

Infectious Disease Facts

County of Santa Clara

Employee Services Agency

**Occupational Safety and
Environmental Compliance**

2310 North First Street,
Suite 204
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Introduction

This document contains information on infectious disease that was prepared for the employees of Santa Clara County by the Employee Services Agency, Occupational Safety and Environmental Compliance Division (OSEC). The information was compiled from reliable sources, primarily from the Centers for Disease Control and Prevention (CDC).

The CDC, located in Atlanta, Georgia, is an agency of the U.S. Department of Health and Human Services and is recognized as the lead federal agency for protecting the health and safety of people - at home and abroad, providing credible information to enhance health decisions, and promoting health through strong partnerships.

The CDC serves as the national focus for developing and applying disease prevention and control, environmental health, and health promotion and education activities designed to improve the health of the people of the United States.

You may visit their Web site at <<http://www.cdc.gov>> for the latest information on infectious disease in the United States and abroad.

You may also visit the Santa Clara County Public Health Department web site at <<http://www.sccgov.org>> for the latest information on infectious disease in Santa Clara County.

Your OSEC representative is available to answer your questions about your work environment. The OSEC Office is located at

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Employee Responsibilities

What is an Exposure Incident?

- An exposure incident is a specific occurrence of eye, mouth, other mucous membrane, non-intact skin, or parenteral contact with blood or other potentially infectious materials.

Who do you report Exposure Incidents to?

- Report all injuries (even those requiring only on-the-site first aid) and exposure incidents to your supervisor immediately.
- Report accidents and near misses as soon as possible.
- If you suspect that some aspect of your job may be producing pain or discomfort, or will produce pain or discomfort, report it immediately to your supervisor.

What can you do to protect yourself and others?

Hazard Awareness

- Be aware of the inherent hazards of your work environment.
- Know and understand all aspects of your job, and request additional orientation or training when you are not absolutely sure how to do a task safely.

Avoid exposure if at all possible.

- Do not touch contaminated materials without the proper training and personal protective equipment.

Wear Personal Protective Equipment when required.

- When in doubt, ask your supervisor and/or Safety Coordinator for advice.
- When you use protective devices, check to be sure that they fit you and are in good condition.
- Maintain protective devices as needed (change filter cartridges, etc.).
- Some types of Personal Protective Equipment use require training, recertification and a medical release.

Participate in Vaccination Programs, if available and appropriate.

- Vaccines are available for Hepatitis B, Influenza,

Exercise good personal hygiene by washing your hands regularly.

- Wash your hands with warm running water and soap after using the restroom, before eating and smoking, and after handling potentially contaminated materials.
- Remove potentially contaminated clothing.

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Histoplasmosis

What is histoplasmosis?

Histoplasmosis is an infectious disease caused by inhaling the spores of a fungus called *Histoplasma capsulatum*. Histoplasmosis is not contagious; it cannot be transmitted from an infected person or animal to someone else.

Histoplasmosis primarily affects a person's lungs, and its symptoms vary greatly. The vast majority of infected people are asymptomatic (have no apparent ill effects), or they experience symptoms so mild they do not seek medical attention and may not even realize that their illness was histoplasmosis. If symptoms do occur, they will usually start within 3 to 17 days after exposure, with an average of 10 days. Histoplasmosis can appear as a mild, flu-like respiratory illness and has a combination of symptoms, including malaise (a general ill feeling), fever, chest pain, dry or nonproductive cough, headache, loss of appetite, shortness of breath, joint and muscle pains, chills, and hoarseness. A chest X-ray can reveal distinct markings on an infected person's lungs.

Chronic lung disease due to histoplasmosis resembles tuberculosis and can worsen over months or years. Special antifungal medications are needed to arrest the disease. The most severe and rarest form of this disease is disseminated histoplasmosis, which involves spreading of the fungus to other organs outside the lungs. Disseminated histoplasmosis is fatal if untreated, but death can also occur in some patients even when medical treatment is received. People with weakened immune systems are at the greatest risk for developing severe and disseminated histoplasmosis. Included in this high-risk group are persons with acquired immunodeficiency syndrome (AIDS) or cancer and persons receiving cancer chemotherapy; high-dose, long-term steroid therapy; or other immuno-suppressive drugs.

Impaired vision and even blindness develop in some people because of a rare condition called "presumed ocular histoplasmosis." The factors causing this condition are poorly understood. Results of laboratory tests suggest that presumed ocular histoplasmosis is associated with hypersensitivity to *H. capsulatum* and not from direct exposure of the eyes to the microorganism. What delayed events convert the condition from asymptomatic to symptomatic are also unknown.

How is histoplasmosis diagnosed?

Histoplasmosis can be diagnosed by identifying *H. capsulatum* in clinical samples of a symptomatic person's tissues or secretions, testing the patient's blood serum for antibodies to the microorganism, and testing urine, serum, or other body fluids for *H. capsulatum* antigen. On occasion, diagnosis may require a transbronchial biopsy.

Detection of *H. capsulatum* antigen

A radioimmunoassay method can be used to measure *H. capsulatum* polysaccharide antigen (HPA) levels in samples of a patient's urine, serum, and other body fluids. The test appears to meet the important need for a rapid and accurate method for early diagnosis of disseminated histoplasmosis, especially in patients with AIDS. HPA

is detected in body fluid samples of most patients with disseminated infection and in the urine and serum of 25% to 50% of those with less severe infections.

