

OSHA SAFETY GUIDELINES AND INFORMATION
SMU-IN-TAOS ARCHAEOLOGY FIELD SCHOOL

SAFETY IN THE FIELD AND LAB: GENERAL GUIDELINES FOR ARCHAEOLOGICAL PROJECTS

Archaeological field work can be a fun and educational adventure; however, there are several things that you may want to consider before going out on your first dig. Most field schools are held in remote locations- a situation that the majority of students are not familiar with. It is important that you enter into the field season with at least a little knowledge of the hazards you may encounter. The following information is intended to provide you with very general information. When you arrive at your field site, your field director will give a safety lecture about the site-specific hazards of your area; it is very likely that you will be introduced to hazards not discussed here. You might be required to prepare for the field by adding special equipment or safety gear to your field kit. As each field site is unique, it is important that you direct any questions you may have toward your field director.

What to expect in the field:

AT THE CAMPSITE

It is very likely that you will be camping in the same place for six weeks, creating a temporary community. You should expect that you will be partaking in rotational community chores such as cooking, cleaning, and camp maintenance. As should be assumed of any activity, camp chores come with their extensive lists of hazards to look out for. Limit your exposure to propane fumes if a propane stove or fridge is being used. Reduce your exposure and the exposure of others to contaminated food and illness by learning how to identify signs of bad food, raw or cooked, and by practicing good hygiene.

POTABLE WATER

It can not be stressed enough that you need to know the difference between the potable and non-potable water sources in your camping area. One mistake can result in multiple severe consequences, such as parasitic or bacterial infection. If in doubt, boil it.

TOILETS AND WASHING FACILITIES

It is very likely that you will be far away from any plumbing. It is necessary that you practice safe hygiene. Ask your field director what the availability of safe water will be. If necessary, pack a waterless skin cleanser and paper towels.

SPECIAL MEDICAL NEEDS

At camp, be mindful of any food allergies that you may have, and be sure to inform your field director of such allergies before the start of the field season. If you have any other allergy or a medical condition that requires special needs (ex. bee sting allergy) be sure to prepare for the worst of situations and inform your field director. If you do have certain allergies that require immediate assistance, it would be a good idea to prepare an individual first aid kit to carry with you in your field bag.

FIRES

Many field camp areas **do not** allow fires. It is extremely important that you respect and follow these rules. For those camp areas that do allow fires: If you are enjoying a campfire, or cooking over an open flame, be mindful of what you throw in it. Some trash may produce sparks that can grow out of control. Common sense: if it is not broken, don't try to fix it. Do not throw fuel into an already burning fire. To prevent fire, do not throw lighted coals in the trash. If you are a smoker, be conscious of your surroundings (brush, etc...),

be mindful of where you smoke and dispose of your cigarette butts appropriately. When you arrive on site, your field director will walk you through what to do in the event of a fire, and what other special precautions you can take in order to prevent a fire. If you have any questions whatsoever, please direct them to your field director.

FIELD LABORATORY

Most field schools will set up a field lab on site. It is important to know the hazards associated with this. Your field director will go over the specific safety hazards associated with all chemicals used or stored in your field lab, if any. Some things you can expect in the laboratory include sitting for an extensive period of time while analyzing, bagging, tagging, or cataloging artifacts. Be aware of ergonomic hazards (operator fatigue or discomfort) in order to reduce your chances of repetitive stress injury.

AT THE SITE

Each archaeological site is entirely unique, from what you will find to what kind of a setting it is in. Make sure that you read through all of the site-specific hazards to your particular area. These will be listed and explained in great detail in the Safe Work Practices for Field Personnel manual on site. Your field director will have tailored this manual specifically for your field school. Any questions regarding this manual or the information therein can be directed towards your field director.

EXCAVATION

It is highly recommended that you familiarize yourself with all precautions necessary to avoid injury during excavation. Your field director will provide instruction demonstrating the proper techniques and procedures involved in excavation. It is very important that you take notes and listen carefully. Excavating is one of the most dangerous activities. Be sure that you understand thoroughly the correct and incorrect ways to work in and around trenches and units and how to detect whether or not shoring or the use of a ladder is necessary. It is very important that you follow instruction completely and do not stray away from your task. Any little distraction could cause section or soil collapse and result in serious injury or even death. When back-filling, maintain a safe distance between yourself and machinery, and pay very close attention for yourself *and* all of those around you. Archaeological field work is a team effort. No one should ever work alone on an excavation! Again, if you have any questions or concerns regarding the work that you will be doing on this field school, please contact your field director.

TOOLS

All tools used in archaeological excavations can be very dangerous if not used correctly. You might be instructed to use large tools such as a mattock, pick-axe, shovel, or auger. If you are, be sure that you know how to use them correctly, how to detect and maintain a safe working area, and how to properly store them.

PERSONAL PROTECTIVE EQUIPMENT & TETANUS

If your crew is surveying, it is entirely possible that you might come across historic artifacts (including barbed wire and rusted cans). Try to avoid dangerous run-ins with tetanus (also referred to as "lockjaw") and make sure that you are up to date with your tetanus vaccines before going into the field. Other ways to prevent accidents are to bring personal protective equipment, such as sturdy leather work gloves and sturdy boots. You might even want to consider bringing protective safety goggles to protect eyes from chemicals, dust, or flying obsidian shards.

LIFTING AND CARRYING

Practice common sense while lifting and carrying. If a load is too heavy, ASK FOR HELP. If you are lifting something on your own, lift with your legs, not with your back. Also, be careful setting it down. It is very easy to trap or jam your hands, fingers, or feet under heavy loads. Take your time.

TRIPPING, SLIPPING, AND FALLING

While doing archaeological field work you will see that there is no such thing as a path that is free of obstacles. Pay very close attention to where you are stepping and what is in front of you. During excavation you will be around obstacles that are very difficult to see, such as grid strings, datum pegs, units (!), etc. Keep this in mind at all times. While surveying, you might have to do multiple tasks at a time. Navigating, looking for artifacts, and walking at the same time might sound like a breeze, but it is a lot more difficult than you may think. Pay attention at all times to where you are walking and where you step. That boulder you step around could have a trench on the other side, *or a rattlesnake den!* Don't rush, and use all of your senses.

CLIMATE, CLOTHING, & SKIN PROTECTION

It is important that you prepare for your field area accordingly. Find out if you will be working in 100+ degree heat or in the snow, *or* in both! Working in the heat triggers people to want to wear less. Tank tops, shorts, and flip flops do not make good field attire. By not covering your exposed skin, you are subjecting yourself to sunburn, cuts, bites, and more! The more you cover, the more you are protected, however, if you are working in an area that is going to be scorching, take advantage of those extra light fabrics, such as nylon or polyester fabric blends. These will keep you cool, will pull excessive moisture from your body, and will dry quickly. Though comfort is key, keep in mind that you are going in the field to work, and you will most likely return after six weeks unrecognizable and filthy. Old shirts and pants that you do not care that much about are great for the field.

It is also important to pack plenty of sun block with an appropriate SPF rating, even if you are working in the snow, a good pair of sunglasses with UV coating, & a wide-brim hat, to prevent from sunburn and sunstroke. Monsoons could also be an issue depending on where you will be. It is important to keep in mind that in any season, especially summer, the weather can change quickly at any time. Prepare yourself for any situation.

FIELD SURVEY

It is difficult to prepare for a situation that you are unfamiliar with. Field survey is a very involved activity requiring physical exertion and mental concentration. As we all know, it is hard for any human being to do multiple things at once, but at field school it is likely that you will learn how. It cannot be stressed enough, however, that you must remain attentive and aware of every hazard you may be subject to whether you are surveying across mountain ranges or surveying through trees. Read through your field school's Safe Work Practices for Field Personnel manual to learn more about individual hazards and the "to-do's and not-to-do's" if you encounter them.

GETTING LOST

It is likely that you will be using GPS units and walkie-talkies, but it is important to know that there are many factors that can interfere with the accuracy of your GPS or the range of your walkie-talkie. It can not be stressed enough that you must make certain that you understand how to react if you find yourself lost or away from the crew. 1. Learn how to use your compass. Your field director will walk you through this when you get to the field, but it might be helpful to read up on it before hand. If you are using a "Silva" type of compass, you can find plenty of information online at their website www.silvausa.com. 2. Familiarize yourself with the orientation of your surroundings (major roads, valleys, or ridges) right away. 3.

Do not wander off. If you do, even if you are wandering off to find a “restroom”, make sure that you notify someone of where you are going and make sure that you can find your way back on your own.

WILDLIFE

Do not antagonize wildlife. Most accidents with wildlife are due to lack of common sense. You will encounter wildlife in the field. If you see something, do not get closer to get a better look or photo op. Rattlesnakes, spiders, mountain lions, and scorpions are not patient and they *will* strike at you if they see that you are invading their space. Make sure you are aware of the potential hazards of your work area *before* you arrive to it.

HIGH-VISIBILITY CLOTHING

When packing, it is a good idea to ask whether or not you will be working in an area where hunting is allowed. If you are going to be working in such an area, hunters could be a hazard. Your field director will be able to tell you if you are going to be working in such locations. If so, it is a very good idea to pack at least one high-visibility article of clothing to inform those around you that you are not game.

FIRST AID

Before going out, be sure that you know which personnel have first aid experience. Your field director is CPR trained and certified. If the crew is using one main first aid kit, make sure that you know where it is, or which crew member is carrying it, at all times.

TRAVEL

Most field accidents occur in a vehicle. It is important to abide by all traffic laws. After a hard day out in the field, you can guarantee that everyone will not be as alert as they were after their first cup of instant coffee. When traveling to from the campsite, all vehicular laws must be followed. Use common sense and wear your seatbelt at all times.

IGNORANCE

Being shy or modest is incompatible with field work. ASK QUESTIONS if you do not know something or do not understand what to do or how to do it. You are responsible for your own safety and there will be many situations where you could be responsible for the safety of those around you. You will be in the field to learn. Do not be afraid to speak up.

REPORTING

All accidents must be reported! If you or any of your colleagues are involved in any type of accident, notify your field director at once. He or she will know what to do or how to look for help. The field is not the place to try to be a hero, leave first aid and CPR to those who are certified.

