁴³

I. Other Wilderness Poisonings

- 1. All substances are poisons. There is none which is not a poison. The right dose differentiates a poison and a remedy. åParacelsus (1493-1541)
- 2. Plants and mushrooms are certainly common in the wilderness. However, treatment for ingested poisons is the same as on the street:
- 3. Get as much history as you can.
- 4. Contact a Poison Control Center via radio if you can.
- 5. If you can't reach a Poison Control center follow your standard EMT training as far as diluting, inducing vomiting, and giving charcoal.

Glossary

Arthritis: Inflammation of the joints.

- Autoimmune: When you develop an allergic (immune) reaction against part of your own body. This may be caused by an infection with a germ that ``looks" like a part of your own body. Your lymphocytes then attack the part of your body as well as the germ.
- Axial: along the long axis of a limb.
- Cruciate: Cross-shaped.
- Encephalitis: A brain infection.
- **Envenomated Bites:** Bites of an animal or insect or arachnid that contain venom (poison). Not all bites of poisonous species are envenomated.
- Erythema Chronica Migrans: Erythema Migrans.
- **Erythema Migrans:** A slowly-spreading circular red rash that is a sign of Lyme Disease.
- Heart Block: An abnormality of the cardiac conduction system.
- Hymenoptera: The order Hymenoptera includes bees, wasps, hornets, and ants.
- Lyme Disease: An infectious disease, transmitted by the bite of certain ticks. Named after the Connecticut town where the disease was first discovered.
- Lymphatics: Lymphatic vessels. They return fluid that ``leaks" out of capillaries back to the central circulation. Lymph nodes are found along lymphatics.

XI: Bites and Stings

Other Wilderness Poisonings

- Lymph nodes: Small subcutaneous bumps that are found in many places, especially in the neck, armpit, and groin. They lie along lymphatic vessels. Lymph nodes are ``factories" for certain kinds of white blood cells, and enlarge in response to infections.
- Macular: refers to a rash in which you can see small spots, but cannot feel them. As compared to papular, which is a rash with palpable bumps.
- Mannitol: A type of sugar that is not absorbed by the body, but excreted in the urine. It is sometimes given IV to decrease swelling, for instance to decrease swelling in the brain. It works by increasing osmotic pressure in the blood, thus pulling water out of the swollen area. (The main effect in brain swelling is now thought to be to dilute the blood, by drawing water into the blood vessels, and allow it to flow through the brain more easily.)
- Morbidity: Non-lethal complications from a disease or injury. Examples would include brain damage or amputation of a limb, or a long hospitalization.
- Mortality: Death.
- Myalgias: Muscle aches.
- Paresthesias: unusual sensations, usually due to damage to nerves, or to biochemical abnormalities; a feeling of ``pins and needles" is a common paresthesia.
- **Retrospective:** When referring to a medical or scientific study, ``retrospective" means a study that, after the fact, analyzes medical records. This is in distinction to a ``prospective" study, which lays out, in advance, the way the study will be carried out. Prospective studies are generally more reliable than retrospective.
- Rheumatoid Arthritis: A common type of autoimmune arthritis.
- **RMSF:** Rocky Mountain Spotted Fever.
- Rocky Mountain Spotted Fever: An infectious disease transmitted by the bite of certain ticks.

Transverse: across the long axis of a limb.

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ASRC-CEM WEMT Curriculum

Other Wilderness Poisonings

XI: Bites and Stings

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