Histoplasmin skin test

A person can learn from a histoplasmin skin test whether he or she has been previously infected by *H.capsulatum*. This test, similar to a tuberculin skin test, is available at many physicians' offices and medical clinics. A histoplasmin skin test becomes positive 2 to 4 weeks after a person is infected by *H.capsulatum*, and repeated tests will usually give positive results for the rest of the person's life. A previous infection by *H.capsulatum* can provide partial protection against ill effects if a person is reinfected. Since a positive skin test does not mean that a person is completely protected against ill effects, appropriate exposure precautions should be taken regardless of a worker's skin-test status. Furthermore, while histoplasmin skin test information is useful to epidemiologists, a positive skin test does not help diagnose acute histoplasmosis, unless a previous skin test is known to have been negative.

Where are *H. capsulatum* spores found?

H. capsulatum grows in soils throughout the world. In the United States, the fungus is endemic and the proportion of people infected by *H. capsulatum* is higher in central and eastern states, especially along the valleys of the Ohio, Mississippi, and St. Lawrence rivers, and the Rio Grande. The fungus seems to grow best in soils having a high nitrogen content, especially those enriched with bird manure or bat droppings. The organism can be carried on the wings, feet, and beaks of birds and infect soil under roosting sites or manure accumulations inside or outside buildings. Active and inactive roosts of blackbirds (e.g., starlings, grackles, red-winged blackbirds, and cowbirds) have been found heavily contaminated by *H. capsulatum*. Therefore, the soil in a stand of trees where blackbirds have roosted for 3 or more years should be suspected of being contaminated by the fungus. Habitats of pigeons and bats, and poultry houses with dirt floors have also been found contaminated by *H. capsulatum*.

On the other hand, fresh bird droppings on surfaces such as sidewalks and windowsills have not been shown to present a health risk for histoplasmosis because birds themselves do not appear to be infected by *H. capsulatum*. Rather, bird manure is primarily a nutrient source for the growth of *H. capsulatum* already present in soil. Unlike birds, bats can become infected with *H. capsulatum* and consequently can excrete the organism in their droppings.

Who can get histoplasmosis and what jobs and activities put people at risk for exposure to *H. capsulatum* spores?

Anyone working at a job or present near activities where material contaminated with *H. capsulatum* becomes airborne can develop histoplasmosis if enough spores are inhaled. After an exposure, how ill a person becomes varies greatly and most likely depends on the number of spores inhaled and a person's age and susceptibility to the disease. The number of inhaled spores needed to cause disease is unknown. Infants, young children, and older persons, in particular those with chronic lung disease, are at increased risk for developing symptomatic histoplasmosis.

The U.S. Public Health Service (USPHS) and the Infectious Diseases Society of America (IDSA) have jointly published guidelines for the prevention of opportunistic infections in persons infected with the human immunodeficiency virus (HIV). The USPHS/IDSA Prevention of Opportunistic Infections Working Group recommended that HIV-infected persons "should avoid activities known to be associated with increased risk (e.g., cleaning chicken coops, disturbing soil beneath bird-roosting sites, and exploring caves)." HIV-infected persons should consult their health care provider about appropriate exposure precautions that should be taken for any activity with a risk of exposure to *H. capsulatum*.

Below is a partial list of occupations and hobbies with risks for exposure to *H. capsulatum* spores. Appropriate exposure precautions should be taken by these people and others whenever contaminated soil, bat droppings, or bird manure are disturbed.

- Bridge inspector or painter
- Chimney cleaner
- Construction worker
- Demolition worker
- Farmer
- Gardener
- Heating and air-conditioning system installer or service person
- Microbiology laboratory worker
- Pest control worker
- Restorer of historic or abandoned buildings
- Roofer
- Spelunker (cave explorer)

If someone who engages in these activities develops flu-like symptoms days or even weeks after disturbing material that might be contaminated with *H. capsulatum*, and the illness worsens rather than subsides after a few days, medical care should be sought and the health care provider informed about the exposure.

Should workers who might be exposed to *H. capsulatum* have pre-exposure skin or blood tests?

Workers at risk of exposure to *H. capsulatum* may learn useful information from a histoplasmin skin test. The results of skin testing would inform each worker of his or her status regarding either susceptibility to infection by *H. capsulatum* (a negative skin test) or partial protection against ill effects if reinfected (a positive skin test). However, a false-negative skin test result can be reported early in an infection or with persons with weakened immune systems. A false-positive skin test can result from cross-reactions with antigens of certain other pathogenic fungi. One drawback to routine pre-exposure skin testing is that a person with a positive skin test might incorrectly assume a false sense of security that he or she is completely protected against ill effects if reinfected. The work practices and personal protective equipment described in this booklet are expected to protect both skin-test positive and skin-test negative persons from excessive inhalation exposures to materials that might be contaminated with *H. capsulatum*.

Although a pre-exposure serum sample could be useful in determining whether a worker's post-exposure illness is histoplasmosis, routine collection and storage of serum specimens from workers is unnecessary and impractical in most work settings.