FURTHER INFORMATION

Again, you can expect that your field director will give a safety lecture, introducing the site-specific hazards in great detail, either before leaving for the field, or once you are on site. If you have any concerns or questions regarding ways in which you can prepare for a field season, please contact your field supervisor

PROTECTING YOURSELF FROM THE SUN

Sunlight contains ultraviolet (UV) radiation, which causes premature aging of the skin, wrinkles, cataracts, and skin cancer. The amount of damage from UV exposure depends on the strength of the light, the length of exposure, and whether the skin is protected. *There are no safe UV rays or safe suntans.*

Skin Cancer

Sun exposure at any age can cause skin cancer. Be especially careful in the sun if you burn easily, spend a lot of time outdoors, or have any of the following physical features:

- Numerous, irregular, or large moles.
- Freckles.
- Fair skin.
- Blond, red, or light brown hair.

Self-Examination

It's important to examine your body monthly because skin cancers detected early can almost always be cured. The most important warning sign is a spot on the skin that is changing in size, shape, or color during a period of 1 month to 1 or 2 years.

Skin cancers often take the following forms:

- Pale, wax-like, pearly nodules.
- Red, scaly, sharply outlined patches.
- Sores that don't heal.
- Small, mole-like growths - melanoma, the most serious type of skin cancer.

If you find such unusual skin changes, see a health care professional immediately.

Block Out UV Rays

- **Cover up.** Wear tightly-woven clothing that blocks out light. Try this test: Place your hand between a single layer of the clothing and a light source. If you can see your hand through the fabric, the garment offers little protection.
- **Use sunscreen.** A sun protection factor (SPF) of at least 15 blocks 93 percent of UV rays. You want to block both UVA and UVB rays to guard against skin cancer. Be sure to follow application directions on the bottle.
- **Wear a hat.** A wide brim hat (not a baseball cap) is ideal because it protects the neck, ears, eyes, forehead, nose, and scalp.
- **Wear UV-absorbent shades.** Sunglasses don't have to be expensive, but they should block 99 to 100 percent of UVA and UVB radiation.
- **Limit exposure.** UV rays are most intense between 10 a.m. and 4 p.m. If you're unsure about the sun's intensity, take the shadow test: If your shadow is shorter than you, the sun's rays are the day's strongest.

Preventing Skin Cancer

For more information about preventing, detecting, and treating skin cancer, check out these sources:

American Cancer Society
www.cancer.org 1-800-ACS-2345

Centers for Disease Control and Prevention
www.cdc.gov/ChooseYourCover 1-888-842-6355
The Skin Cancer Foundation
www.skincancer.org 1-800-SKIN-490

OSHA 3166-06R 2003

WORKING IN HOT ENVIRONMENTS

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service
Centers for Disease Control

National Institute for Occupational Safety and Health

INTRODUCTION

- From iron workers to pastry bakers, Americans work in a wide variety of hot or hot and humid environments:
 - Outdoor operations in hot weather, including surface mining, roofing, road repair and construction, dam building, and other construction
 - Farming operations
 - Iron, steel and nonferrous foundries
 - Brick-firing and ceramics operations
 - Glass products manufacturing plants
 - Rubber products manufacturing plants
 - Electrical utilities (particularly boiler rooms)
 - Bakeries
 - Confectioneries
 - Restaurant kitchens
 - Laundries
 - Food canneries
 -
 - Mines
 - Smelters
 - Steam tunnels
 - Being uncomfortable is not the major problem with working in high temperatures and humidities. Workers who are suddenly exposed to working in a hot environment face additional and generally avoidable hazards to their safety and health. The employer should provide detailed instructions on preventive measures and adequate protection necessary to prevent heat stress.
-
-

HOW THE BODY HANDLES HEAT

The human body, being warm blooded, maintains a fairly constant internal temperature, even though it is being exposed to varying environmental temperatures. To keep internal body temperatures within safe limits, the body must get rid of its excess heat, primarily through varying the rate and amount of blood circulation through the skin and the release of fluid onto the skin by the sweat glands. These automatic responses usually occur when the temperature of the blood exceeds 98.6°F and are kept in balance and controlled by the brain. In this process of lowering internal body temperature, the heart begins to pump more blood, blood vessels expand to accommodate the increased flow, and the microscopic blood vessels

(capillaries) which thread through the upper layers of the skin begin to fill with blood. The blood circulates closer to the surface of the skin, and the excess heat is lost to the cooler environment.

If heat loss from increased blood circulation through the skin is not adequate, the brain continues to sense overheating and signals the sweat glands in the skin to shed large quantities of sweat onto the skin surface. Evaporation of sweat cools the skin, eliminating large quantities of heat from the body.

As environmental temperatures approach normal skin temperature, cooling of the body becomes more difficult. If air temperature is as warm as or warmer than the skin, blood brought to the body surface cannot lose its heat. Under these conditions, the heart continues to pump blood to the body surface, the sweat glands pour liquids containing electrolytes onto the surface of the skin and the evaporation of the sweat becomes the principal effective means of maintaining a constant body temperature. Sweating does not cool the body unless the moisture is removed from the skin by evaporation. Under conditions of high humidity, the evaporation of sweat from the skin is decreased and the body's efforts to maintain an acceptable body temperature may be significantly impaired. These conditions adversely affect an individual's ability to work in the hot environment. With so much blood going to the external surface of the body, relatively less goes to the active muscles, the brain, and other internal organs; strength declines; and fatigue occurs sooner than it would otherwise. Alertness and mental capacity also may be affected. Workers who must perform delicate or detailed work may find their accuracy suffering, and others may find their comprehension and retention of information lowered.

SAFETY PROBLEMS

Certain safety problems are common to hot environments. Heat tends to promote accidents due to the slipperiness of sweaty palms, dizziness, or the fogging of safety glasses. Wherever there exists molten metal hot surfaces, steam, etc., the possibility of burns from accidental contact also exists.

Aside from these obvious dangers, the frequency of accidents, in general appears to be higher in hot environments than in more moderate environmental conditions. One reason is that working in a hot environment lowers the mental alertness and physical performance of an individual. Increased body temperature and physical discomfort promote irritability, anger, and other emotional states which sometimes cause workers to overlook safety procedures or to divert attention from hazardous tasks.

HEALTH PROBLEMS

Excessive exposure to a hot work environment can bring about a variety of heat-induced disorders.

Heat Stroke

Heat stroke is the most serious of health problems associated with working in hot environments. It occurs when the body's temperature regulatory system fails and sweating becomes inadequate. The body's only effective means of removing excess heat is compromised with little warning to the victim that a crisis stage has been reached.

A heat stroke victim's skin is hot, usually dry, red or spotted. Body temperature is usually 105°F or higher, and the victim is mentally confused, delirious, perhaps in convulsions, or unconscious. Unless the victim receives quick and appropriate treatment, death can occur.

Any person with signs or symptoms of heat stroke requires immediate hospitalization. However, first aid should be immediately administered. This includes removing the victim to a cool area, thoroughly soaking the clothing with water, and vigorously fanning the body to increase cooling. Further treatment at a medical facility should be directed to the continuation of the cooling process and the monitoring of complications which often accompany the heat stroke. Early recognition and treatment of heat stroke are the only means of preventing permanent brain damage or death.

Heat Exhaustion

Heat exhaustion includes several clinical disorders having symptoms which may resemble the early symptoms of heat stroke. Heat exhaustion is caused by the loss of large amounts of fluid by sweating, sometimes with excessive loss of salt. A worker suffering from heat exhaustion still sweats but experiences extreme weakness or fatigue, giddiness, nausea, or headache. In more serious cases, the victim may vomit or lose consciousness. The skin is clammy and moist, the complexion is pale or flushed, and the body temperature is normal or only slightly elevated.

In most cases, treatment involves having the victim rest in a cool place and drink plenty of liquids. Victims with mild cases of heat exhaustion usually recover spontaneously with this treatment. Those with severe cases may require extended care for several days. There are no known permanent effects.

CAUTION

Persons with heart problems or those on a low *sodium* diet who work in hot environments should consult a physician about what to do under these conditions.

Heat Cramps

Heat cramps are painful spasms of the muscles that occur among those who sweat profusely in heat, drink large quantities of water, but do not adequately replace the body's salt loss. The drinking of large quantities of water tends to dilute the body's fluids, while the body continues to lose salt. Shortly thereafter, the low salt level in the muscles causes painful cramps. The affected muscles may be part of the arms, legs, or abdomen, but tired muscles (those used in performing the work) are usually the ones most susceptible to cramps. Cramps may occur during or after work hours and may be relieved by taking salted liquids by mouth.

CAUTION

Persons with heart problems or those on a low *low sodium* diet who work in hot environments should consult a physician about what to do under these conditions.

Fainting

A worker who is not accustomed to hot environments and who stands erect and immobile in the heat may faint. With enlarged blood vessels in the skin and in the lower part of the body due to the body's attempts to control internal temperature, blood may pool there rather than return to the heart to be pumped to the brain. Upon lying down, the worker should soon recover. By moving around, and thereby preventing blood from pooling, the patient can prevent further fainting.

Heat Rash

Heat rash, also known as prickly heat, is likely to occur in hot, humid environments where sweat is not easily removed from the surface of the skin by evaporation and the skin remains wet most of the time. The sweat ducts become plugged, and a skin rash soon appears. When the rash is extensive or when it is complicated by infection, prickly heat can be very uncomfortable and may reduce a worker's performance. The worker can prevent this condition by resting in a cool place part of each day and by regularly bathing and drying the skin.

Transient Heat Fatigue

Transient heat fatigue refers to the temporary state of discomfort and mental or psychologic strain arising from prolonged heat exposure. Workers unaccustomed to the heat are particularly susceptible and can suffer, to varying degrees, a decline in task performance, coordination, alertness, and vigilance. The severity of transient heat fatigue will be lessened by a period of gradual adjustment to the hot environment (heat acclimatization).

PREPARING FOR THE HEAT

One of the best ways to reduce heat stress on workers is to minimize heat in the workplace. However, there are some work environments where heat production is difficult to control, such as when furnaces or sources of steam or water are present in the work area or when the workplace itself is outdoors and exposed to varying warm weather conditions.

Humans are, to a large extent, capable of adjusting to the heat. This adjustment to heat, under normal circumstances, usually takes about 5 to 7 days, during which time the body will undergo a series of changes that will make continued exposure to heat more endurable.

