



**American
Red Cross**

First Aid/CPR/AED

PARTICIPANT'S MANUAL



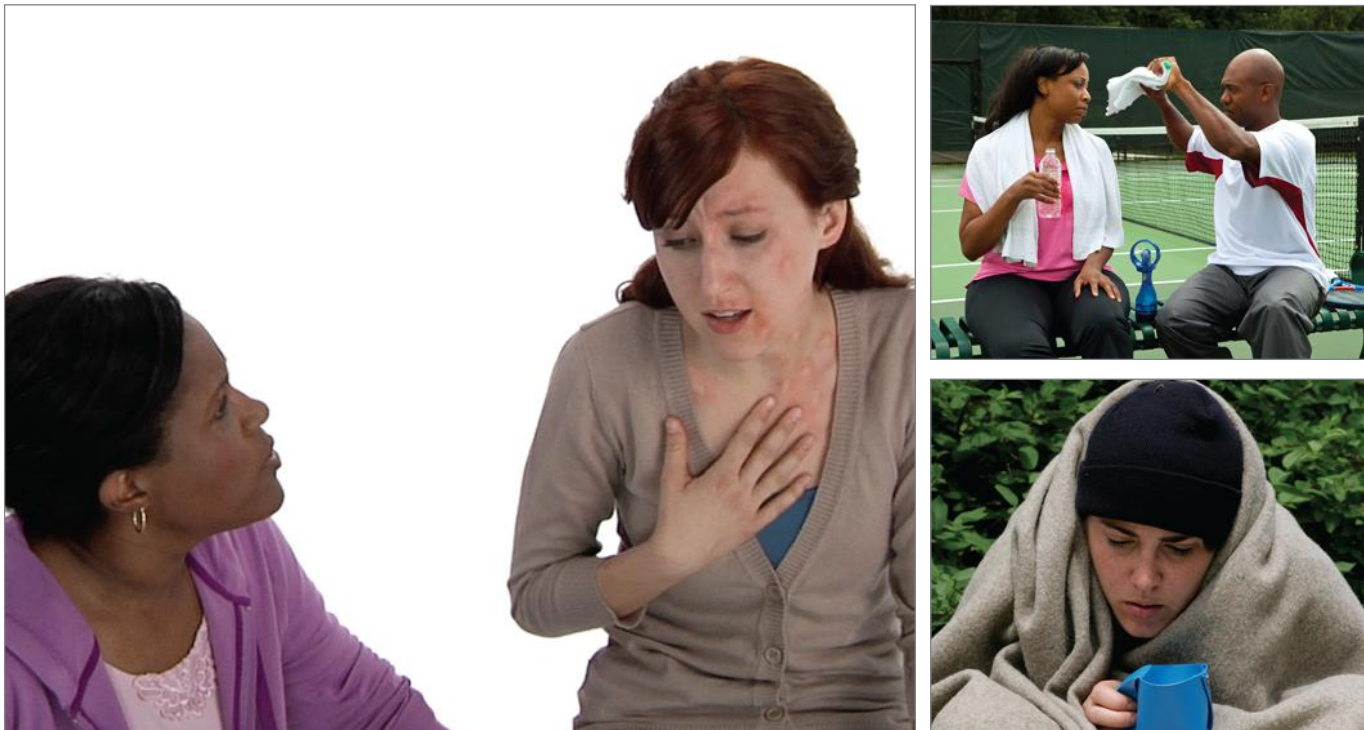
Table of Contents

	About This Manual	vii
	Health Precautions and Guidelines During Training	viii
CHAPTER 1	Before Giving Care and Checking an Injured or Ill Person	1
	Your Role in the EMS System	2
	Disease Transmission and Prevention	5
	Taking Action: Emergency Action Steps	8
	Checking a Conscious Person	14
	Shock	16
	Checking an Unconscious Person	17
	Incident Stress	22
	Putting It All Together	23
SKILL SHEET:	Removing Gloves	24
SKILL SHEET:	Checking an Injured or Ill Adult	25
SKILL SHEET:	Checking an Injured or Ill Child or Infant	27
CHAPTER 2	Cardiac Emergencies and CPR	29
	Background	30
	Heart Attack	30
	Cardiac Arrest	33
	Putting It All Together	40
SKILL SHEET:	CPR—Adult	41
SKILL SHEET:	CPR—Child	42
SKILL SHEET:	CPR—Infant	43
CHAPTER 3	AED	44
	When the Heart Suddenly Fails	45
	Using an AED	45
	AED Precautions	45
	How to Use an AED—Adults	46
	How to Use an AED—Children and Infants	47
	Special AED Situations	47
	Other AED Protocols	49
	AED Maintenance	49
	Putting It All Together	49
SKILL SHEET:	AED—Adult or Child Older Than 8 Years or Weighing More than 55 Pounds	50
SKILL SHEET:	AED—Child and Infant Younger Than 8 Years or Weighing Less than 55 Pounds	52

CHAPTER 4	Breathing Emergencies	54
	Background	55
	Respiratory Distress and Respiratory Arrest	56
	Choking	59
	Putting It All Together	65
SKILL SHEET:	Conscious Choking—Adult	66
SKILL SHEET:	Conscious Choking—Child	67
SKILL SHEET:	Conscious Choking—Infant	68
SKILL SHEET:	Unconscious Choking—Adult	69
SKILL SHEET:	Unconscious Choking—Child and Infant	70
CHAPTER 5	Sudden Illness	71
	Sudden Illness	72
	Specific Sudden Illnesses	73
	Poisoning	79
	Putting It All Together	83
CHAPTER 6	Environmental Emergencies	84
	Heat-Related Illnesses and Cold-Related Emergencies	85
	Bites and Stings	88
	Poisonous Plants	98
	Lightning	99
	Putting It All Together	100
CHAPTER 7	Soft Tissue Injuries	101
	Wounds	102
	Burns	109
	Special Situations	112
	Putting It All Together	116
SKILL SHEET:	Controlling External Bleeding	117
SKILL SHEET:	Using a Manufactured Tourniquet	118
CHAPTER 8	Injuries to Muscles, Bones and Joints	119
	Background	120
	Types of Injuries	121
	Putting It All Together	129
SKILL SHEET:	Applying an Anatomic Splint	130
SKILL SHEET:	Applying a Soft Splint	132
SKILL SHEET:	Applying a Rigid Splint	134
SKILL SHEET:	Applying a Sling and Binder	136

CHAPTER 9	Special Situations and Circumstances	138
	Children and Infants	139
	Emergency Childbirth	145
	Older Adults	146
	People With Disabilities	147
	Language Barriers	149
	Crime Scenes and Hostile Situations	149
	Putting It All Together	150
CHAPTER 10	Asthma	151
	Asthma	152
	Putting It All Together	154
SKILL SHEET:	Assisting With an Asthma Inhaler	155
CHAPTER 11	Anaphylaxis and Epinephrine Auto-Injectors	157
	Anaphylaxis	158
	Putting It All Together	160
SKILL SHEET:	Assisting with an Epinephrine Auto-Injector	161
APPENDIX	Injury Prevention and Emergency Preparedness	163
	Injuries	164
	Putting It All Together	171
	Sources	172
	Index	175

Environmental Emergencies



Disease, illness and injury are not the only causes of medical emergencies. Much of our environment appears to be relatively harmless. A weekend outing can bring you closer to the joys of nature: animals, mountains, rivers, blue skies. But it also can expose you to disease-carrying insects, other biting or stinging creatures and rapid changes in the weather. Whereas many environmental emergencies can be avoided, even with the best prevention efforts, emergencies do occur.