Some employers, such as public health agencies and microbiology laboratories, have facilities for long-term storage of serum and do collect pre-exposure serum specimens from those employees who might be exposed to high-risk infectious agents. If a worker is to have blood drawn for this purpose and is to receive a histoplasmin skin test, the blood sample should be drawn first because the skin test may cause a positive complement-fixation test for up to 3 months and the appearance of the M band on an immunodiffusion test for *H. capsulatum*.

What can be done to reduce exposures to *H. capsulatum*?

Excluding a colony of bats or a flock of birds from a building

Although a primary focus of this booklet is how to protect the health of workers cleaning up accumulated bat or bird manure, the best work practice is to prevent the accumulation of manure in the first place. Therefore, when a colony of bats or a flock of birds is discovered roosting in a building, immediate action should be taken to exclude the intruders by sealing all entry points. Any measure that might unnecessarily harm or kill a bat or bird should be avoided.

Before excluding a colony of bats or a flock of birds from a building, attention should be given to the possibility that flightless young may be present. In the United States, this is an especially important consideration for bats from May through August.

Ultrasonic devices and chemical repellents are ineffective for eliminating bats from a roosting area. While there may be several openings in a building, bats will typically use only one or two. Therefore, after observing the bats leaving a building on several nights, all openings except the ones used by the bats should be sealed. Because some bats are so small that they can squeeze through an opening smaller than the diameter of a dime, even the smallest hole should be sealed. Exclusion valves – flaps made of polypropylene bird netting that allow bats to leave but not enter – should then be placed over the remaining openings. If these openings are inaccessible, installing and maintaining lights in a roosting area will force bats to seek another daytime roosting site. Because of concerns for the welfare of evicted bats, constructing bat houses near former roosts has become a common practice of some pest control companies.

In some buildings, extensive bat exclusion measures may be more successful in the late fall or winter months after a colony has migrated to a warmer habitat or to another location for hibernation. In some regions of the United States, bats may not migrate, but rather will hibernate in the same building. Consequently, any work on a building that might disturb such a colony should be delayed until spring. Disturbing bats during hibernation is likely to result in their death.

Excluding birds from a building also involves sealing entry points. Because their food source is usually nearby, birds prevented from reentering a building will often complicate an exclusion by beginning to roost on window sills and ledges of the building or others nearby. Visual deterrents (e.g., balloons, flags, lights, and replicas of hawks and owls) and noises (e.g., gun shots, alarms, gas cannons, and fireworks) may scare birds away, but generally only temporarily.

Nontoxic, chemical bird repellents are available as liquids, aerosols, and nondrying films and pastes. Disadvantages of these antiroosting materials are that some are

messy and none are permanent. Even the most effective ones require periodic reapplication. More permanent repellents include mechanical antiroosting systems consisting of angled and porcupine wires made of stainless steel. These systems may require some occasional maintenance to clear nesting material or other debris from the wires.

Live trapping of birds to relocate them is seldom effective when traps are put in a roosting site, but this method can be effective when used in a feeding area. Shooting birds, using contact poisons, and baiting with poisoned food should be used as last resorts and should only be done by qualified pest control specialists. Using such methods to kill nuisance birds may also require a special permit.

Posting health risk warnings

If a colony of bats or a flock of birds is allowed to live in a building or a stand of trees, their manure will accumulate and create a health risk for anyone who enters the roosting area and disturbs the material. Once a roosting site has been discovered in a building, exclusion plans should be made, and the extent of contamination should be determined. When an accumulation of bat or bird manure is discovered in a building, removing the material is not always the next step. Simply leaving the material alone if it is in a location where no human activity is likely may be the best course of action.

Areas known or suspected of being contaminated by *H. capsulatum*, such as bird roosts, attics, or even entire buildings that contain accumulations of bat or bird manure, should be posted with signs warning of the health risk. Each sign should provide the name and telephone number of a person to be contacted if there are questions about the area. In some situations, a fence may need to be built around a property or locks put on attic doors to prevent unsuspecting or unprotected individuals from entering.

Communicating health risks to workers

Before an activity is started that may disturb any material that might be contaminated by *H. capsulatum*, workers should be informed in writing of the personal risk factors that increase an individual's chances of developing histoplasmosis. Such a written communication should include a warning that individuals with weakened immune systems are at the greatest risk of developing severe and disseminated histoplasmosis if they become infected. These people should seek advice from their health care provider about whether they should avoid exposure to materials that might be contaminated with *H. capsulatum*. The [fact sheet](#) in the appendix is one way of conveying information about histoplasmosis; it can be distributed to workers during their hazard communication training.

Controlling aerosolized dust when removing bat or bird manure from a building.