On the first day of work in a hot environment, the body temperature, pulse rate, and general discomfort will be higher. With each succeeding daily exposure, all of these responses will gradually decrease, while the sweat rate will increase. When the body becomes acclimated to the heat, the worker will find it possible to perform work with less strain and distress.

Gradual exposure to heat gives the body time to become accustomed to higher environmental temperatures. Heat disorders in general are more likely to occur among workers who have not been given time to adjust to working in the heat or among workers who have been away from hot environments and who have gotten accustomed to lower temperatures. Hot weather conditions of the summer are likely to affect the worker who is not acclimatized to heat. Likewise, workers who return to work after a leisurely vacation or extended illness may be affected by the heat in the work environment. Whenever such circumstances occur, the worker should be gradually reacclimatized to the hot environment.

LESSENING STRESSFUL CONDITIONS

Many industries have attempted to reduce the hazards of heat stress by introducing engineering controls, training workers in the recognition and prevention of heat stress, and implementing work-rest cycles. Heat stress depends, in part, on the amount of heat the worker's body produces while a job is being performed. The amount of heat produced during hard, steady work is much higher than that produced during intermittent or light work. Therefore, one way of reducing the potential for heat stress is to make the job easier or lessen its duration by providing adequate rest time. Mechanization of work procedures can often make it possible to isolate workers from the heat sources (perhaps in an air-conditioned booth) and increase overall productivity by decreasing the time needed for rest. Another approach to reducing the level of heat stress is the use of engineering controls which include ventilation and heat shielding.

Number and Duration of Exposures

Rather than be exposed to heat for extended periods of time during the course of a job, workers should, wherever possible, be permitted to distribute the workload evenly over the day and incorporate work-rest cycles. Work-rest cycles give the body an opportunity to get rid of excess heat, slow down the production of internal body heat, and provide greater blood flow to the skin.

Workers employed outdoors are especially subject to weather changes. A hot spell or a rise in humidity can create overly stressful conditions. The following practices can help to reduce heat stress:

- Postponement of nonessential tasks,
- Permit only those workers acclimatized to heat to perform the more strenuous tasks, or
- Provide additional workers to perform the tasks keeping in mind that all workers should have the physical capacity to perform the task and that they should be accustomed to the heat.

Thermal Conditions in the Workplace

A variety of engineering controls can be introduced to minimize exposure to heat. For instance, improving the insulation on a furnace wall can reduce its surface temperature and the temperature of the area around it. In a laundry room, exhaust hoods installed over those sources releasing moisture will lower the humidity in the work area. In general the simplest and least expensive methods of reducing heat and humidity can be accomplished by:

- Opening windows in hot work areas,
- Using fans, or
- Using other methods of creating airflow such as exhaust ventilation or air blowers.

Rest Areas

Providing cool rest areas in hot work environments considerably reduces the stress of working in those environments. There is no conclusive information available on the ideal temperature for a rest area. However, a rest area with a temperature near 76°F appears to be adequate and may even feel chilly to a hot, sweating worker, until acclimated to the cooler environment. The rest area should be as close to the workplace as possible. Individual work periods should not be lengthened in favor of prolonged rest periods. Shorter but frequent work-rest cycles are the greatest benefit to the worker.

Drinking Water

In the course of a day's work in the heat, a worker may produce as much as 2 to 3 gallons of sweat. Because so many heat disorders involve excessive dehydration of the body, it is essential that water intake during the workday be about equal to the amount of sweat produced. Most workers exposed to hot conditions drink less fluids than needed because of an insufficient thirst drive. A worker, therefore, should not depend on thirst to signal when and how much to drink. Instead, the worker should drink 5 to 7 ounces of fluids every 15 to 20 minutes to replenish the necessary fluids in the body. There is no optimum temperature of drinking water, but most people tend not to drink warm or very cold fluids as readily as they will cool ones. Whatever the temperature of the water, it must be palatable and readily available to the worker. Individual drinking cups should be provided—never use a common drinking cup.

Heat acclimatized workers lose much less salt in their sweat than do workers who are not adjusted to the heat. The average American diet contains sufficient salt for acclimatized workers even when sweat production is high. If, for some reason, salt replacement is required, the best way to compensate for the loss is to add a little extra salt to the food. Salt tablets *should not* be used.

CAUTION

Persons with heart problems or those on a low sodium diet who work in hot environments should consult a physician about what to do under these conditions.

Protective Clothing

Clothing inhibits the transfer of heat between the body and the surrounding environment. Therefore, in hot jobs where the air temperature is lower than skin temperature, wearing clothing reduces the body's ability to lose heat into the air.

When air temperature is higher than skin temperature, clothing helps to prevent the transfer of heat from the air to the body. However, this advantage may be nullified if the clothes interfere with the evaporation of sweat.

In dry climates, adequate evaporation of sweat is seldom a problem. In a dry work environment with very high air temperatures, protective clothing could be an advantage to the worker. The proper type of clothing depends on the specific circumstance. Certain work in hot environments may require insulated gloves, insulated suits, reflective clothing, or infrared reflecting face shields. For extremely hot conditions, thermally conditioned clothing is available. One such garment carries a self-contained air conditioner in a backpack, while another is connected a compressed air source which feeds cool air into the jacket or coveralls through a vortex tube. Another type of garment is a plastic jacket which has pockets that can be filled with dry ice or containers of ice.

AWARENESS IS IMPORTANT

The key to preventing excessive heat stress is educating the employer and worker on the hazards of working in heat and the benefits of implementing proper controls and work practices. The employer should establish a program designed to acclimatize workers who must be exposed to hot environments and provide necessary work-rest cycles and water to minimize heat stress.

SPECIAL CONSIDERATIONS DURING PROLONGED HEAT SPELLS

During unusually hot weather conditions lasting longer than 2 days, the number of heat illnesses usually increases. This is due to several factors, such as progressive body fluid deficit, loss of appetite (and possible salt deficit), buildup of heat in living and work areas, and breakdown of air-conditioning equipment. Therefore, it is advisable to make a special effort to adhere rigorously to the above preventive measures during these extended hot spells and to avoid any unnecessary or unusual stressful activity. Sufficient sleep and good nutrition are important for maintaining a high level of heat tolerance. Workers who may be at a greater risk of heat illnesses are the obese, the chronically ill, and older individuals.

When feasible, the most stressful tasks should be performed during the cooler parts of the day (early morning or at night). Double shifts and overtime should be avoided whenever possible. Rest periods should be extended to alleviate the increase in the body heat load.

The consumption of alcoholic beverages during prolonged periods of heat can cause additional dehydration. Persons taking certain medications (e.g., medications for blood pressure control, diuretics, or water pills) should consult their physicians in order to determine if any side effects could occur during excessive heat exposure. Daily fluid intake must be sufficient to prevent significant weight loss during the workday and over the workweek.

SOURCES OF ADDITIONAL INFORMATION

1. American Conference of Governmental Industrial Hygienists [1991]. TLVs. threshold limit values and biological exposure indices for 1985-86, Cincinnati OH: ACGIH pp. 91-98.
2. NIOSH [1986]. Criteria for a recommended standard . . . occupational exposure to hot environments - revised criteria. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, DHHS(NIOSH) Publication No. 86-113.
3. NIOSH [1976]. Standards for occupational exposures to hot environments—proceedings of symposium. Cincinnati, OH: U.S. Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health, HEW(NIOSH) Publication No. 76-100.
4. Westinghouse Electric Corporation [1986]. Heat stress management program for nuclear power plants. University Park, PA: Pennsylvania State University, GPU Nuclear Corporation.

ALL ABOUT HANTAVIRUSES

National Center for Infectious Diseases

General Information

For general interest readers, students, and others

Tracking a Mystery Disease: A Brief History of Hantavirus Pulmonary Syndrome

When did we first hear about hantavirus? What has happened since the first cases made national headlines? Learn about how researchers from many different institutions joined together to hunt down the source of the deadly illness.

How Is the Virus That Causes HPS Transmitted? The Rodent Connection

Rodents, particularly the deer mouse and cotton rat, are the ultimate source of the disease. Learn how people get the virus from them!

Who Is at Risk of Getting HPS, and Why?

Find out who gets the disease and why. What does being "at risk" mean?

What are the Symptoms of HPS?

What signs and symptoms are important to know? What symptoms aren't?

How Do I Prevent HPS?

Prevention is your best bet for dealing with HPS. That means keeping rodents out of homes and workplaces, keeping away from rodents when camping or hiking, and cleaning up safely if you do find rodents. Our prevention pages have complete tips and instructions for all kinds of people, and all kinds of problems and concerns.

Treating Hantavirus Pulmonary Syndrome

There is no miracle drug to cure HPS. Instead, patients should get immediate intensive care. What does this involve?

Tracking a Mystery Disease: The Detailed Story of Hantavirus Pulmonary Syndrome

The "First" Outbreak

In May 1993, an outbreak of an unexplained pulmonary illness occurred in the southwestern United States, in an area shared by Arizona, New Mexico, Colorado and Utah known as "The Four Corners." A young, physically fit Navajo man suffering from shortness of breath was rushed to a hospital in New Mexico and died very rapidly.

While reviewing the results of the case, medical personnel discovered that the young man's fiancée had died a few days before after showing similar symptoms, a piece of information that proved key to discovering the disease. As Dr. James Cheek of the Indian Health Service (IHS) noted, "I think if it hadn't been for that initial pair of people that became sick within a week of each other, we never would have discovered the illness at all."

An investigation combing the entire Four Corners region was launched by the New Mexico Office of Medical Investigations (OMI) to find any other people who had a similar case history. Within a few hours, Dr. Bruce Tempest of IHS, working with OMI, had located five young, healthy people who had all died after acute respiratory failure.

A series of laboratory tests had failed to identify any of the deaths as caused by a known disease, such as bubonic plague. At this point, the CDC Special Pathogens Branch was notified. CDC, the state health departments of New Mexico, Colorado and Utah, the Indian Health Service, the Navajo Nation, and the University of New Mexico all joined together to confront the outbreak.