In this chapter you will discover how to prevent heat-related illnesses and cold-related emergencies, as well as bites and stings from insects, spiders and other animals. You also will find information on how to avoid contact with poisonous plants and how to avoid being struck by lightning. In addition, you will read about when to call for help and how to give care until help arrives.

HEAT-RELATED ILLNESSES AND COLD-RELATED EMERGENCIES

Exposure to extreme heat or cold can make a person seriously ill. The likelihood of illness also depends on factors such as physical activity, clothing, wind, humidity, working and living conditions, and a person's age and state of mind (Fig. 6-1).

Once the signals of a heat-related illness or cold-related emergency begin to appear, a person's condition can quickly worsen. A heat-related illness or cold-related emergency can result in death. If you see any of the signals, act quickly.

People at risk for heat-related illness or a cold-related emergency include those who work or exercise outdoors, elderly people, young children and people with health problems. Also at risk are those who have had a heat-related illness or cold-related emergency in the past, those with medical conditions that cause poor blood circulation and those who take medications to eliminate water from the body (*diuretics*).

People usually try to get out of extreme heat or cold before they begin to feel ill. However, some people do not or cannot. Athletes and those who work outdoors often keep working even after they begin to feel ill. People living in buildings with poor ventilation, poor insulation or poor heating or cooling systems are at increased risk of heat-related illnesses or cold-related emergencies. Often they might not even recognize that they are in danger of becoming ill.

Heat-Related Illness

Heat cramps, heat exhaustion and heat stroke are conditions caused by overexposure to heat, loss of fluids and electrolytes.

Heat Cramps

Heat cramps are the least severe of the heat-related illnesses. They often are the first signals that the body is having trouble with the heat.

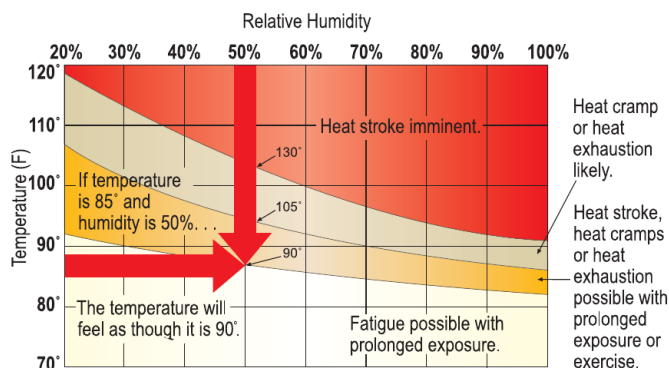


FIGURE 6-1 Exposure to extreme heat or cold can make a person seriously ill.



FIGURE 6-2 Lightly stretching the muscle and gently massaging the area, along with having the person rest and giving electrolyte- and carbohydrate-containing fluids, usually is enough for the body to recover from heat cramps.

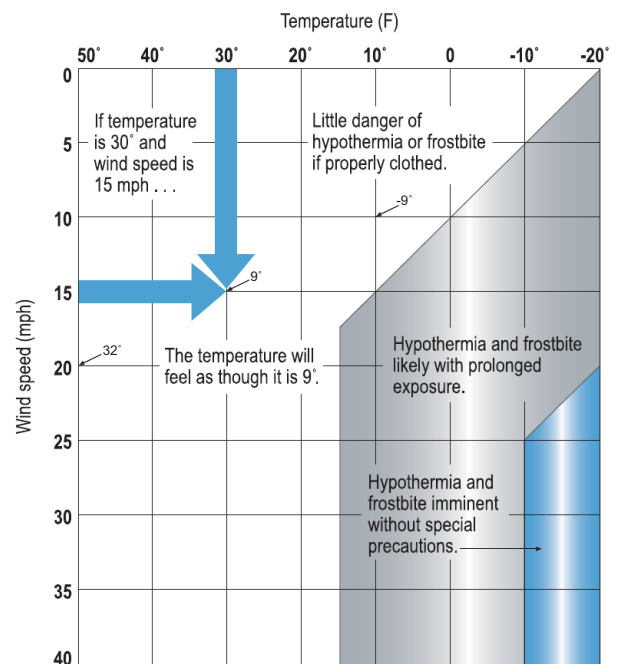
What to Look For

Heat cramps are painful muscle spasms. They usually occur in the legs and abdomen. Think of them as a warning of a possible heat-related illness.

What to Do

To care for heat cramps, help the person move to a cool place to rest. Give an electrolyte- and carbohydrate-containing fluid such as a commercial sports drink, fruit juice or milk. Water also may be given. Lightly stretch the muscle and gently massage the area (Fig. 6-2). The person should not take salt tablets. They can worsen the situation.

When cramps stop, the person usually can start activity again if there are no other signals of illness. He or she should keep drinking plenty of fluids. Watch the person carefully for further signals of heat-related illness.



Heat Exhaustion

Heat exhaustion is a more severe condition than heat cramps. It often affects athletes, firefighters, construction workers and factory workers. It also affects those who wear heavy clothing in a hot, humid environment.

What to Look For

Signals of heat exhaustion include cool, moist, pale, ashen or flushed skin; headache; nausea; dizziness; weakness; and exhaustion.

What to Do

When a heat-related illness is recognized in its early stages, it usually can be reversed. Get the person out of the heat. Move the person to a cooler environment with circulating air. Loosen or remove as much clothing as possible and apply cool, wet cloths, such as towels or sheets, taking care to remoisten the cloths periodically (Fig. 6-3). Spraying the person with water and fanning also can help.

If the person is conscious and able to swallow, give him or her small amounts of a cool fluid such as a commercial sports drink or fruit juice to restore fluids and electrolytes. Milk or water also may be given. Do not let the conscious person drink too quickly. Give about 4 ounces of fluid every 15 minutes. Let the person rest in a comfortable position and watch carefully for changes in his or her condition. The person should not resume normal activities the same day.

If the person's condition does not improve or he or she refuses fluids, has a change in consciousness or vomits, call 9-1-1 or the local emergency number, as these are indications that the person's condition is getting worse.

Stop giving fluids and place the person on his or her side to keep the airway open. Watch for signals of breathing problems. Keep the person lying down and continue to cool the body any way you can (see What to Do Until Help Arrives).



FIGURE 6-3 When you recognize a heat-related illness, get the person out of the heat, loosen or remove clothing and apply cool, wet cloths, such as towels or sheets. Spraying the person with water and fanning also can be effective.