The best way to prevent exposure to *H. capsulatum* spores is to avoid situations where material that might be contaminated can become aerosolized and subsequently inhaled. A brief inhalation exposure to highly contaminated dust may be all that is needed to cause infection and subsequent development of histoplasmosis. Therefore, work practices and dust control measures that eliminate

or reduce dust generation during the removal of bat or bird manure from a building will also reduce risks of infection and subsequent development of disease. For example, instead of shoveling or sweeping dry, dusty material, carefully wetting it with a water spray can reduce the amount of dust aerosolized during an activity. Adding a surfactant or wetting agent to the water might reduce further the amount of aerosolized dust. Once the material is wetted, it can be collected in double, heavy-duty plastic bags, a 55-gallon drum, or some other secure container for immediate disposal. An alternative method is use of an industrial vacuum cleaner with a high-efficiency filter to *bag* contaminated material. Truck-mounted or trailer-mounted vacuum systems are recommended for buildings with large accumulations of bat or bird manure. These high-volume systems can remove tons of contaminated material in a short period. Using long, large-diameter hoses, such a system can also remove contaminated material located several stories above its waste hopper. This advantage eliminates the risk of dust exposure that can happen when bags tear accidentally or containers break during their transfer to the ground.

The removal of all material that might be contaminated by *H. capsulatum* from a building and immediate waste disposal will eliminate any further risk that someone might be exposed to aerosolized spores. Air sampling, surface sampling, or the use of any other method intended to confirm that no infectious agents remain following removal of bat or bird manure is unnecessary in most cases. However, before a removal activity is considered finished, the cleaned area should be inspected visually to ensure that no residual dust or debris remains.

Disinfecting contaminated material

Disinfectants have occasionally been used to treat contaminated soil and accumulations of bat manure when removal was impractical or as a precaution before a removal process was started. Formaldehyde solutions are the only disinfectants proven to be effective for decontaminating soil containing *H. capsulatum*. Because of the potentially serious health hazards associated with formaldehyde exposures, this chemical should be handled only by persons who know how to apply it safely. If a disinfectant is applied to land known to be contaminated by *H. capsulatum*, the soil should be thoroughly saturated so that the disinfectant penetrates deeply enough to contact all the soil containing *H. capsulatum*. While *H. capsulatum* was found in a blackbird roost at a depth of more than 12 inches, soil saturation to a depth of 6 to 8 inches will be sufficient for most disinfectant applications. To ensure a disinfectant's effectiveness, soil samples should be collected before and after an application and analyzed for *H. capsulatum*. The appropriate number of samples to be collected will vary depending upon the size of the property. Each sampling location should be flagged or marked in a way that will ensure that the same locations will be sampled after application of the disinfectant. A map of the treated area showing the approximate location of each sampling site will also be useful in the event flags or markings are lost. After a disinfectant's effectiveness has been documented – more than one application may be necessary – additional tests for *H. capsulatum* should be done periodically if the land remains idle.

Disposing of waste

Any material that might be contaminated with *H. capsulatum* that is removed from a work site should be disposed of or decontaminated properly and safely and not

merely moved to another area where it could still be a health hazard. Before an activity is started, the quantity of material to be removed should be estimated. (If the approximate volume of dry bat or bird manure in a building is known, the approximate weight can be calculated using a conversion factor of 40 pounds per cubic foot.) Requirements established by local and state authorities for the removal, transportation, and disposal of contaminated material should be followed. Arrangements should be made with a landfill operator concerning the quantity of material to be disposed of, the dates when the material will be delivered, and the disposal location. If local or state landfill regulations define material contaminated with *H. capsulatum* to be infectious waste, incineration or another decontamination method may also be required.

Controlling aerosolized dust during construction, excavation, and demolition

Dusts containing *H. capsulatum* spores can be aerosolized during construction, excavation, or demolition. Once airborne, spores can be carried easily by wind currents over long distances. Such contaminated airborne dusts can cause infections not only in persons at a work site, but also in others nearby. Such activities were suggested as the causes of the three largest outbreaks of histoplasmosis ever recorded. All three outbreaks took place in Indianapolis, Indiana. During the first outbreak, in the fall of 1978 and spring of 1979, an estimated 120,000 people were infected, and 15 people died. The second outbreak, in 1980, was similar to the first in the number of people affected. AIDS patients accounted for nearly 50% of culture-proven cases during the third outbreak, in 1988.

Water sprays or other dust suppression techniques should be used to reduce the amount of dust aerosolized during construction, excavation, or demolition in regions where *H. capsulatum* is endemic. During windy periods or other times when typical dust suppression techniques are ineffective, earthmoving activities should be interrupted. All earthmoving equipment (e.g., bulldozers, trucks, and front-end loaders) should have cabs with air-conditioning (if available) to protect their operators. Air filters on air-conditioners should be inspected on a regular schedule and cleaned or replaced as needed. During filter cleaning or replacement of exceptionally dusty air filters, respiratory protection should be worn by the maintenance person if there is a potential for the dust to be aerosolized. Beds of all trucks carrying dirt or debris from a work site should be covered, and all trucks should pass through a wash station before leaving the site. When at a dump site, a truck operator should ensure that all individuals in the vicinity are in an area where they will not be exposed to dust aerosolized while the truck is emptied.

Water sprays and other suppression techniques may not be enough to control dust aerosolized during demolition of a building or other structure. Consequently, removal of accumulations of bird or bat manure before demolition may be necessary in some situations. Factors affecting decisions about pre-demolition removal of such accumulations include the quantity and locations of the material, the structural integrity or soundness of the building, weather conditions, proximity of the building to other buildings and structures, and whether nearby buildings are occupied by persons who may be at increased risk for developing symptomatic histoplasmosis (e.g., schools, day-care facilities, hospitals, clinics, jails, and prisons.)