During the next few weeks, as additional cases of the disease were reported in the Four Corners area, physicians and other scientific experts worked intensively to narrow down the list of possible causes. The particular mixture of symptoms and clinical findings pointed researchers away from possible causes, such as exposure to a herbicide or a new type of influenza, and toward some type of virus. Samples of tissue from patients who had gotten the disease were sent to CDC for exhaustive analysis. Virologists at CDC used several tests, including new methods to pinpoint virus genes at the molecular level, and were able to link the pulmonary syndrome with a virus, in particular a previously unknown type of hantavirus.

Researchers Launch Investigations to Pin Down the Carrier of the New Virus

Researchers knew that all other known hantaviruses were transmitted to people by rodents, such as mice and rats. Therefore, an important part of their mission was to trap as many different species of rodents living in the Four Corners region as possible to find the particular type of rodent that carried the virus. From June through mid-August of 1993, all types of rodents were trapped inside and outside homes where people who had hantavirus pulmonary syndrome had lived, as well as in piñon groves and summer sheep camps where they had worked. Additional rodents were trapped for comparison in and around nearby households as well. Taking a calculated risk, researchers decided not to wear protective clothing or masks during the trapping process. "We didn't want to go in wearing respirators, scaring...everybody," John Sarisky, an Indian Health Service environmental disease specialist said. However, when the almost 1,700 rodents trapped were dissected to prepare samples for analysis at CDC, protective clothing and respirators were worn.

Among rodents trapped, the deer mouse (*Peromyscus maniculatus*) was found to be the main host to a previously unknown type of hantavirus. Since the deer mouse often lives near people in rural and semi-rural areas—in barns and outbuildings, woodpiles, and inside people's homes—researchers suspected that the deer mouse might be transmitting the virus to humans. About 30% of the deer mice tested showed evidence of infection with hantavirus. Tests also showed that several other types of rodents were infected, although in lesser numbers.

The next step was to pin down the connection between the infected deer mice and households where people who had gotten the disease lived. Therefore, investigators launched a case-control investigation. They compared "case" households, where people who had gotten the disease lived, with nearby "control" households. Control households were similar to those where the case-patients lived, except for one factor: no one in the control households had gotten the disease.

The results? First, investigators trapped more rodents in case households than in control households, so more rodents may have been living in close contact with people in case households. Second, people in case households were more likely than those in control households to do cleaning around the house or to plant in or hand-plow soil outdoors in fields or gardens. However, it was unclear if the risk for contracting HPS was due to performing these tasks, or with entering closed-up rooms or closets to get tools needed for these tasks.

In November 1993, the specific hantavirus that caused the Four Corners outbreak was isolated. The Special Pathogens Branch at CDC used tissue from a deer mouse that had been trapped near the New Mexico home of a person who had gotten the disease and grew the virus from it in the laboratory. Shortly afterwards and independently, the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) also grew the virus, from a person in New Mexico who had gotten the disease as well as from a mouse trapped in California.

The new virus was called Muerto Canyon virus—later changed to Sin Nombre virus (SNV)—and the new disease caused by the virus was named hantavirus pulmonary syndrome, or HPS.

The isolation of the virus in a matter of months was remarkable. This success was based on close cooperation of all the agencies and individuals involved in investigating the outbreak, years of basic research on other hantaviruses that had been conducted at CDC and USAMRIID, and on the continuing development of modern molecular virologic tests. To put the rapid isolation of the Sin Nombre virus in perspective, it took several decades for the first hantavirus discovered, the Hantaan virus, to be isolated.

HPS Not Really a New Disease

As part of the effort to locate the source of the virus, researchers located and examined stored samples of lung tissue from people who had died of unexplained lung disease. Some of these samples showed evidence of previous infection with Sin Nombre virus—indicating that the disease had existed before the "first" known outbreak—it simply had not been recognized!

Other early cases of HPS have been discovered by examining samples of tissue belonging to people who had died of unexplained adult respiratory distress syndrome. By this method, the earliest known case of HPS that has been confirmed has been the case of a 38-year-old Utah man in 1959.

Interestingly, while HPS was not known to the epidemiologic and medical communities, there is evidence that it was recognized elsewhere. The Navajo Indians, a number of whom contracted HPS during the 1993 outbreak, recognize a similar disease in their medical traditions, and actually associate its occurrence with mice. As strikingly, Navajo medical beliefs concur with public health recommendations for preventing the disease.

Why Did the Outbreak Occur in the Four Corners Area?

But why this sudden cluster of cases? The key answer to this question is that, during this period, there were suddenly many more mice than usual. The Four Corners area had been in a drought for several years. Then, in early 1993, heavy snows and rainfall helped drought-stricken plants and animals to revive and grow in larger-than-usual numbers. The area's deer mice had plenty to eat, and as a result they reproduced so rapidly that there were ten times more mice in May 1993 than there had been in May of 1992. With so many mice, it was more likely that mice and humans would come into contact with one another, and thus more likely that the hantavirus carried by the mice would be transmitted to humans.

Person-to-Person Spread of HPS Decided Unlikely

"Although person-to-person spread [of HPS] has not been documented with any of the other known hantaviruses, we were concerned [during this outbreak] because we were dealing with a new agent," said Charles Vitek, a CDC medical investigator.

Researchers and clinicians investigating the ongoing outbreak were not the only groups concerned about the disease. Shortly after the first few HPS patients died and it became clear that a new disease was affecting people in the area, and that no one knew how it was transmitted, the news media began extensive reporting on the outbreak. Widespread concern among the public ensued.

Unfortunately, the first victims of the outbreak were Navajo. News reports focused on this fact, and the misperception grew that the unknown disease was somehow linked to Navajos. As a consequence, Navajos found themselves at the center of intense media attention and the objects of the some people's fears.

By later in the summer of 1993, the media frenzy had quieted somewhat, and the source of the disease was pinpointed. Researchers determined that, like other hantaviruses, the virus that causes HPS is not transmitted from person to person the way other infections, such as the common cold, may be.

To date, no cases of HPS have been reported in the United States in which the virus was transmitted from one person to another. In fact, in a study of health care workers who were exposed to either patients or specimens infected with related types of hantaviruses (which cause a different disease in humans), none of the workers showed evidence of infection or illness.

HPS Since the First Outbreak

After the initial outbreak, the medical community nationwide was asked to report any cases of illness with symptoms similar to those of HPS that could not be explained by any other cause. As a result, additional cases have been reported.

Since 1993, researchers have discovered that there is not just one hantavirus that causes HPS, but several. In June 1993, a Louisiana bridge inspector who had not traveled to the Four Corners area developed HPS. An investigation was begun. The patient's tissues were tested for the presence of antibodies to hantavirus. The results led to the discovery of another hantavirus, named Bayou virus, which was linked to a carrier, the rice rat (*Oryzomys palustris*). In late 1993, a 33-year-old Florida man came down with HPS symptoms; he later recovered. This person also had not traveled to the Four Corners area. A similar investigation revealed yet another hantavirus, named the Black Creek Canal virus, and its carrier, the cotton rat (*Sigmodon hispidus*). Another case occurred in New York. This time, the Sin Nombre-like virus was named New York-1, and the white-footed mouse, *Peromyscus leucopus*, was implicated as the carrier.

More recently, cases of HPS stemming from related hantaviruses have been documented in Argentina, Brazil, Canada, Chile, Paraguay, and Uruguay, making HPS a pan-hemispheric disease.

References

Information for this page was developed using the CDC video *Preventing Hantavirus Disease* and resource articles listed in the bibliography.

How Is Hantavirus Transmitted?

In the United States, deer mice (along with cotton rats and rice rats in the southeastern states and the white-footed mouse in the Northeast) carry hantaviruses that cause hantavirus pulmonary syndrome. Learn more about the rodent carriers of HPS.

Rodents shed the virus in their urine, droppings, and saliva. The virus is mainly transmitted to people when they breathe in air contaminated with the virus.

When fresh rodent urine, droppings or nesting materials are stirred up, tiny droplets containing the virus get into the air. This process is known as "aerosolization."

There are several other ways rodents may spread hantavirus to people:

- If a rodent with the virus bites someone, the virus may be spread to that person—but this type of transmission is rare.
- Researchers believe that people may be able to get the virus if they touch something that has been contaminated with rodent urine, droppings, or saliva, and then touch their nose or mouth.
- Researchers also suspect people can become sick if they eat food contaminated by urine, droppings, or saliva from an infected rodent.

Can You Get Hantavirus from Another Person?

The types of hantavirus that cause HPS in the United States cannot be transmitted from one person to another. For example, you cannot get the virus from touching or kissing a person who has HPS or from a health care worker who has treated someone with the disease. You also cannot get the virus from a blood transfusion in which the blood came from a person who became ill with HPS and survived.

Can You Get Hantavirus from Animals Other Than Rodents, or from Insects? What About Pets?

No—the hantaviruses that cause HPS in the United States are not known to be transmitted by any types of animals other than certain species of rodents. You cannot get hantavirus from farm animals, such as cows, chickens, or sheep, or from insects, such as mosquitoes. Dogs and cats are not known to carry hantavirus; however, they may bring infected rodents into contact with people if they catch such animals and carry them home. Guinea pigs, hamsters, gerbils, and rodents from pet stores are not known to carry hantavirus.

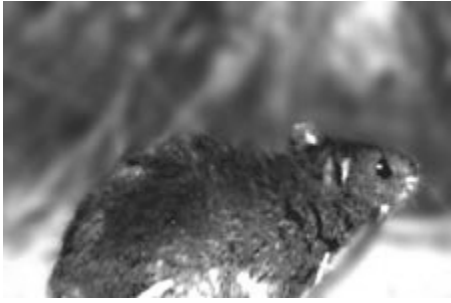
Here are the Rodents That Carry the Types of Hantavirus Which Cause HPS in the United States:



The Deer Mouse (*Peromyscus maniculatus*) is a deceptively cute animal, with big eyes and big ears. Its head and body are normally about 2 - 3 inches long, and the tail adds another 2 - 3 inches in length. You may see it in a variety of colors, from gray to reddish brown, depending on its age. The underbelly is always white and the tail has sharply defined white sides. The deer mouse is found almost everywhere in North America. Usually, the deer mouse likes woodlands, but also turns up in desert areas.



The Cotton Rat (*Sigmodon hispidus*), which you'll find in the southeastern United States (and way down into Central and South America), has a bigger body than the deer mouse—head and body about 5 - 7 inches, and another 3 - 4 inches for the tail. The hair is longer and coarser, of a grayish brown color, even grayish black. The cotton rat prefers overgrown areas with shrubs and tall grasses.