Heat Stroke

Heat stroke is the least common but most severe heat-related illness. It usually occurs when people ignore the signals of heat exhaustion. Heat stroke develops when the body systems are overwhelmed by heat and begin to stop functioning. Heat stroke is a serious medical emergency.

What to Look For

Signals of heat stroke include extremely high body temperature, red skin that can be either dry or moist; changes in consciousness; rapid, weak pulse; rapid, shallow breathing; confusion; vomiting; and seizures.

When to Call 9-1-1

Call 9-1-1 or the local emergency number immediately. Heat stroke is a life-threatening emergency.

What to Do Until Help Arrives

- Preferred method: Rapidly cool the body by immersing the person up to the neck in cold water, if possible.
OR
Douse or spray the person with cold water.
- Sponge the person with ice water-doused towels over the entire body, frequently rotating the cold, wet towels.
- Cover with bags of ice.
- If you are not able to measure and monitor the person's temperature, apply rapid cooling methods for 20 minutes or until the person's condition improves.
- Give care according for other conditions found.

Cold-Related Emergencies

Frostbite and *hypothermia* are two types of cold-related emergencies.

Frostbite

Frostbite is the freezing of body parts exposed to the cold. Severity depends on the air temperature, length of exposure and the wind. Frostbite can result in the loss of fingers, hands, arms, toes, feet and legs.

What to Look For

The signals of frostbite include lack of feeling in the affected area, swelling and skin that appears waxy, is cold to the touch or is discolored (flushed, white, yellow or blue). In more serious cases, blisters may form and the affected part may turn black and show signs of deep tissue damage.

When to Call 9-1-1

Call 9-1-1 or the local emergency number for more serious frostbite or seek emergency medical help as soon as possible.

What to Do Until Help Arrives

To care for frostbite, handle the area gently. Remove wet clothing and jewelry, if possible, from the affected area. Never rub a frostbitten area. Rubbing causes further damage to soft tissues. Do not attempt to rewarm the frostbitten area if there is a chance that it might refreeze or if you are close to a medical facility. For minor frostbite, rapidly rewarm the affected part using skin-to-skin contact such as with a warm hand.

To care for a more serious injury, gently soak it in water not warmer than about 105° F (Fig. 6-4, A). If you do not have a thermometer, test the water temperature yourself. If the temperature is uncomfortable to your touch, it is too warm. Keep the frostbitten part in the water until normal color returns and it feels warm (20 to 30 minutes). Loosely bandage the area with a dry, sterile dressing (Fig. 6-4, B). If fingers or toes are frostbitten, place cotton or gauze between them. Do not break any blisters. Take precautions to prevent hypothermia. Monitor the person's condition, and if you see that the person is going into shock, give care accordingly. Do not give ibuprofen or other nonsteroidal anti-inflammatory drugs (NSAIDs) when caring for frostbite.

Hypothermia

In a hypothermic condition, the entire body cools because its ability to keep warm is failing. The person will die if not given the proper care.

The air temperature does not have to be below freezing for people to develop hypothermia. This is especially true if the person is wet or if it is windy. Elderly people in poorly heated homes can develop hypothermia. The homeless, the ill and young children also are at risk.

Certain conditions can more easily lead to hypothermia, including:

- Ingestion of substances that interfere with the body's ability to regulate temperature (such as alcohol, other drugs and certain medications).
- Any medical condition that impairs circulation, such as diabetes or cardiovascular disease.
- Prolonged exposure to cold, wet and/or windy conditions or wet clothing.

What to Look For

Signals of hypothermia include the following:

- Shivering
- Numbness
- Glassy stare
- Indifference
- Loss of consciousness

Shivering that stops without rewarming is a sign that the person's condition is worsening. He or she needs immediate medical care.

When to Call 9-1-1

Call 9-1-1 or the local emergency number immediately for any case of hypothermia.



FIGURE 6-4, A-B To care for more serious frostbite: **A**, Warm the area gently by soaking the affected part in water not warmer than 105° F. Keep the frostbitten part in the water until normal color returns and it feels warm (20–30 minutes). **B**, Loosely bandage the area with a dry, sterile dressing.

What to Do Until Help Arrives

To care for hypothermia, start by caring for life-threatening conditions (see below). Make the person comfortable. Gently move the person to a warm place. Remove wet clothing and dry the person. Put on dry clothing. Warm the body *gradually* by wrapping the person in blankets and plastic sheeting to hold in body heat (Fig. 6-5). Also, keep the head covered to further retain body heat.

If you are far from medical care, position the person near a heat source or apply heat pads or other heat sources to the body, such as containers filled with warm water. Carefully monitor any heat source to avoid burning the person. Keep a barrier, such as a blanket, towel or clothing, between the heat source and the person.

If the person is alert, give warm liquids that do not contain alcohol or caffeine. Alcohol can cause heat loss and caffeine can cause dehydration. Do not warm the person too quickly, such as by immersing the person in warm water. Check breathing and monitor for any changes in the person's condition and care for shock.

In cases of *severe hypothermia*, the person may be unconscious. Breathing may have slowed or stopped. The body may feel stiff because the muscles became rigid. Check for breathing for no more than 10 seconds. If the person is not breathing, perform CPR. Continue to warm the person until emergency medical services (EMS) personnel take over. Be prepared to use an automated external defibrillator (AED), if available.



FIGURE 6-5 For hypothermia, warm the body gradually by wrapping the person in blankets or putting on dry clothing and moving him or her to a warm place. Courtesy of Canadian Red Cross.

Preventing Heat-Related Illnesses and Cold-Related Emergencies

In general, you can prevent illnesses caused by overexposure to extreme temperatures. To prevent heat-related illnesses and cold-related emergencies, follow these guidelines:

- Do not go outdoors during the hottest or coldest part of the day.
- Change your activity level according to the temperature.
- Take frequent breaks.
- Dress appropriately for the environment.
- Drink large amounts of fluids.

BITES AND STINGS

People are bitten and stung every day by insects, spiders, snakes, animals and marine life. Most of the time, these bites and stings do not cause serious problems. However, in rare circumstances, certain bites and stings can cause serious illness or even death in people who are sensitive to the venom.

Insect Stings

Most of the time, insect stings are harmless. If the person is allergic, an insect sting can lead to anaphylaxis, a life-threatening condition.

What to Look For

Signals of an insect sting include:

- Presence of a stinger.
- Pain.
- Swelling.
- Signals of an allergic reaction.

What to Do

If someone is stung by an insect:

- Remove any visible stinger. Scrape it away from the skin with a clean fingernail or a plastic card, such as a credit card, or use tweezers (Fig. 6-6). In the case of a bee sting, if you use tweezers, grasp the stinger, not the venom sac.
- Wash the site with soap and water.
- Cover the site and keep it clean.
- Apply a cold pack to the area to reduce pain and swelling.
- Call 9-1-1 if the person has any trouble breathing or for any other signals of anaphylaxis.