City or county governments in regions where *H. capsulatum* is endemic should establish and enforce regulations concerning work practices that will control dust

aerosolization at construction, excavation, and demolition sites. However, even in regions where *H. capsulatum* is not considered endemic, dust aerosolized during work activities in bird roosts has also resulted in outbreaks of histoplasmosis. Consequently, regardless of whether a work site is in an endemic region, precautions should be taken at active and inactive bird roosts to prevent dust aerosolization.

Wearing personal protective equipment

Because work practices and dust control measures to reduce worker exposures to *H. capsulatum* have not been fully evaluated, using personal protective equipment is still necessary during some activities. During removal of an accumulation of bat or bird manure from an enclosed area such as an attic, dust control measures should be used, but wearing a NIOSH-approved respirator and other items of personal protective equipment is also recommended to reduce further the risk of *H. capsulatum* exposure.

For some jobs involving exposures to airborne dusts, working conditions have changed little over the years despite improvements in other aspects of the industry. For example, inhalation of dust aerosolized from the dirt floors of chicken coops that contained *H. capsulatum* spores was reported more than 30 years ago as the cause of clinical cases of histoplasmosis in workers. As the poultry industry has grown (there are now approximately 120,000 poultry farms in the United States), the old-style chicken coop has been replaced by larger housing facilities. However, the floors of poultry houses are still dirt covered and provide an excellent medium for the growth of *H. capsulatum*. Ventilation systems in poultry houses are not primarily intended to reduce poultry workers' exposures to aerosolized dust, and dust measurements made during growing and catching chickens show that inhalation exposures of poultry workers to dust can be excessive. Since ventilation systems designed especially to reduce airborne dust to "safe" levels in poultry houses would likely be economically and mechanically impractical, wearing a respirator is probably the most feasible method for protecting poultry workers.

What personal protective equipment other than respirators should workers wear? Disposable protective clothing and shoe coverings should be worn whenever regular work clothing and shoes might be contaminated with dust containing *H. capsulatum* spores. Wearing such clothing can reduce or eliminate the likelihood of transferring spore-contaminated dust to places away from a work site, such as a car or home. When spore-contaminated material is likely to fall from overhead, workers should wear disposable protective clothing with hoods. Workers should wear disposable shoe coverings with ridged soles made of slip-resistant material to reduce the likelihood of slipping on wet or dusty surfaces. After working in a spore-contaminated area and before removing respirators, workers should remove all protective clothing and shoe coverings and seal them in heavy-duty plastic bags to be disposed of in a landfill.

Since the personal protective equipment described above can be more insulating than regular work clothing, sweat evaporation may be impeded during some work activities. Therefore, precautions may need to be taken to control heat stress. Workers should know the symptoms of heat-stress-related illnesses and be able to take appropriate measures to ensure that such illnesses do not occur. Some jobs may have such a significant risk of heat stress that they should be scheduled only when ambient temperatures are relatively cool. **What other infectious agents are**

health risks for workers who disturb accumulations of bat droppings or bird manure?In addition to *H. capsulatum*, inhalation exposure to *Cryptococcus neoformans* may also be a health risk for workers in environments containing accumulations of bat droppings or bird manure. Inhalation exposures to *Chlamydia psittaci* have occurred occasionally in environments containing the manure of certain birds, and exposure to the rabies virus is a health risk for workers who must handle dead bats.

Cryptococcus neoformans

C. neoformans is the infectious agent of the fungal disease cryptococcosis. Formerly a rare disease, the incidence of cryptococcosis has increased in recent years because of its frequent occurrence in AIDS patients. *C. neoformans* and *H. capsulatum* are only two of the more than 100 microorganisms that have been reported with increased frequency among HIV-infected persons, and cryptococcosis and histoplasmosis are both classified as AIDS-indicator opportunistic infectious diseases. The USPHS/IDSA Prevention of Opportunistic Infections Working Group recommends that HIV-infected persons should avoid "sites that are likely to be heavily contaminated with *C. neoformans* (e.g., areas heavily contaminated with pigeon droppings)." However, evidence is lacking that contaminated bird manure is the primary environmental source of exposure to *C. neoformans* in most cases of cryptococcosis among HIV-infected persons. An HIV-infected person should consult his or her health care provider about the appropriate exposure precautions to be taken for any activity having a risk of exposure to *C. neoformans*.

C. neoformans uses the creatinine in avian feces as a nitrogen source. It gains a competitive advantage over other microorganisms and multiplies exceedingly well in dry bird manure accumulated in places that are not in direct sunlight. This microorganism is commonly associated with old pigeon manure, but it has also been recovered from dried excreta of chickens, sparrows, starlings, and other birds. As with *H. capsulatum*, *C. neoformans* has not been found in fresh bird droppings, but it has been cultured from the beaks and feet of pigeons. Bats have been shown to be infected with *C. neoformans*,⁹⁶ and both *C. neoformans* and *H. capsulatum* have been recovered from bat dropping samples collected at the same site. However, it should not be assumed that a worker's illness is cryptococcosis when only *C. neoformans* is recovered from environmental samples collected from suspected sources of exposure. *C. neoformans* has been recovered from environments where *H. capsulatum* was not recovered, even though sick workers were diagnosed from the results of clinical tests as having histoplasmosis.