The Rice Rat (*Oryzomys palustris*) is slightly smaller than the cotton rat, having a head and body 5 - 6 inches long, plus a very long, 4- to 7-inch tail. Rice rats sport short, soft, grayish brown fur on top, and gray or tawny underbellies. Their feet are whitish. As you might expect from the name, this rat likes marshy areas and is semiaquatic. It's found in the southeastern United States and in Central America.



The White-footed Mouse (*Peromyscus leucopus*) is hard to distinguish from the deer mouse. The head and body together are about four inches long. Note that its tail is normally shorter than its body (about 2 - 4 inches long). Topside, its fur ranges from pale brown to reddish brown, while its underside and feet are white. The white-footed mouse is found through southern New England, the Mid-Atlantic and southern states, the midwestern and western states, and Mexico. It prefers wooded and brushy areas, although sometimes it will live in more open ground.

Both the deer mouse and the cotton rat usually live in rural areas, but can also be found in cities when conditions are right, such as easy availability of food, water and shelter. (Remember this point when it comes to "discouraging" rodents, which is discussed under "How Do I Prevent HPS").

Other Rodents May Also Carry Hantavirus

Other rodents carry strains of hantavirus that cause HPS, but they have not yet been identified. In addition, other rodent species may play host to other types of hantaviruses that cause a different type of infection, hemorrhagic fever with renal syndrome, or HFRS. See "hantavirus" for more information.

It is wise, therefore, to avoid close contact with rodents in general.

Transmission Details: So How Does "Aerosolization" Really Work?

For a hantavirus to cause HPS, the virus must travel from the rodents that carry it to a person. A common way this happens is when a person breathes in the hantavirus from the air.

Let's create an imaginary scenario and go through the process step by step. Say you have a storage room in your home that you hardly ever enter. You keep old furniture there, old newspapers and magazines, and so on. At some point, a group of deer mice find their way into the room, looking for places to build nests. They found their way into the room through a crack—deer mice can squeeze through holes as small as a shirt button! Some mice chew through the fabric of an old armchair and build a nest inside it. Other mice shred bits of magazines and build nests under the shredded pieces.

A few of these mice are infected with the hantavirus. The infected mice don't show any signs of being sick. In fact, the virus does not seem to make them ill at all; it simply lives in their bodies. However, the virus is shed continuously from them: into the droppings and urine they leave around the room, and into their saliva, which dries on anything they have chewed, such as nesting material. Out in the environment like this, the virus can live for several days.

Meanwhile, you decide to clean up your storage room. You go inside, spend a few minutes moving boxes and furniture. The mice hear you coming and scurry away, leaving a trail of fresh urine! Because you find mouse droppings and some of the furniture stuffing the mice have used as nesting material, you get a broom and sweep up the mess. As you move around and sweep, tiny particles of fresh urine, droppings and saliva, with the virus in them, get kicked up into the air. This is the aerosolization. It is these tiny particles that you breathe in—and this is the beginning of becoming sick with HPS.

Because the virus is spread when virus-containing particles are stirred up into the air, an essential HPS tactic in areas showing signs of rodents is to avoid actions that raise dust and to carefully wet the area down with disinfectant. The less chance the virus has to get into the air, the less chance it will be breathed in!

Who Is at Risk of Getting HPS, and Why?

Anyone who comes into contact with rodents that carry hantavirus is at risk of HPS. Rodent infestation in and around the home remains the primary risk for hantavirus exposure. Even healthy individuals are at risk for HPS infection if exposed to the virus.

What Kind of Activities Are Risky?

Any activity that puts you in contact with rodent droppings, urine, saliva, or nesting materials can place you at risk for infection. Hantavirus is spread when virus-containing particles from rodent urine, droppings, or saliva are stirred into the air. It is important to avoid actions that raise dust, such as sweeping or vacuuming. Infection occurs when you breathe in virus particles.

Opening and Cleaning Previously Unused Buildings

Opening or cleaning cabins, sheds, and outbuildings, including barns, garages and storage facilities, that have been closed during the winter is a potential risk for hantavirus infections, especially in rural settings.

Housecleaning Activities

Cleaning in and around your own home can put you at risk if rodents have made it their home too. Many homes can expect to shelter rodents, especially as the weather turns cold. Please see our prevention information on how to properly clean rodent-infested areas.

Work-related Exposure

Construction, utility and pest control workers can be exposed when they work in crawl spaces, under houses, or in vacant buildings that may have a rodent population.

Campers and Hikers

Campers and hikers can also be exposed when they use infested trail shelters or camp in other rodent habitats.

The chance of being exposed to hantavirus is greatest when people work, play, or live in closed spaces where rodents are actively living. However, recent research results show that many people who have become ill with HPS were infected with the disease after continued contact with rodents and/or their droppings. In addition, many people who have contracted HPS reported that they had not seen rodents or their droppings before becoming ill. Therefore, if you live in an area where the carrier rodents, such as the deer mouse, are known to live, take sensible precautions—even if you do not see rodents or their droppings.

What Are The Symptoms of HPS?

Early symptoms

Early symptoms include fatigue, fever and muscle aches, especially in the large muscle groups-thighs, hips, back, and sometimes shoulders. These symptoms are universal.

There may also be headaches, dizziness, chills, and abdominal problems, such as nausea, vomiting, diarrhea, and abdominal pain. About half of all HPS patients experience these symptoms.

Late symptoms

Four to 10 days after the initial phase of illness, the late symptoms of HPS appear. These include coughing and shortness of breath, with the sensation of, as one survivor put it, a "...tight band around my chest and a pillow over my face" as the lungs fill with fluid.

Uncommon symptoms

Earache, sore throat, runny nose, and rash are very uncommon symptoms of HPS.

How long after contracting the virus do symptoms appear?

Due to the small number of HPS cases, the "incubation time" is not positively known. However, on the basis of limited information, it appears that symptoms may develop between 1 and 5 weeks after exposure to urine, droppings, or saliva of infected rodents.

Another important point to remember from the data that the CDC Special Pathogens Branch keeps on all reported cases of HPS, is that it appears many people who have become ill were in a situation where they did not see rodents or rodent droppings. Other people have had frequent contact with rodents and their droppings before becoming ill. This apparent inconsistency makes it very difficult to pin down the precise time when the virus was transmitted.

How Do I Prevent HPS?

Eliminate or minimize contact with rodents in your home, workplace, or campsite. If rodents don't find that where you are is a good place for them to be, then you're less likely to come into contact with them. Seal up holes and gaps in your home or garage. Place traps in and around your home to decrease rodent infestation. Clean up any easy-to-get food.

Recent research results show that many people who became ill with HPS developed the disease after having been in frequent contact with rodents and/or their droppings around a home or a workplace. On the other hand, many people who became ill reported that they had not seen rodents or rodent droppings at all. Therefore, if you live in an area where the carrier rodents are known to live, try to keep your home, vacation place, workplace, or campsite clean.

Prevention Indoors and Outdoors

Indoors:

- Keep a clean home, especially kitchen (wash dishes, clean counters and floor, keep food covered in rodent-proof containers).
- Keep a tight-fitting lid on garbage, discard uneaten pet food at the end of the day.
- Set and keep spring-loaded rodent traps. Set traps near baseboards because rodents tend to run along walls and in tight spaces rather than out in the open.
- Set Environmental Protection Agency-approved rodenticide with bait under plywood or plastic shelter along baseboards. These are sometimes known as "covered bait stations." Remember to follow product use instructions carefully, since rodenticides are poisonous to pets and people, too.
- Seal all entry holes 1/4 inch wide or wider with lath screen or lath metal, cement, wire screening or other patching materials, inside and out.

If bubonic plague is a problem in your area, spray flea killer or spread flea powder in the area before setting traps. This is important. If you control rodents but do not control fleas as well, you may increase the risk of infection with bubonic plague, since fleas will leave rodents once the rodents die and will seek out other food sources, including humans.

Outdoors:

- Clear brush, grass and junk from around house foundations to eliminate a source of nesting materials.
- Use metal flashing around the base of wooden, earthen or adobe homes to provide a strong metal barrier. Install so that the flashing reaches 12 inches above the ground and six inches down into the ground.
- Elevate hay, woodpiles and garbage cans to eliminate possible nesting sites. If possible, locate them 100 feet or more from your house.
- Trap rodents outside, too. Poisons or rodenticides may be used as well, but be sure to keep them out of the reach of children or pets.
- Encourage the presence of natural predators, such as non-poisonous snakes, owls and hawks.
- Remember, getting rid of all rodents isn't feasible, but with ongoing effort you can keep the population very low.

Some Common Signs of Rodent Infestation

Remember that not all types of rodents carry hantavirus. Neither common house mice nor common rats have been associated with HPS in humans, for example. Yet because it can be tough to tell just what kind of rodents you have, play it safe – clean up the infestation and rodent-proof your home or workplace.

Here are some common signs that you may have a rodent problem.

Rodent Droppings

This is one of the most reliable signs that you have a rodent problem. You may find droppings in places where you store your food or your pet/animal food, such as in cupboards and drawers or in bins. Because mice like to run in places that offer them some protection from predators, you may find droppings in cupboards or under the sink, along walls, or on top of wall studs or beams. Mice will leave droppings near

their nests as well (see below). Storage rooms, sheds, barns, or cabins loaded with boxes, bags, old furniture, and other objects make an ideal home for rodents, so you may find droppings there, even inside boxes and other containers.

Workplaces can also make good rodent homes. Warehouses, restaurants, and the like are obvious places to look because food may be plentiful there. However, rodents can infest office buildings, too. Once again, look for droppings in protected places, such as closets, storage rooms, or inside boxes.

Signs of Rodent Nests

Rodents tend to build their nests from materials that are soft, fuzzy, or warm. Among common rodent nest materials are shredded paper, bunches of dry grass or small twigs, fabric, and furniture stuffing. Rodents will nest wherever safety from enemies can be found close enough to food and water, and they prefer places that are relatively quiet. Inside buildings, here are some places to look:

- inside cabinets
- under or inside dressers
- in and among boxes
- behind and inside machinery and appliances (kitchen appliances such as stoves or refrigerator drip pans; water coolers; and electric motor cases or computer cases)
- inside upholstered furniture
- inside double walls or the space between floors and ceilings.