Tick-Borne Diseases

Humans can get very sick from the bite of an infected tick. Some of the diseases spread by ticks include Rocky Mountain spotted fever, *Babesia* infection, ehrlichiosis and Lyme disease.

LAYER YOUR WAY TO WARMTH

As long as seasonal changes and cold climates exist, preventing cold-related emergencies, such as hypothermia, remains important when we work or play outside.

The best way to ensure your comfort and warmth outdoors is to layer your clothing. The first layer, called the base layer, is next to your skin. The base layer helps to regulate your body temperature by moving perspiration away from your skin. This is important because if perspiration gets trapped inside your clothes, you can become chilled rapidly, which can lead to hypothermia.

Thermal underwear makes a good base layer for cold weather. The fabrics that are best at moving sweat away from the skin (also called wicking) are silk, merino wool and certain synthetics. Cotton is not a good choice because it traps moisture rather than wicking it away.

The job of the middle layer is insulation. This layer keeps you warm; it helps you retain heat by trapping air close to your body. Natural fibers, such as wool and goose down, are excellent insulators. So is synthetic fleece. Vests, jackets and

tights are examples of clothing that can be worn for insulation.

The shell or outer layer protects you from wind, rain or snow. For cold weather, the shell layer should be both waterproof and “breathable.” This will keep wind and water from getting inside of the other two layers while allowing perspiration to evaporate. The shell also should be roomy enough to fit easily over the other layers without restricting your movement.

One of the other advantages of layering is that you can make quick adjustments if the weather changes or you change your activity level. You can take clothes off when you become too warm and put them back on if you get cold.

In addition to layering your clothes, to stay warm in cold weather you also should wear:

- A hat.
- A scarf or knit mask that covers your face and mouth.
- Sleeves that are snug at the wrist.
- Mittens (they are warmer than gloves).
- Water-resistant boots.



FIGURE 6-6 If someone is stung by an insect, scrape the stinger away from the skin with a clean fingernail or a plastic card, such as a credit card.

Rocky Mountain Spotted Fever

Rocky Mountain spotted fever is a bacterial infection spread by wood ticks in the western United States, dog ticks in the eastern United States, and other ticks in the southern United States. Rocky Mountain spotted fever occurs mostly in the spring and summer, and most cases occur in children.

What to Look For

Signals of Rocky Mountain spotted fever usually appear between 2 and 14 days after a tick bite.

Initial signals of Rocky Mountain spotted fever include the following:

- Fever
- Nausea

- Vomiting
- Muscle aches or pain
- Lack of appetite
- Severe headache

Later signals include:

- Rash: The *spotted rash* usually starts a few days after fever develops. It first appears as small spots on the wrists and ankles. It then spreads to the rest of the body. However, about one-third of persons infected with the illness do not get a rash.
- Abdominal pain.
- Joint pain.
- Diarrhea.

When to Seek Medical Care

Call a health care provider if the person develops signals of Rocky Mountain spotted fever after a tick bite. The health care provider is likely to prescribe antibiotics. In most cases, the person will recover fully. If left untreated, complications of Rocky Mountain spotted fever can be life threatening.

Babesia Infection

Babesia also called *Babesiosis* is a protozoa infection spread by deer ticks and black-legged ticks. It is more common during warm months, and most cases happen in the northeast and upper Midwest regions of the United States.

What to Look For

Many people infected with *Babesia* have no apparent symptoms. Some people may have flu-like symptoms, such as:

- Fever
- Sweats
- Chills
- Body aches and headaches
- No appetite
- Nausea
- Fatigue

Others infected with *Babesia* develop a type of anemia that can cause jaundice and dark urine. In some people, the disease can be life threatening if untreated. The elderly and persons with no spleen, a weak immune system or a serious health condition are the most susceptible.

When to Seek Medical Care

If a person develops any of the signals described above, he or she should seek medical care. Most people with signals of the disease can be treated successfully with prescription medications.

Ehrlichiosis

Most cases of infection with the bacteria *ehrlichia* in humans are caused by bites by an infected Lone Star tick, and occur mainly in the southern, eastern and south-central United States.

What to Look For

Many people with ehrlichiosis do not become ill. Some develop only mild signals that are seen 5 to 10 days after an infected tick bit the person.

Initial signals include the following:

- Fever
- Headache
- Fatigue
- Muscle aches

Other signals that may develop include the following:

- Nausea
- Vomiting
- Diarrhea
- Cough
- Joint pains
- Confusion
- Rash (in some cases)

When to Seek Medical Care

If the person becomes ill with any of the above signals described, he or she should seek medical care. Ehrlichiosis is treated with antibiotics.

Lyme Disease

Lyme disease is spreading throughout the United States. Although it is most prevalent on the east coast and the upper Midwest, cases of Lyme disease have been reported in all 50 states.

Lyme disease is spread by the deer tick and black-legged tick, which attaches itself to field mice and deer. Deer ticks are tiny and difficult to see (Fig. 6-7). They are much smaller than the common dog tick or wood tick. They can be as small as a poppy seed or the head of a pin. Adult deer ticks are only as large as a grape seed. Because of the tick's tiny size, its bite usually is painless. Many people who develop Lyme disease cannot recall having been bitten.

The tick is found around branches and in wooded and grassy areas. Like all ticks, it attaches itself to any warm-blooded animal with which it comes into direct contact, including humans. Deer ticks are active any time the temperature is above about 45° F. However, most cases of infection happen between May and late August, when ticks are most active and



FIGURE 6-7 Deer ticks are tiny and difficult to see. © iStockphoto.com/Martin Pietak.

people spend more time outdoors. Recent studies indicate that the tick must remain embedded in human skin for about 36 to 48 hours to transmit the disease. More information on Lyme disease may be available from your local or state health department, the American Lyme Disease Foundation (aldf.com), or the Centers for Disease Control and Prevention (CDC) (cdc.gov/features/lymedisease/).

What to Look For

The first signal of infection may appear a few days or a few weeks after a tick bite. In 80 to 90 percent of all cases of Lyme disease, a rash starts as a small red area at the site of the bite. It may spread up to 7 inches across (Fig. 6-8). In fair-skinned people, the center may be a lighter color with the outer edges red and raised. This sometimes gives the rash a bull's-eye appearance. In some individuals, the rash may appear to be solid red. In dark-skinned people, the area may look black and blue, like a bruise. The rash may or may not be warm to the touch and usually is not itchy or painful. If a rash does appear, it will do so in about 1 to 2 weeks and may last for about 3 to 5 weeks. Some people with Lyme disease never develop a rash.

Other signals of Lyme disease include fever, headache, weakness, and joint and muscle pain. These signals are similar to signals of flu and can develop slowly. They might not occur at the same time as the rash.

Lyme disease can get worse if it is not treated. Signals can include severe fatigue; fever; a stiff, aching neck; tingling or numbness in the fingers and toes; and facial paralysis.