Unlike outbreaks of other mycoses, outbreaks of cryptococcosis traced to environmental sources have not been described, and it is presumed that most people can overcome most inhalation exposures to *C. neoformans*. More detailed information about *C. neoformans* and cryptococcosis is available in other reports. Work practices described previously in this document for controlling exposures to *H. capsulatum*, including the use of personal protective equipment, will also protect against inhalation exposures to *C. neoformans* and other microorganisms.

Chlamydia psittaci

While psittacosis is caused by a bacterium (*C. psittaci*) rather than a fungus, it is another infectious disease that people can develop after disturbing and inhaling

contaminated bird manure. While *C. psittaci* has been isolated from 129 avian species, most human infections result from inhalation exposures to aerosolized urine, respiratory secretions, or dried manure of infected psittacine birds (e.g., parakeets, parrots, macaws, and cockatiels). The disease is also occasionally associated with exposures to infected pigeons, turkeys, chickens, ducks, and geese, or their manure.

From 1985 to 1995, 1,132 cases of psittacosis in humans were reported to CDC, but this number may be an underestimation because diagnosis of the disease can be difficult. The severity of disease experienced by an infected person can range from asymptomatic to severe systemic disease with pneumonia; death occurs in less than 1% of properly treated patients.

Rabies

Rabies is an infectious viral disease that can affect wild and domestic animals and humans. In the United States, wild animals (e.g., raccoons, skunks, bats, and foxes) are the most important sources of rabies infection. Rabid bats have been reported from every state except Alaska and Hawaii, and 17 of the 32 cases of human rabies diagnosed in the United States from 1980 to 1996 resulted from infections with bat-related rabies virus variants.

Rabies is transmitted via an infected animal's bite or contamination of scratches, abrasions, open wounds, or mucous membranes by infectious material such as saliva. Contact with the blood, urine, or manure of a rabid animal is not a risk factor for contracting rabies. Consequently, workers exposed to accumulations of bat droppings in environments from which bats have been excluded have no rabies risk. Although spelunkers seldom have direct contact with bats, they are included in a frequent-risk category by CDC because of potential for exposure to the rabies virus in bat saliva aerosolized when bats squeak. Two fatal cases of rabies in humans have been associated with probable exposure to aerosolized bat saliva in humid caves containing millions of bats. In addition, a bite was documented in only one of the 17 bat-related human rabies cases in the United States since 1980, suggesting "that limited or seemingly insignificant physical contact with rabid bats may result in transmission of virus." While aerosol transmission of the rabies virus from bats to people is theoretically possible under extraordinary conditions, the risk is otherwise negligible.

The percentage of rabid bats in any colony is probably low (0.5% or less). However, a dead bat should still never be picked up with bare hands since its death may have been caused by an infectious agent. If a dead bat must be handled, wearing heavy work gloves should minimize the risk of disease transmission because of an accidental scratch from the bat's teeth or by contamination of existing scratches or abrasions on a worker's hands.

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<http://www.cdc.gov/niosh/hi97146.html>

Influenza (the flu)

<http://www.cdc.gov/flu/about/qa/disease.htm>

Seasonal Influenza

What is influenza (flu)?

Influenza, commonly called "the flu," is caused by the influenza virus, which infects the respiratory tract (nose, throat, lungs). Unlike many other viral respiratory infections, such as the common cold, the flu causes severe illness and life-threatening complications in many people.

What are the symptoms of the flu?

Influenza is a respiratory illness. Symptoms of flu include fever, headache, extreme tiredness, dry cough, sore throat, runny or stuffy nose, and muscle aches. Children can have additional gastrointestinal symptoms, such as nausea, vomiting, and diarrhea, but these symptoms are uncommon in adults. Although the term "stomach flu" is sometimes used to describe vomiting, nausea, or diarrhea, these illnesses are caused by certain other viruses, bacteria, or possibly parasites, and are rarely related to influenza. Please also see "[Is it a Cold or the Flu](#)".

When is the flu season in the United States?

In the United States, the peak of flu season has occurred anywhere from late November through March. The overall health impact (e.g., infections, hospitalizations, and deaths) of a flu season varies from year to year. CDC monitors circulating flu viruses and their related disease activity and provides influenza reports each week from October through May. See [Weekly U.S. Influenza Summary Update](#).

How does CDC monitor the progress of the flu season?

CDC collects data year-round and reports on influenza (flu) activity in the United States each week from October through May. These reports are available at www.cdc.gov/flu/weekly/fluactivity.htm. The U.S. influenza surveillance system consists of seven separate components.