Food Boxes, Containers, or Food Itself That Appears To Be Nibbled

Look for droppings nearby. Rodents can chew through plastic, so plastic bags do not make safe food storage containers.

Signs of Rodent "Feeding Stations"

These are semi-hidden spots where rodents eat food they have collected. At these stations, rodents may leave larger-than-normal amounts of droppings/urine, plus remnants of a variety of foods (such as nut shells), bits of plastic or paper, and cockroach carcasses.

You Find Evidence of Gnawing

To get to food, rodents will gnaw on almost anything that is softer than the enamel of their teeth. This includes such things as wood, paper board, cloth sacks, and materials even harder than these. Because rodents' teeth grow continuously, they must gnaw to keep them short. That may help to explain why chair legs or similar surfaces show gnawed spots or tooth marks in rodent-infested places.

You Notice an Odd, Stale Smell

In closed-up rooms infested by rodents, you will commonly smell an unusual, musky odor.

You See a Mouse in Your House

Rodents are normally active at night, and generally avoid humans. If you have rodents, unless the infestation is large, you may never see one.

Clean Up Infested Areas, Using Safety Precautions:

Put on latex rubber gloves before cleaning up.

Do not stir up dust by sweeping up or vacuuming up droppings, urine or nesting materials.

Instead, thoroughly wet contaminated areas with detergent or liquid to deactivate the virus. Most general purpose disinfectants and household detergents are effective. However, a hypochlorite solution prepared by mixing 1 and 1/2 cups of household bleach in 1 gallon of water may be used in place of commercial disinfectant. When using the chlorine solution, avoid spilling the mixture on clothing or other items that may be damaged.

Once everything is wet, take up contaminated materials with a damp towel, then mop or sponge the area with disinfectant.

Spray dead rodents with disinfectant, then double-bag along with all cleaning materials and bury or burn—or throw out in appropriate waste disposal system. If burning or burying isn't feasible, contact your local or state health department about other disposal methods.

Finally, disinfect gloves *before taking them off* with disinfectant or soap and water. After taking off the clean gloves, thoroughly wash hands with soap and warm water.

When going into cabins or outbuildings (or work areas) that have been closed for awhile, open them up and air out before cleaning.

Hantaviruses and Disinfectants

Hantaviruses are surrounded by a lipid (fatty) envelope, so they are somewhat fragile. The lipid envelope can be destroyed and the virus killed by fat solvents, such as alcohol, ordinary disinfectants and household bleach. That is why one of the most important ways to prevent transmitting the disease is to carefully wet down dead rodents and areas where rodents have been with disinfectant and/or bleach. When you do this, you are killing the virus itself and reducing the chance that the virus will get into the air.

Strength and Quantity of Hypochlorite Solutions (Bleach)

Special Pathogens Branch recommends a 10% bleach solution be used to inactivate hantaviruses.

Special Precautions for Homes of Persons with Confirmed Hantavirus Infection or Buildings with Heavy Rodent Infestations

Special precautions should be used for cleaning homes or buildings with heavy rodent infestations in areas where HPS has been reported. If you are attempting to deal with such an infestation, it is recommended that you contact the responsible local, state, or federal public health agency for guidance.

The special precautions may also apply to vacant dwellings that have attracted numbers of rodents while unoccupied and to dwellings and other structures that have been occupied by persons with confirmed hantavirus infection.

Workers who are either hired specifically to perform the clean-up or asked to do so as part of their work activities should receive a thorough orientation from the responsible health agency about hantavirus transmission and should be trained to perform the required activities safely.

Precautions To Be Used:

- Persons involved in the clean-up should wear coveralls (disposable, if possible), rubber boots or disposable shoe covers, rubber or plastic gloves, protective goggles, and an appropriate respiratory protection device, such as a half-mask air-purifying (or negative-pressure) respirator with a high-efficiency particulate air (HEPA) filter or a powered air-purifying respirator (PAPR) with HEPA filters.

Please note: the HEPA classification recently has been discontinued. Please read "Update On the Nomenclature and Use of Respirators as a Precaution for Hantavirus Infection, February, 1999" for details.

- Personal protective gear should be decontaminated upon removal at the end of the day. If the coveralls are not disposable, they should be laundered on site. If no laundry facilities are available, the coveralls should be immersed in liquid disinfectant until they can be washed.
- All potentially infective waste material (including respirator filters) from clean-up operations that cannot be burned or deep buried on site should be double bagged in appropriate plastic bags. The bagged material should then be labeled as infectious (if it is to be transported) and disposed of in accordance with local requirements for infectious waste.
- Workers who develop symptoms suggestive of HPS within 45 days of the last potential exposure should immediately seek medical attention. The physician should contact local health authorities promptly if hantavirus-associated illness is suspected. A blood sample should be obtained and forwarded with the baseline serum through the state health department to CDC for hantavirus antibody testing.

Precautions for Workers in Affected Areas Who are Regularly Exposed to Rodents

Persons who frequently handle or are exposed to rodents (e.g., mammalogists, pest-control workers) in the affected area are probably at higher risk for hantavirus infection than the general public because of their frequency of exposure. Therefore, enhanced precautions are warranted to protect them against hantavirus infection.

Precautions To Be Used:

- Workers in potentially high-risk settings should be informed about the symptoms of the disease and be given detailed guidance on prevention measures.
- Workers who develop a febrile or respiratory illness within 45 days of the last potential exposure should immediately seek medical attention and inform the attending physician of the potential occupational risk of hantavirus infection. The physician should contact local health authorities promptly if hantavirus-associated illness is suspected. A blood sample should be obtained and forwarded with the baseline serum through the state health department to CDC for hantavirus antibody testing.
- Workers should wear a half-face air-purifying (or negative-pressure) respirator or PAPR equipped with HEPA filters when removing rodents from traps or handling rodents in the affected area. (Please note: the HEPA classification recently has been discontinued. Under the new classification system, the N-100 filter type is recommended. Read the Federal Occupational Safety and Health Administration (OSHA) directive online, at "OSHA Directives: CPL 2-0.120 - Inspection procedures for the Respiratory Protection Standard".), at http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=DIRECTIVES&p_id=2275

- Respirators (including positive-pressure types) are not considered protective if facial hair interferes with the face seal, since proper fit cannot be assured. Respirator use practices should be in accord with a comprehensive user program and should be supervised by a knowledgeable person.
- Workers should wear rubber or plastic gloves when handling rodents or handling traps containing rodents. Gloves should be washed and disinfected before removing them, as described above.
- Traps contaminated by rodent urine or feces or in which a rodent was captured should be disinfected with a commercial disinfectant or bleach solution. Dispose of dead rodents as described in the section on Eliminating Rodents inside the Home.
- Persons removing organs or obtaining blood from rodents in affected areas should contact the Special Pathogens Branch, Division of Viral and Rickettsial Diseases, National Center for Infectious Diseases, Centers for Disease Control and Prevention, [telephone (404) 639-1115] for detailed safety precautions.

Precautions for Other Occupational Groups Who Have Potential Rodent Contact

Insufficient information is available at this time to allow general recommendations regarding risks or precautions for persons in the affected areas who work in occupations with unpredictable or incidental contact with rodents or their habitations. Examples of such occupations include telephone installers, maintenance workers, plumbers, electricians, and certain construction workers. Workers in these jobs may have to enter various buildings, crawl spaces, or other sites that may be rodent infested. Recommendations for such circumstances must be made on a case-by-case basis after the specific working environment has been assessed and state or local health departments have been consulted.

Precautions for Campers and Hikers in the Affected Areas

There is no evidence to suggest that travel into areas where HPS has been reported should be restricted. Most usual tourist activities pose little or no risk that travelers will be exposed to rodents or their urine and/or droppings.

However, persons who do outdoor activities such as camping or hiking in areas where the disease has been reported should take precautions to reduce the likelihood of their exposure to potentially infectious materials.

Useful Precautions:

- Avoid coming into contact with rodents and rodent burrows or disturbing dens (such as pack rat nests).
- Air out, then disinfect cabins or shelters before using them. These places often shelter rodents.
- Do not pitch tents or place sleeping bags in areas in proximity to rodent droppings or burrows or near areas that may shelter rodents or provide food for them (e.g., garbage dumps or woodpiles).
- If possible, do not sleep on the bare ground. In shelters, use a cot with the sleeping surface at least 12 inches above the ground. Use tents with floors or a ground cloth if sleeping in the open air.
- Keep food in rodent-proof containers!
- Promptly bury (or—preferably—burn followed by burying, when in accordance with local requirements) all garbage and trash, or discard in covered trash containers.
- Use only bottled water or water that has been disinfected by filtration, boiling, chlorination, or iodination for drinking, cooking, washing dishes, and brushing teeth.
- And last but not least, do not play with or handle any rodents that show up at the camping or hiking site, even if they appear friendly.

Update On the Nomenclature and Use of Respirators as a Precaution for Hantavirus Infection
February, 1999

The CDC **Interim Recommendations for Risk Reduction for Hantavirus Infection**(1) describe precautions for persons who are involved in the cleanup of homes of confirmed cases of hantavirus infection or of areas with heavy rodent infestation and for workers in affected areas who are regularly exposed to rodents. Among these precautions is the wearing of one of the following types of respirators(2) equipped with a high-efficiency particulate air (HEPA) filter:



b) powered air-purifying respirator (PAPR)

Recent changes in the nomenclature and certification of the type of filters used in these respirators include the **discontinuation of the HEPA designation** and the designation of new classes of filters. As shown on the chart below, the N-100 (99.97) is equivalent to the previous HEPA filter.

Use of an N-100 filter should provide the same protection as the HEPA filter. Due to the nature of the virus, no studies have been able to test the efficacy of either the HEPA or N-100 filters in protecting against HPS transmission. Available evidence suggests that HPS is transmitted by inspiring small (less than 5 micron) viral particles in aerosols which the N-100 is the most effective in removing.

Cautions: As described in CDC **Interim Recommendations for Risk Reduction for Hantavirus Infection**, all negative-pressure respirators are fit-dependent. Anything that interferes with the respirator's face seal, such as facial hair, will allow ambient air to bypass the filter medium in the respirator(3). Ideally, users should be fit-tested with the same make, model, style, and size of respirator that will be actually used. Respirator practices should follow a comprehensive user program and be supervised by a knowledgeable person.