In its advanced stages Lyme disease may cause painful arthritis; numbness in the arms, hands or legs; severe headaches; long- or short-term memory loss; confusion; dizziness; and problems



FIGURE 6-8 A person with Lyme disease may develop a rash. © iStockphoto.com/Heike Kampe.

in seeing or hearing. Some of these signals could indicate problems with the brain or nervous system. Lyme disease may also cause heart problems such as an irregular or rapid heartbeat.

When to Seek Medical Care

If rash or flu-like signals develop, the person should seek medical care immediately. A health care provider usually will prescribe antibiotics to treat Lyme disease. Antibiotics work quickly and effectively if taken as soon as possible. Most people who get treated early make a full recovery. If you suspect Lyme disease, do not delay seeking treatment. Treatment time is longer and less effective when the person has been infected for a long period of time.

Preventing Tick-borne Diseases

Follow the guidelines presented in *Focus on Prevention: How to Beat Those Little Critters* in this chapter for general tips on how to prevent contact with, and bites from, ticks when you are in wooded or grassy areas.

To prevent tick-borne illnesses, always check for ticks immediately after outdoor activities. Most experts believe that the longer the tick stays attached to the skin, the greater the chances are of infection. Therefore, check for ticks at least once daily after having been outdoors. Quickly remove any ticks that you find before they become swollen with blood.

Wash all clothing. Be sure to check pets because they can carry ticks into the house, where they can then attach themselves to people or other pets. Pets also can develop signals of tick-borne diseases.

If you find a tick embedded in a person's skin, *it must be removed*. With a gloved hand, grasp the tick with fine-tipped and pointed tweezers that has a smooth inside

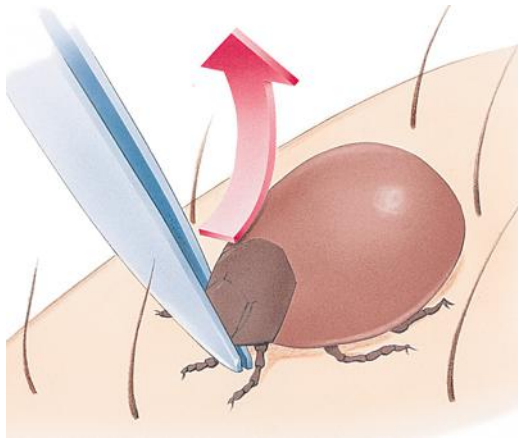


FIGURE 6-9 Remove a tick by pulling slowly, steadily and firmly with fine-tipped tweezers.

surface. Get as close to the skin as possible. Pull slowly, steadily and firmly with no twisting (Fig. 6-9).

- Do not try to burn off the tick.
- Do not apply petroleum jelly or nail polish to the tick.

Put the tick in a container or jar with rubbing alcohol to kill it. Clean the bite area with soap and water and an antiseptic. Apply an antibiotic ointment if it is available and the person has no known allergies or sensitivities to the medication. Encourage the person to seek medical advice because of the risk of contracting a tick-borne disease. If you cannot remove the tick, have the person seek advanced medical care.

Mosquito-Borne Illness: West Nile Virus

West Nile virus (WNV) is passed on to humans and other animals by mosquitoes that bite them after feeding on infected birds. Recently, WNV has been reported in some mild climate areas of North America and Europe.

WNV cannot be passed from one person to another. Also, no evidence supports that humans can acquire the disease by handling live or dead birds infected with WNV. However, it is still a good idea to use disposable gloves when handling an infected bird. Contact your local health department for instructions on reporting and disposing of the bird's body.

For most people, the risk of infection by WNV is very low. Less than 1 percent of people who are bitten by mosquitoes develop any signals of the disease. In addition, relatively few mosquitoes actually carry WNV. People who spend a lot of time outdoors are at a higher risk for catching the disease. Only about 1 in every 150 people who are infected with WNV will become seriously ill.

Preventing West Nile Virus

The easiest and best way to avoid WNV is to prevent mosquito bites. Specifically, you can:

- Use insect repellents containing DEET (N, N-diethyl-meta-toluamide) when you are outdoors. Follow the directions on the package (see *Focus on Prevention: Repelling Those Pests*).
- Consider staying indoors at dusk and dawn, when mosquitoes are most active. If you have to be outdoors during these times, use insect repellent and wear long sleeves and pants. Light-colored clothing can help you to see mosquitoes that land on you.
- Make sure you have good screens on your windows and doors to keep mosquitoes out.
- Get rid of mosquito breeding sites by emptying sources of standing water outside of the home, such as from flowerpots, buckets and barrels. Also, change the water in pet dishes and replace the water in bird baths weekly, drill drainage holes in tire swings so that water drains out and keep children's wading pools empty and on their sides when they are not being used.

For more information, visit cdc.gov/westnile or call the CDC public response hotline at (888) 246-2675 (English), (888) 246-2857 (Español) or (866) 874-2646 (TTY).

Source: CDC.gov and redcross.org

What to Look For

Most people infected with WNV have no signals. Approximately 20 percent develop mild signals, such as fever and aches, which pass on their own. The risk of severe disease is higher for people 50 years and older.

People typically develop signals of WNV between 3 and 14 days after an infected mosquito bites them. Signals of WNV include the following:

- High fever
- Headache
- Neck stiffness
- Confusion
- Coma
- Tremors
- Convulsions
- Muscle weakness
- Vision loss
- Numbness
- Paralysis

These signals may last several weeks. In some cases, WNV can cause fatal encephalitis, which is a swelling of the brain that leads to death.

HOW TO BEAT THOSE LITTLE CRITTERS

You can prevent bites and stings from insects, spiders, ticks or snakes by following these guidelines when you are in wooded or grassy areas:

- Wear long-sleeved shirts and long pants.
- Tuck your pant legs into your socks or boots.
- Use a rubber band or tape to hold pants against socks so that nothing can get under clothing.
- Tuck your shirt into your pants.
- Wear light-colored clothing to make it easier to see tiny insects or ticks.
- When hiking in woods and fields, stay in the middle of trails. Avoid underbrush and tall grass.
- If you are outdoors for a long time, check yourself several times during the day. Especially check in hairy areas of the body like the back of the neck and the scalp line.
- Inspect yourself carefully for insects or ticks after being outdoors or have someone else do it.
- Avoid walking in areas where snakes are known to live.
- If you encounter a snake, look around for others. Turn around and walk away on the same path on which you came.
- Wear sturdy hiking boots.
- If you have pets that go outdoors, spray them with repellent made for that type of pet. Apply the repellent according to the label and check your pet for ticks often.
- If you will be in a grassy or wooded area for a long time or if you know that the area is highly infested with insects or ticks, consider using a repellent. Follow the directions carefully.

When to Seek Care

If you develop signals of severe WNV illness, such as unusually severe headaches or confusion, seek medical attention immediately. Pregnant women and nursing mothers are encouraged to talk to their doctors if they develop signals that could indicate WNV. There is no specific treatment for WNV infection or a vaccine to prevent it. In more severe cases, people usually need to go to the hospital, where they will receive intravenous fluids, assistance with breathing and nursing care.