- Laboratory-based viral surveillance, which tracks the number and percentage of influenza-positive tests from laboratories across the country;
- Sentinel physician surveillance for influenza-like illness (ILI), which tracks the percentage of doctor visits for flu-like symptoms;
- Mortality surveillance as reported through the 122 Cities Mortality Reporting System, which tracks the percentage of deaths reported to be caused by pneumonia and influenza in 122 cities in the United States;
- State and territorial epidemiologist reports of influenza activity, which indicates the number of states affected by flu and the degree to which they are affected;

- Influenza-associated pediatric mortality as reported through the Nationally Notifiable Disease Surveillance System, which tracks the number of deaths in children with laboratory confirmed influenza infection; and
- Influenza-associated pediatric hospitalizations as reported through the Emerging Infections Programs in 9 sites which tracks the number of children reported hospitalized for flu-related complications; and
- Influenza-associated pediatric hospitalization as reported through the New Vaccine Surveillance Network in 3 sites, which also tracks the number of children reported hospitalized for flu-related complications.

These surveillance components allow CDC to determine when and where influenza activity is occurring, determine what types of influenza viruses are circulating, detect changes in the influenza viruses collected and analyzed, track patterns of influenza-related illness, and measure the impact of influenza in the United States. All influenza activity reporting by states, laboratories, and health-care providers is voluntary. For more information about CDC's influenza surveillance activities, see the [Overview of Influenza Surveillance in the United States](#).

Why is there a week-long lag between the data and when it's reported?

The influenza surveillance system is one of the largest and most timely surveillance systems at CDC. The system consists of 7 complementary surveillance components. These components include reports from more than 120 laboratories, 2,000 sentinel health care providers, vital statistics offices in 122 cities, research and health care personnel at the Emerging Infections Program (EIP) and New Vaccine Surveillance Network (NVSN) sites, and influenza surveillance coordinators and state epidemiologists from all 50 state health departments and the New York City and District of Columbia health departments. Influenza surveillance data collection is based on a reporting week that starts on Sunday and ends on Saturday of each week. Each surveillance participant is requested to summarize weekly data and submit it to CDC by Tuesday afternoon of the following week. The data are then downloaded, compiled, and analyzed at CDC each Wednesday. The compiled data are interpreted and checked for anomalies which are resolved before the report is written and submitted for clearance at CDC. On Friday the report is approved, distributed, and posted to the Internet.

How does the flu spread?

The main way that influenza viruses are spread is from person to person in respiratory droplets of coughs and sneezes. (This is called "droplet spread.") This can happen when droplets from a cough or sneeze of an infected person are propelled (generally up to 3 feet) through the air and deposited on the mouth or nose of people nearby. Though much less frequent, the viruses also can be spread when a person touches respiratory droplets on another person or an object and then touches their own mouth or nose (or someone else's mouth or nose) before washing their hands.

If I got the flu last year, will I have immunity against the flu this year?

In general, a person who is infected with an influenza virus one year will have some immunity to closely related viruses that may persist for one or more years. For example, if someone was infected with the A/New Caledonia/20/99-like strain of H1N1 that predominated during the 2006-07 season, they are likely to have some immunity that will protect them if they are exposed to that strain or a closely related strain again during the 2007-08 season. The degree of protection depends on the health of the person involved. Young and healthy people with normal immune systems will likely have good immunity against the same or closely related strains of virus from one year to the next. However, people with weakened immune systems are less likely to have immunity that carries over in other years. It's important to remember that influenza viruses are constantly changing so antibody made against one strain will become less effective against new strains as influenza strains evolve over time. In addition, there are different types of influenza viruses circulating and different variants within virus types, and the same type of flu virus does not necessarily circulate each year. For instance, during the 2006-07 flu season, influenza A (H1N1) viruses predominated; however, infection with an influenza A (H1N1) virus (and subsequent antibodies protecting against re-infection with the same virus) would not provide protection against influenza B or influenza A (H3N2) viruses.

Does the flu have complications?

Yes. Some of the complications caused by flu include bacterial pneumonia, dehydration, and worsening of chronic medical conditions, such as congestive heart failure, asthma, or diabetes. Children may get sinus problems and ear infections as complications from the flu. Those aged 65 years and older and persons of any age with chronic medical conditions (such as asthma, diabetes, or heart disease) are at highest risk for serious complications of flu.

How do I find out if I have the flu?

It is very difficult to distinguish the flu from other viral or bacterial causes of respiratory illnesses on the basis of symptoms alone. A test can confirm that an illness is influenza if the patient is tested within the first two to three days after symptoms begin. In addition, a doctor's examination may be needed to determine whether a person has another infection that is a complication of influenza.

How soon will I get sick if I am exposed to the flu?

The time from when a person is exposed to flu virus to when symptoms begin is about one to four days, with an average of about two days.

How long is a person with flu virus contagious?

The period when an infected person is contagious depends on the age and health of the person. Studies show that most healthy adults may be able to infect others from 1 day prior to becoming sick and for 5 days after they first develop

symptoms. Some young children and people with weakened immune systems may be contagious for longer than a week.

How many people get sick or die from the flu every year?

Each flu season is unique, but it is estimated that, on average, approximately 5% to 20% of U.S. residents get the flu, and [more than 200,000 persons are hospitalized](#) for flu-related complications each year. About 36,000 Americans die on average per year from the complications of flu.

Is the “stomach flu” really the flu?

No. Many people use the term "stomach flu" to describe illnesses with nausea, vomiting or diarrhea. These symptoms can be caused by many different viruses, bacteria or even parasites. While vomiting, diarrhea, and being nauseous or "sick to your stomach" can sometimes be related to the flu – more commonly in children than adults – these problems are rarely the main symptoms of influenza. The flu is a respiratory disease and not a stomach or intestinal disease.