New Classes of Filters for Respiratory Protection Devices(4)

<i>New classes of filters ††</i>			<i>Characteristics</i>
		Equivalent to HEPA	
N-95	N-99	N-100 (99.97)	Not resistant to oil
R-95	R-99	R-100 (99.97)	Resistant to oil
P-95	P-99	P-100 (99.97)	Oil Proof

†† number indicates % efficiency in removing monodispersed particles 0.3 micrometers in diameter.

Authority for testing and certifying these respirators has been given exclusively to NIOSH. For additional information:

- contact the Industrial Hygiene Section, Office of Health & Safety, CDC at 404 639-3112.
- Read the NIOSH directive online, at "OSHA Directives: CPL 2-0.120 - Inspection procedures for the Respiratory Protection Standard", at http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=DIRECTIVES&p_id=2275

(1) *MMWR* Recommendations and Reports, July 30, 1993; 42 [RR-11]: 1-13)

(2) All of these respirators can be purchased from commercial suppliers of laboratory safety equipment. The items displayed here are intended to show the general design of the respirator and do not constitute endorsement of any particular brand of respirator.

(3) *MMWR* 47(40): 1045-1049, demonstrates importance of fit testing for all negative-pressure respirators.

(4) As described in NIOSH 42, CFR 84.

What Is the Treatment for HPS?

At the present time, there is no specific treatment or "cure" for hantavirus infection. However, we do know that if the infected individuals are recognized early and are taken to an intensive care unit, some patients may do better. In intensive care, patients are intubated and given oxygen therapy to help them through the period of severe respiratory distress.

The earlier the patient is brought in to intensive care, the better. If a patient is experiencing full distress, it is less likely the treatment will be effective.

Therefore, if you have been around rodents and have symptoms of fever, deep muscle aches and severe shortness of breath, see your doctor *immediately*. Be sure to tell your doctor that you have been around rodents—this will alert your physician to look closely for any rodent-carried disease such as HPS.

This page last reviewed Thursday, April 28, 2005

Infectious Disease Pathology Activity
Division of Viral and Rickettsial Diseases
National Center for Infectious Diseases
Centers for Disease Control and Prevention
U.S. Department of Health and Human Services



BUBONIC PLAGUE

Plague, is caused by bacteria called *Yersinia pestis*. Onset of plague is usually 2 to 6 days after a person is exposed. Initial symptoms include fever, headache, and general illness, followed by the development of painful, swollen regional lymph nodes. The disease progresses rapidly and the bacteria can invade the bloodstream, producing severe illness, called plague septicemia. Once a human is infected, a progressive illness generally results unless specific antibiotic therapy is given. Progression leads to blood infection and, finally, to lung infection. The infection of the lung is termed plague pneumonia, and it can be transmitted to others through the expulsion of droplets by coughing. The incubation period of primary pneumonic plague is 1 to 3 days and is characterized by development of an overwhelming pneumonia with high fever, cough, bloody sputum, and chills. For plague pneumonia patients, the death rate is over 50%.

Geographic Distribution of Plague

In the United States, most of the human plague cases occur in two regions:

- Northern New Mexico, northern Arizona, and southern Colorado.
- California, southern Oregon, and far western Nevada.

How Is Plague Transmitted?

Plague is transmitted from animal to animal and from animal to human by the bites of infective fleas. Less frequently, the organism enters through a break in the skin by direct contact with tissue or body fluids of a plague-infected animal, for instance, in the process of skinning a rabbit or other infected animal. Plague is also transmitted by inhaling infected droplets expelled by coughing, by a person or animal, especially domestic cats, with pneumonic plague. Transmission of plague from person to person is uncommon and has not been observed in the United States since 1924 but does occur as an important factor in plague epidemics in some developing countries.

Human plague cases in the U.S. have been sporadic cases acquired from wild rodents or their fleas. Rock squirrels and their fleas are the most frequent sources of human infection in the southwestern states. For the Pacific states, the California ground squirrel and its fleas are the most common source. Many other rodent species, for instance, prairie dogs, wood rats, chipmunks, and other ground squirrels and their fleas, suffer plague outbreaks and some of these occasionally serve as sources of human infection. Deer mice and voles are thought to maintain the disease in animal populations but are less important as sources of human infection. Other less frequent sources of infection include wild rabbits, wild carnivores, and even antelopes, which pick up their infections from wild rodent outbreaks. Domestic cats (and sometimes dogs) are readily infected by fleas or from eating infected wild rodents. Cats may serve as a source of infection to persons exposed to them. Pets may also bring plague-infected fleas into the home. Between outbreaks, the plague bacterium is believed to circulate within populations of certain species of rodents without causing excessive mortality. Such groups of infected animals serve as silent, long-term reservoirs of infection.

Prevention

Plague will probably continue to exist in its many localized geographic areas in the southwest since attempts to eliminate wild rodent plague are impractical and futile. Therefore, primary preventive measures are directed toward reducing the threat of infection in humans in high risk areas through three techniques:

- Environmental management
- Public health education
- Preventive drug therapy

Environmental Management

Preventing epidemic plague requires the reducing or eliminating house rat populations in both urban and rural areas.

Control of plague in such situations requires two things:

- Close surveillance for human plague cases, and for plague in rodents.
- Use of an effective insecticide to control rodent fleas when human plague cases and rodent outbreaks occur.

Public Health Education

In regions such as the American West where plague is widespread in wild rodents, the greatest threat is to people living, working, or playing in areas where the infection is active. Public health education of citizens and the medical community should include information on the following plague prevention measures:

- Eliminating of food and shelter for rodents around homes, work places, and recreation areas by removing brush, rock piles, junk, and food sources (such as pet food), from the site.
- Surveillance for plague activity in rodent populations in and surrounding high risk areas by public health workers or by citizens reporting rodents found sick or dead to local health departments.
- Use of appropriate and licensed insecticides to kill fleas during wild animal plague outbreaks to reduce the risk to humans.
- Treatment of pets (dogs and cats) for flea control once each week.

Preventive Drug Therapy

Antibiotics may be taken in the event of exposure to the bites of wild rodent fleas during an outbreak or to the tissues or fluids of a plague-infected animal. Preventive therapy is also recommended in the event of close exposure to another person or to a pet animal with suspected plague pneumonia. For preventive drug therapy, the preferred antibiotics are the tetracyclines, chloramphenicol, or one of the effective sulfonamides.

References

Health Information, National Center for Infectious Diseases, Centers for Disease Control and Prevention, Department of Health and Human Services.

If you have any questions, please contact a Regional Public Health Consultant, park sanitarian or call WASO Public Health for more information at 202-513-7226.

AN INTRODUCTION TO INDOOR AIR QUALITY

Pollutants and Sources of Indoor Air Pollution

- [Asbestos](#)
- [Biological Pollutants](#)
- [Carbon Monoxide](#)
- [Formaldehyde/Pressed Wood Products](#)
- [Household Cleaning and Maintenance, Personal Care, or Hobbies](#)
- [Lead](#)
- [Nitrogen Dioxide](#)
- [Pesticides](#)
- [Radon](#)
- [Respirable Particles](#)
- [Secondhand Smoke/Environmental Tobacco Smoke](#)
- [Stoves, Heaters, Fireplaces, and Chimneys](#)

Read "[The Inside Story: A Guide to Indoor Air Quality](#)"

Biological Pollutants

Biological contaminants include bacteria, [molds, mildew](#), viruses, animal dander and cat saliva, house dust, mites, cockroaches, and pollen (see more about Asthma triggers at www.epa.gov/asthma). There are many sources of these pollutants. Pollens originate from plants; viruses are transmitted by people and animals; bacteria are carried by people, animals, and soil and plant debris; and household pets are sources of saliva and animal dander. The protein in urine from rats and mice is a potent allergen. When it dries, it can become airborne. Contaminated central air handling systems can become breeding grounds for mold, mildew, and other sources of biological contaminants and can then distribute these contaminants through the home.

By controlling the relative humidity level in a home, the growth of some sources of biologicals can be minimized. A relative humidity of 30-50 percent is generally recommended for homes. Standing water, water-damaged materials, or wet surfaces also serve as a breeding ground for molds, mildews, bacteria, and insects. House dust mites, the source of one of the most powerful biological allergens, grow in damp, warm environments.

Sources

Common biological contaminants include mold, dust mites, pet dander (skin flakes), droppings and body parts from cockroaches, rodents and other pests or insects, viruses, and bacteria. Many of these biological contaminants are small enough to be inhaled.

Biological contaminants are, or are produced by, living things. Biological contaminants are often found in areas that provide food and moisture or water. For example, damp or wet areas such as cooling coils, humidifiers, condensate pans, or unvented bathrooms can be moldy. Draperies, bedding, carpet, and other areas where dust collects may accumulate biological contaminants.

Health Effects From Biological Contaminants

Some biological contaminants trigger allergic reactions, including hypersensitivity pneumonitis, allergic rhinitis, and some types of [asthma](#). Infectious illnesses, such as influenza, measles, and chicken pox are transmitted through the air. Molds and mildews release disease-causing toxins. Symptoms of health

problems caused by biological pollutants include sneezing, watery eyes, coughing, shortness of breath, dizziness, lethargy, fever, and digestive problems.

Allergic reactions occur only after repeated exposure to a specific biological allergen. However, that reaction may occur immediately upon re-exposure or after multiple exposures over time. As a result, people who have noticed only mild allergic reactions, or no reactions at all, may suddenly find themselves very sensitive to particular allergens.

Some diseases, like humidifier fever, are associated with exposure to toxins from microorganisms that can grow in large building ventilation systems. However, these diseases can also be traced to microorganisms that grow in home heating and cooling systems and humidifiers. Children, elderly people, and people with breathing problems, allergies, and lung diseases are particularly susceptible to disease-causing biological agents in the indoor air.

Mold, dust mites, pet dander, and pest droppings or body parts can trigger asthma. Biological contaminants, including molds and pollens can cause allergic reactions for a significant portion of the population. Tuberculosis, measles, staphylococcus infections, *Legionella* and influenza are known to be transmitted by air.