Spider Bites and Scorpion Stings

Few spiders in the United States can cause serious illness or death. However, the bites of the black widow and brown recluse spiders can, in rare cases, kill a person (Fig. 6-10, A–B). Another dangerous spider is the northwestern brown, or hobo, spider.

Widow spiders can be black, red or brown. The black widow spider is black with a reddish hourglass shape on the underside of its body and is the most venomous of the widow spiders. The brown recluse spider (also known as the violin or fiddleback spider) has a distinctive violin-shaped pattern on the back of its front body section.

These spiders prefer dark, out-of-the-way places. Examples of places where these spiders live include wood, rock and brush piles; dark garages; and attics. People often are bitten on their arms and hands when reaching into these places.

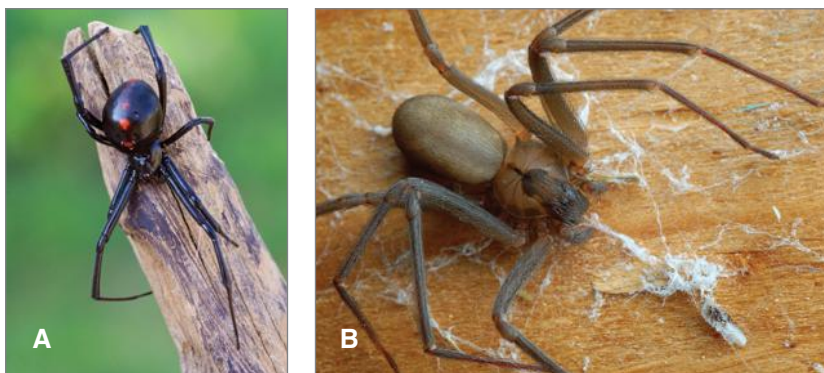


FIGURE 6-10, A–B Bites from **A**, the black widow spider and **B**, the brown recluse spider can make a person very sick. Fig. A © iStockphoto.com/Mark Kostich, Fig. B Image © Miles Boyer, 2010, Used under license from Shutterstock.com.

REPELLING THOSE PESTS

Insect repellent is used to keep away pests such as mosquitoes and ticks that sting and bite. DEET is the active ingredient in many insect repellents. Insect repellents that contain DEET are available in many different forms, including sprays, lotions and liquids. Using repellent with DEET is safe for most people. However, it is important to follow label directions and take proper precautions (see below).

The amount of DEET in insect repellents ranges from less than 10 percent to over 30 percent. The more DEET that a product contains, the longer it will protect from mosquito and tick bites. For example, an insect repellent containing about 24 percent DEET provides about 5 hours of protection.

Products with 10 percent DEET are as safe as products with 30 percent DEET when used properly. Precautions to follow when using products containing DEET include:

- *Apply products that contain DEET only once a day.*
- *Do not use DEET on infants under 2 months of age.*
- *Do not use a product that combines sunscreen with a DEET-containing insect repellent. Sunscreens wash off and need to be reapplied often. DEET does not wash off with water. Repeating applications may increase*

absorption of the chemical and cause possible toxic effects.

Before using insect repellent, check the label carefully for the list of ingredients. If you are unsure whether the product is safe for you and your family to use, ask your health care provider. Use caution when considering insect repellents to be used by pregnant women, infants and children.

If you use a repellent, follow these general rules:

- *Keep all repellents out of the reach of children.*
- *To apply repellent to the face, first spray it on your hands and then apply it from your hands to your face. Avoid sensitive areas, such as the lips and eyes.*
- *Never use repellents on an open wound or irritated skin.*
- *Use repellents sparingly. One application will last 4 to 8 hours. Heavier or more frequent applications do not increase effectiveness.*
- *If you suspect that you are having a reaction to a repellent, wash the treated skin immediately and call your health care provider.*
- *Never put repellents on children's hands. They may put them in their eyes or mouth.*

For current information about pesticides, contact the National Pesticide Information Center at npic.orst.edu or at (800) 858-7378.

Scorpions live in dry regions such as the southwestern United States and Mexico. They live under rocks, logs and the bark of certain trees (Fig. 6-11). They are most active at night. Like spiders, only a few species of scorpions have a sting that can cause death. It is difficult to distinguish highly poisonous scorpions from nonpoisonous scorpions. Therefore, *all* scorpion stings should be treated as medical emergencies.

What to Look For

Signals of spider bites depend on the amount of poison, called *venom*, injected and the person's sensitivity to the venom. Most spider bites heal with no adverse effects or scarring. Signals of venomous spider bites can seem identical to those of other conditions and therefore can be difficult to recognize. The only way



FIGURE 6-11 A scorpion. © iStockphoto.com/John Bell.

to be certain that a spider has bitten a person is to have witnessed it.

The bite of the black widow spider is the most painful and deadly of the widow spiders, especially in very young children and the elderly. The bite usually causes an immediate sharp pinprick pain, followed by a dull pain in the area of the bite. However, the person often does not know that he or she has been bitten until he or she starts to feel ill or notices a bite mark or swelling. Other signals of a black widow spider bite include:

- Rigid muscles in the shoulders, chest, back and abdomen.
- Restlessness.
- Anxiety.
- Dizziness.
- Headache.
- Excessive sweating.
- Weakness.
- Drooping or swelling of the eyelids.

The bite of the brown recluse spider may produce little or no pain initially. Pain in the area of the bite develops an hour or more later. A blood-filled blister forms under the surface of the skin, sometimes in a target or bull's-eye pattern. Over time, the blister increases in size and eventually ruptures, leading to tissue destruction and a black scab.

The hobo spider also can produce an open, slow-healing wound.

General signals of spider bites and scorpion stings may include:

- A mark indicating a possible bite or sting.
- Severe pain in the sting or bite area.
- A blister, lesion or swelling at the entry site.
- Nausea and vomiting.
- Stiff or painful joints.
- Chills or fever.
- Trouble breathing or swallowing or signs of anaphylaxis.
- Sweating or salivating profusely.
- Muscle aches or severe abdominal or back pain.
- Dizziness or fainting.
- Chest pain.
- Elevated heart rate.
- Infection at the site of the bite.

When to Call 9-1-1

Call 9-1-1 or the local emergency number immediately if you suspect that someone has been bitten by a black

widow spider or brown recluse spider, stung by a scorpion or if the person has any other life-threatening conditions.

What to Do Until Help Arrives

If the person has been bitten by a venomous spider or stung by a scorpion:

- Wash the wound thoroughly.
- Apply an antibiotic ointment, if the person has no known allergies or sensitivities to the medication, to prevent infection.
- Bandage the wound.
- Apply an ice or cold pack to the site to reduce pain and swelling.
- Encourage the person to seek medical attention. Children and older adults may need antivenin to block the effects of the spider's venom.
- If you transport the person to a medical facility, keep the bitten area elevated and as still as possible.

Venomous Snake Bites

Snakebites kill few people in the United States. Of the estimated 7000 people bitten annually, fewer than 5 die (Fig. 6-12, A–D). Most snakebites occur near the home, not in the wild. Rattlesnakes account for most snakebites, and most of the deaths from snakebites in the United States. Most deaths occur because the bitten person has an allergic reaction, is in poor health or because too much time passes before he or she receives medical care.

What to Look For

Signals of a possibly venomous snakebite include:

- A bite mark.
- Pain.
- Swelling.

When to Call 9-1-1

If the bite is from a venomous snake such as a rattlesnake, copperhead, cottonmouth or coral snake call 9-1-1 or the local emergency number immediately.

What to Do Until Help Arrives

To care for a venomous snake bite:

- Wash the wound.
- Apply an elastic (pressure immobilization) bandage to slow the spread of venom through the lymphatic system by following these steps:



FIGURE 6-12, A-D Venomous snakes found in the United States include **A**, rattlesnake (Image © Audrey Snider-Bell, 2010 Used under license from Shutterstock.com). **B**, copperhead (© iStockphoto.com/Jake Holmes), **C**, cottonmouth (Image © Leighton Photography & Imaging, 2010 Used under license from Shutterstock.com), and **D**, coral snake (© iStockphoto.com/Mark Kostich).

- Check for feeling, warmth and color of the limb and note changes in skin color and temperature.
- Place the end of the bandage against the skin and use overlapping turns.
- The wrap should cover a long body section, such as an arm or a calf, beginning at the point farthest from the heart. For a joint, such as the knee or ankle, use figure-eight turns to support the joint.
- Check above and below the injury for feeling, warmth and color, especially fingers and toes, after you have applied an elastic roller bandage. By checking before and after bandaging, you may be able to tell if any tingling or numbness is from the elastic bandage or the injury.
- Check the snugness of the bandaging—a finger should easily, but not loosely, pass under the bandage.
- Keep the injured area still and *lower* than the heart. The person should walk *only* if absolutely necessary.
- *Do not* apply ice.
- *Do not* cut the wound.
- *Do not* apply suction.

- *Do not* apply a tourniquet.
- *Do not* use electric shock, such as from a car battery.

Animal Bites

The bite of a domestic or wild animal can cause infection and soft tissue injury. The most serious possible result is rabies. Rabies is transmitted through the saliva of diseased animals such as skunks, bats, raccoons, cats, dogs, cattle and foxes.

Animals with rabies may act strangely. For example, those that are usually active at night may be active in the daytime. A wild animal that usually tries to avoid people might not run from you. Rabid animals may drool, appear to be partially paralyzed, or act aggressively or strangely quiet.

If not treated, rabies is fatal. Anyone bitten by an animal that might have rabies must get medical attention. Treatment for rabies includes a series of vaccine injections to build up immunity that will help fight the disease.

If an animal bites someone, try to get the person away from the animal without putting yourself in danger. Do not try to stop, hold or catch the animal. Do not touch a pet that may have come in contact with the animal's saliva without using or wearing some form of protection like disposable gloves.

What to Look For

Signals of an animal bite include:

- A bite mark.
- Bleeding.

When to Call 9-1-1

Call 9-1-1 or the local emergency number if the wound is bleeding seriously or you suspect the animal might have rabies.

If possible, try to remember the animal's appearance and where you last saw it. When you call 9-1-1 or the local emergency number, the call taker will direct the proper authorities, such as animal control, to the scene.

What to Do Until Help Arrives

To care for an animal bite:

- Control bleeding *first* if the wound is bleeding seriously.
- Do not clean serious wounds. The wound will be cleaned at a medical facility.
- If bleeding is minor, wash the wound with soap and water then irrigate with clean running tap water.

- Control any bleeding.
- Apply an antibiotic ointment to a minor wound, if the person has no known allergies or sensitivities to the medication, and cover the wound with a dressing.
- Watch for signals of infection.

Marine Life Stings

The stings of some forms of marine life are not only painful, but they can make you sick, and in some parts of the world, can kill you (Fig. 6-13, A–D). The side effects include allergic reactions that can cause breathing and heart problems, as well as paralysis and death. The lifeguards in your area should know the types of jellyfish that may be present.

What to Look For

Signals of marine life stings include:

- Possible puncture marks.
- Pain.
- Swelling.
- Signs of a possible allergic reaction.

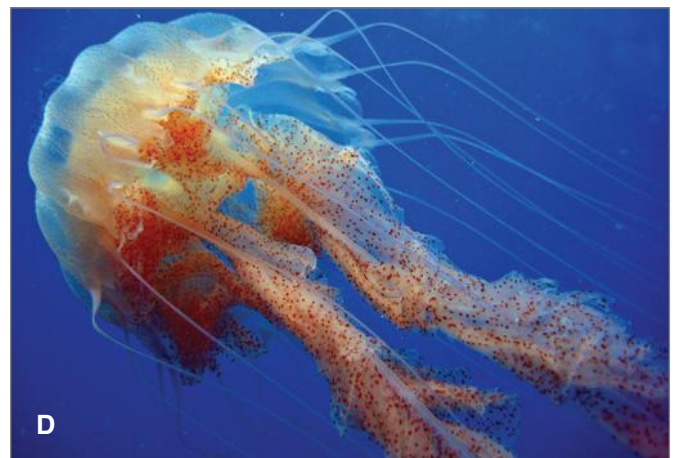


FIGURE 6-13, A–D The painful sting of some marine animals can cause serious problems: **A**, stingray (© iStockphoto.com/Dia Karanouh); **B**, Bluebottle jellyfish/Portuguese man-of-war (© iStockphoto.com/Mark Kostich); **C**, sea anemone (© iStockphoto.com/Omers); **D**, jellyfish (Image © Johan1900, 2010 Used under license from Shutterstock.com).

When to Call 9-1-1

Call 9-1-1 or the local emergency number if the person does not know what stung him or her, has a history of allergic reactions to marine-life stings, is stung on the face or neck, or starts to have trouble breathing.

What to Do Until Help Arrives

If you encounter someone who has a marine-life sting:

- Get a lifeguard to remove the person from the water as soon as possible. If a lifeguard is not available, use a reaching assist, if possible (see Chapter 1). Avoid touching the person with your bare hands, which could expose you to the stinging tentacles. Use gloves or a towel when removing any tentacles.
- If you know the sting is from a jellyfish, irrigate the injured part with large amounts of vinegar as soon as possible for at least 30 seconds. This can help to remove the tentacles and stop the injection of venom. Vinegar works best to offset the toxin, but a baking soda slurry also may be used if vinegar is not available.
- If the sting is known to be from a bluebottle jellyfish, also known as a Portugese man-of-war, use ocean water instead of vinegar. Vinegar triggers further envenomation.