Reducing Exposure to Biological Contaminants

General good housekeeping, and maintenance of heating and air conditioning equipment, are very important. Adequate ventilation and good air distribution also help. The key to mold control is moisture control. If mold is a problem, clean up the mold and get rid of excess water or moisture. Maintaining the relative humidity between 30% - 60% will help control mold, dust mites, and cockroaches. Employ integrated pest management to control insect and animal allergens. Cooling tower treatment procedures exist to reduce levels of *Legionella* and other organisms.

- *Install and use exhaust fans that are vented to the outdoors in kitchens and bathrooms and vent clothes dryers outdoors.*
These actions can eliminate much of the moisture that builds up from everyday activities. There are exhaust fans on the market that produce little noise, an important consideration for some people. Another benefit to using kitchen and bathroom exhaust fans is that they can reduce levels of organic pollutants that vaporize from hot water used in showers and dishwashers.
- *Ventilate the attic and crawl spaces to prevent moisture build-up.*
Keeping humidity levels in these areas below 50 percent can prevent water condensation on building materials.
- *If using cool mist or ultrasonic humidifiers, clean appliances according to manufacturer's instructions and refill with fresh water daily.*
Because these humidifiers can become breeding grounds for biological contaminants, they have the potential for causing diseases such as hypersensitivity pneumonitis and humidifier fever. Evaporation trays in air conditioners, dehumidifiers, and refrigerators should also be cleaned frequently.
- *Thoroughly clean and dry water-damaged carpets and building materials (within 24 hours if possible) or consider removal and replacement.*
Water-damaged carpets and building materials can harbor mold and bacteria. It is very difficult to completely rid such materials of biological contaminants.
- *Keep the house clean. House dust mites, pollens, animal dander, and other allergy-causing agents can be reduced, although not eliminated, through regular cleaning.*

People who are allergic to these pollutants should use allergen-proof mattress encasements, wash bedding in hot (130°F) water, and avoid room furnishings that accumulate dust, especially if they cannot be washed in hot water. Allergic individuals should also leave the house while it is being vacuumed because vacuuming can actually increase airborne levels of mite allergens and other biological contaminants. Using central vacuum systems that are vented to the outdoors or vacuums with high efficiency filters may also be of help.

- ***Take steps to minimize biological pollutants in basements.***
Clean and disinfect the basement floor drain regularly. Do not finish a basement below ground level unless all water leaks are patched and outdoor ventilation and adequate heat to prevent condensation are provided. Operate a dehumidifier in the basement if needed to keep relative humidity levels between 30 - 50 percent.

Standards or Guidelines

There are currently no federal government standards for biologicals in school indoor air environments (as of 1999).

Additional Resources

EPA's Asthma Website - www.epa.gov/asthma

EPA's Mold Website - www.epa.gov/mold

Publications/Fact Sheets

Biological Pollutants in Your Home, January 1990 (402-F-90-102)

Explains indoor biological pollution, health effects of biological pollutants, and how to control their growth and buildup. One third of all structures have damp conditions that may encourage development of pollutants such as mold and bacteria, which can cause allergic reactions - including asthma - and spread infectious diseases. Describes corrective measures for achieving moisture control and cleanliness.

- This brochure was prepared by the American Lung Association and the U.S. Consumer Product Safety Commission. www.cpsc.gov/cpsc/pub/pubs/425.html [EXIT Disclaimer](#)

Fact Sheet - Flood Cleanup: Avoiding Indoor Air Quality Problems

Discusses steps to take when cleaning and repairing a home after flooding. Excess moisture in the home is cause for concern about indoor air quality primarily because it provides breeding conditions for microorganisms. This fact sheet provides tips to avoid creating indoor air quality problems during cleanup.

- [PDF Version](#) (PDF, 2 pp, 35KB [About PDF](#))
- EPA 402-F-93-005, Revised October 2003

Indoor Allergens: Assessing and Controlling Adverse Health Effects, Andrew M. Pope, Roy Patterson, and Harriet Burge, editors; Committee on the Health Effects of Indoor Allergens, Division of Health Promotion and Disease Prevention, Institute of Medicine. National Academy Press, 1993. 308 pages. ISBN 0-309-04831-1.

This project was supported by funds from the Environmental Protection Agency, National Institute of Environmental Health Sciences, National Institute of Allergy and Infectious Diseases, National Heart, Lung, and Blood Institute, and Agency for Toxic Substances and Disease Registry. Copies of this book are available from the National Academy Press, 2101 Constitution Ave., N.W., Box 285, Washington, DC 20055. Call 1-800-624-6242 or 202-334-3313 (in the Washington DC metro area).

Indoor Air Fact Sheet No. 8 - Use and Care of Home Humidifiers

Explains that some types of home humidifiers can disperse microorganisms from their water tanks into the indoor air. Describes the different types of humidifiers and provides recommendations for their use and maintenance.

- [HTML Version](#)
- [PDF Version](#) (PDF, 3 pp, 33KB, [About PDF](#))
- EPA 402-F-91-101, February 1991

HOW TO PREVENT SNAKE BITES

- Be aware of snakes that may be swimming in the water to get to higher ground and those that may be hiding under debris or other objects.
- If you see a snake, back away from it slowly and do not touch it.

Signs of Snake Bites

Pay attention to the following snake bite signs.

Depending on the type of snake, the signs and symptoms may include:

- A pair of puncture marks at the wound
- Redness and swelling around the bite
- Severe pain at the site of the bite
- Nausea and vomiting
- Labored breathing (in extreme cases, breathing may stop altogether)
- Disturbed vision
- Increased salivation and sweating
- Numbness or tingling around your face and/or limbs

What To DO if You or Someone Else is Bitten by a Snake

- If you or someone you know are bitten, try to see and remember the color and shape of the snake, which can help with treatment of the snake bite.
- Keep the bitten person still and calm. This can slow down the spread of venom if the snake is poisonous.
- Seek medical attention as soon as possible.
- Dial 911 or call local Emergency Medical Services (EMS).
- Apply first aid if you cannot get the person to the hospital right away.
 - Lay or sit the person down with the bite below the level of the heart.
 - Tell him/her to stay calm and still.
 - Cover the bite with a clean, dry dressing.

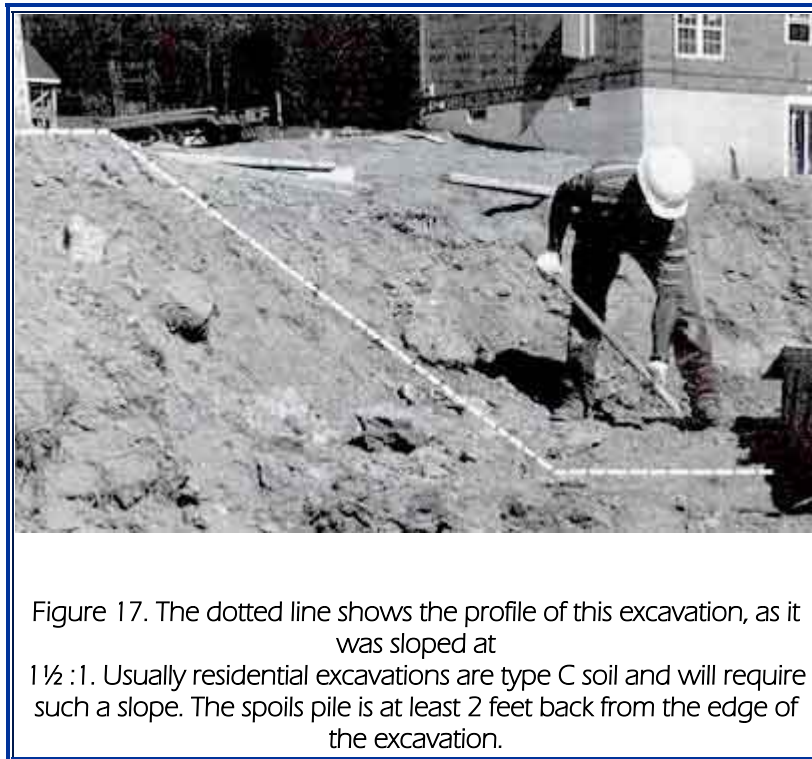
What NOT To Do if You or Someone Else is Bitten by a Snake

- Do not pick up the snake or try to trap it (this may put you or someone else at risk for a bite).
- Do not apply a tourniquet.
- Do not slash the wound with a knife.
- Do not suck out the venom.
- Do not apply ice or immerse the wound in water.
- Do not drink alcohol as a pain killer.
- Do not drink caffeinated beverages.

EXCAVATIONS AND TRENCHING

General

- Find the location of all underground utilities by contacting the local utility locating service before digging.
- Keep workers away from digging equipment and never allow workers in an excavation when equipment is in use.
- Keep workers from getting between equipment in use and other obstacles and machinery that can cause crushing hazards.
- Keep equipment and the excavated dirt (spoils pile) back 2 feet from the edge of the excavation (Figure 17).



- Have a competent person conduct daily inspections and correct any hazards before workers enter a trench or excavation.
- Provide workers a way to get into and out of a trench or excavation such as ladders and ramps. They must be within 25 feet of the worker.
- For excavations and utility trenches over 5 feet deep, use shoring, shields (trench boxes), benching, or slope back the sides. Unless soil analysis has been completed, the earth's slope must be at least 1 ½ feet horizontal to 1 vertical (Figure 18).
- Keep water out of trenches with a pump or drainage system, and inspect the area for soil movement and potential cave-ins.
- Keep drivers in the cab and workers away from dump trucks when dirt and other debris are being loaded into them. Don't allow workers under any load and train them to stay clear of the backs of vehicles.

Do Not Enter an Unprotected Trench!



For your safety:

- Slope or bench trench walls, or
- Shore trench walls with supports, or
- Shield trench walls with trench boxes.
- Provide safe access through the use of ladders, ramps or stairways.
- Keep heavy equipment away from trench edges.
- Know where underground utilities are prior to digging.
- Keep excavated or other materials at least 2 feet back from the edge of trench.

OSHA's role is to assure the safety and health of workers by setting and enforcing standards; providing training, outreach and education; establishing partnerships; and encouraging continual improvement in workplace safety and health.



To get more information, report an emergency or contact your local office:

www.osha.gov • (800) 321-OSHA • TTY (877) 889-5627
OSHA 3215-04N-05