- Do not rub the wound, apply a pressure immobilization bandage or apply fresh water or other remedies because this may increase pain.
- Once the stinging action is stopped and tentacles removed, care for pain by hot-water immersion. Have the person take a hot shower if possible for at least 20 minutes. The water temperature should be as hot as can be tolerated (non-scalding) or about 113° F if the temperature can be measured.
- If you know the sting is from a stingray, sea urchin or spiny fish, flush the wound with tap water. Ocean water also may be used. Keep the injured part still and soak the affected area in non-scalding hot water (as hot as the person can stand) for at least 20 minutes or until the pain goes away. If hot water is not available, packing the area in hot sand may have a similar effect if the sand is hot enough. Then carefully clean the wound and apply a bandage. Watch for signals of infection and check with a health care provider to determine if a tetanus shot is needed.

POISONOUS PLANTS

Every year, millions of people suffer after coming into contact with poisonous plants such as poison ivy, poison sumac and poison oak (Fig. 6-14, A–C).



FIGURE 6-14, A–C A, *poison ivy* (Image © Tim Mainiero, 2010 Used under license from Shutterstock.com); B, *poison sumac* (Courtesy of www.poison-ivy.org); C, *poison oak* (Image © Dwight Smith, 2010 Used under license from Shutterstock.com).

You often can avoid or limit the irritating effects of touching or brushing against poisonous plants by following these steps:

- Remove exposed clothing and wash the exposed area thoroughly with soap and water as soon as possible after contact.
- Wash clothing exposed to plant oils since the oils can linger on fabric. Wash your hands thoroughly after handling exposed clothing. Wash your hands after touching exposed pets.
- Put a paste of baking soda and water on the area several times a day if a rash or weeping sore begins to develop. Calamine lotion and antihistamines, such as Benadryl®, may help to dry up the sores.
- See a health care provider if the condition gets worse or involves areas of the face or throat that could affect breathing. He or she may decide to give anti-inflammatory drugs, such as corticosteroids or other medications, to relieve discomfort.

LIGHTNING

Every year, lightning causes more deaths in the United States than any other weather hazard, including blizzards, hurricanes, floods, tornadoes, earthquakes and volcanic eruptions. The National Weather Service (NWS) estimates that lightning kills nearly 100 people annually and injures about 300 others.

Lightning travels at speeds of up to 300 miles per second. Anything tall—a tower, tree or person—can become a path for the electrical current. A lightning strike can throw a person through the air, burn off clothes and cause the heart to stop beating. The most severe lightning strikes carry up to 50 million volts of electricity. This is enough electricity to light 13,000 homes. Lightning can “flash” over a person’s body or it can travel through blood vessels and nerves to reach the ground.

If a person survives a lightning strike, he or she may act confused. The person may describe the episode as getting hit on the head or hearing an explosion.

Prevent Lightning Injuries

What to do before a possible lightning storm:

- Pick campsites that meet safety precautions.
- Know local weather patterns, especially in summertime.
- Plan turnaround times (the amount of time you need to get back) in lightning-prone areas, based on your research, and stick to the plan.

During thunderstorms, use common sense to prevent being struck by lightning. If a thunderstorm threatens, the NWS advises people to:

- Postpone activities immediately, and not wait for rain to begin. Thunder and lightning can strike without rain.
- Watch cloud patterns and conditions for signs of an approaching storm.
- Designate safe locations and move or evacuate to a safe location at the first sound of thunder. Every 5 seconds between the flash of lightning and the sound of thunder equals 1 mile of distance.
- Where possible, quickly find shelter in a substantial building (not a carport, open garage or covered patio), or in a fully enclosed metal vehicle, such as a hardtop car (not a convertible), truck or van, with the windows completely shut.
- Use the *30-30 rule* where visibility is good and there is nothing obstructing your view of the thunderstorm. When you see lightning, count the time until you hear thunder. If that time is 30 seconds or less, the thunderstorm is within 6 miles. Seek shelter immediately. The threat of lightning continues for a much longer period than most people realize. Wait *at least 30 minutes* after the last clap of thunder before leaving shelter. If inside during a storm, keep away from windows. Injuries may occur from flying debris or glass if a window breaks.
- Stay away from plumbing, electrical equipment and wiring during a thunderstorm.
- Do *not* use a corded telephone or radio transmitter except for emergencies.
- If there is a tornado alert, go to the basement of the lowest interior level of a building.

In a lightning storm, reach safety by following these guidelines:

- Move downhill.
- Do not stay in a meadow or any other wide-open space.
- Seek uniform cover, such as low rolling hills or trees of about the same size.
- If you are boating or swimming, get to land and move away from the shore.
- Avoid all of the following:
 - Metal
 - Anything connected to electrical power
 - High places and high objects such as tall trees
 - Open places
 - Damp, shallow caves and tunnels
 - Overhangs
 - Flood zones



FIGURE 6-15 If lightning strikes and you cannot get inside, squat or sit in a tight body position, preferably on insulating material such as a sleeping pad or life jacket. Courtesy of the Canadian Red Cross.

- Places obviously struck by lightning in the past
- Long conductors, such as fences

If lightning is striking nearby when people are outside, they should assume a safe position:

- Squat or sit in a tight body position on insulating material such as a sleeping pad or a life jacket (Fig. 6-15).
- Take off any metal-framed packs and toss hiking poles away from the group.
- Do not lie down; instead, try to make as little contact with the ground as possible.
- If you feel your hair stand on end or your skin get tingly, cover your ears with your hands, close your eyes and get your head close to your knees.
- Avoid squatting or sitting close to other people. Maintain a minimum distance of at least 15 feet between people. Keep everyone in sight if possible.

Lightning Injuries

Lightning injuries are serious and can be fatal. Being struck by lightning can cause cardiac and pulmonary arrest, neurological problems, blindness, deafness, burns, bone fractures, loss of hearing, eyesight and trauma.

What to Look For

When checking a person struck by lightning, look the person over from head to toe in the front and back for any of the following signals:

- Unconsciousness
- Dazed, confused behavior
- Trouble breathing
- No breathing
- Burn marks on the skin or other open wounds
- Muscle, bone or joint injuries such as fractures or dislocations

When to Call 9-1-1

Call **9-1-1** immediately if a person is struck by lightning.

Even if the person seems to have recovered soon after the incident, advanced medical care still is necessary because serious problems can develop later.

What to Do Until Help Arrives

- Immediately perform CPR if needed.
- Give care for any injuries as needed including care for thermal burns.
- Be ready to care for other conditions, such as hypothermia in a wet, injured person.

PUTTING IT ALL TOGETHER

Outdoor activities in all kinds of weather are healthy and fun, but environmental emergencies can occur. Children and adults become seriously injured, and even die, from heat stroke, hypothermia, snakebites and lightning strikes.

The good news is that you can prevent environmental emergencies most of the time. Be prepared for all kinds of weather and situations before you head out to hike, swim, ski or camp. Know how to dress appropriately, what precautions to take and what to do if a situation becomes uncertain.

Even with excellent preparation, emergencies still happen. Know the signals—especially the early ones—of environmentally caused illnesses. This will allow you to make quick decisions for yourself or others. Quick decisions about when to call 9-1-1 and when to seek medical care can mean the difference between life and death in an environmental emergency!