Page last modified July 16, 2008

Key Facts About Seasonal Influenza (Flu)

What is Influenza (Also Called Flu)? The flu is a contagious respiratory illness caused by influenza viruses. It can cause mild to severe illness, and at times can lead to death. The best way to prevent the flu is by getting a flu **vaccination** each year.

Every year in the United States, on average:

5% to 20% of the population gets the flu;
more than 200,000 people are hospitalized from flu complications; and
about 36,000 people die from flu.

Some people, such as older people, young children, and people with certain health conditions (such as asthma, diabetes, or heart disease), are at high risk for serious flu complications.

Symptoms of Flu Symptoms of flu include:

fever (usually high)
headache
extreme tiredness
dry cough
sore throat
runny or stuffy nose
muscle aches

Stomach symptoms, such as nausea, vomiting, and diarrhea, also can occur but are more common in children than adults

Complications of Flu Complications of flu can include bacterial pneumonia, ear infections, sinus infections, dehydration, and worsening of chronic medical conditions, such as congestive heart failure, asthma, or diabetes.

How Flu Spreads Flu viruses spread mainly from person to person through coughing or sneezing of people with influenza. Sometimes people may become infected by touching something with flu viruses on it and then touching their mouth or nose. Most healthy adults may be able to infect others beginning 1 day **before** symptoms develop and up to 5 days **after** becoming sick. **That means that you may be able to pass on the flu to someone else before you know you are sick, as well as while you are sick.**

Preventing Seasonal Flu: Get Vaccinated The single best way to prevent the flu is to get a flu vaccination each year. There are two types of vaccines:

The "flu shot" – an inactivated vaccine (containing killed virus) that is given with a needle. The flu shot is approved for use in people 6 months of age and older, including healthy people and people with chronic medical conditions.

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The nasal-spray flu vaccine – a vaccine made with live, weakened flu viruses that do not cause the flu (sometimes called LAIV for “Live Attenuated Influenza Vaccine”). LAIV is approved for use in healthy* people 2-49 years of age who are not pregnant.

About two weeks after vaccination, antibodies develop that protect against influenza virus infection. Flu vaccines will not protect against flu-like illnesses caused by non-influenza viruses.

When to Get Vaccinated Yearly flu vaccination should begin in September or as soon as vaccine is available and continue throughout the influenza season, into December, January, and beyond. This is because the timing and duration of influenza seasons vary. While influenza outbreaks can happen as early as October, most of the time influenza activity peaks in January or later.

Who Should Get Vaccinated? In general, anyone who wants to reduce their chances of getting the flu can get vaccinated. However, certain people should get vaccinated each year either because they are at high risk of having serious flu-related complications or because they live with or care for high risk persons. During flu seasons when vaccine supplies are limited or delayed, the Advisory Committee on Immunization Practices (ACIP) makes [recommendations regarding priority groups for vaccination](#).

People who should get vaccinated each year are:

1. People at high risk for complications from the flu, including:

- Children aged 6 months until their 5th birthday,
- Pregnant women,
- People 50 years of age and older,
- People of any age with certain chronic medical conditions, and
- People who live in nursing homes and other long-term care facilities.

2. People who live with or care for those at high risk for complications from flu, including:

- Household contacts of persons at high risk for complications from the flu (see above),
- Household contacts and out of home caregivers of children less than 6 months of age (these children are too young to be vaccinated), and
- Health care workers.

3. Children aged 6 months up to their 19th birthday

4. Anyone who wants to decrease their risk of influenza.

Use of the Nasal Spray Flu Vaccine Vaccination with the nasal-spray flu vaccine is an option for healthy* people 2-49 years of age who are not pregnant, even healthy persons who live with or care for those in a high-risk group. The one exception is healthy persons who care for persons with severely weakened immune systems who require a protected environment; these healthy persons should get the inactivated vaccine. August 26, 2008 Page 3 of 3

Who Should Not Be Vaccinated Some people should not be vaccinated without first consulting a physician. They include:

- People who have a severe allergy to chicken eggs.
- People who have had a severe reaction to an influenza vaccination in the past.
- People who developed [Guillain-Barré syndrome \(GBS\)](#) within 6 weeks of getting an influenza vaccine previously.
- Children less than 6 months of age (influenza vaccine is not approved for use in this age group).
- People who have a moderate or severe illness with a fever should wait to get vaccinated until their symptoms lessen.

If you have questions about whether you should get a flu vaccine, consult your health-care provider.

For more about preventing the flu, see the following:

[Key Facts About Seasonal Flu Vaccine](#)
[Influenza Antiviral Drugs](#)
[Good Health Habits for Prevention](#)
[The Flu: A Guide for Parents](#)

* "Healthy" indicates persons who do not have an underlying medical condition that predisposes them to influenza complications.

For more information, visit www.cdc.gov/flu, or call CDC at 800-CDC-INFO (English and Spanish) or 888-232-6348 (TTY).

Legionnaires' Disease

- How common is legionellosis in the United States?
- What are the usual symptoms of legionellosis?
- How is legionellosis diagnosed?
- Who gets legionellosis?
- What is the treatment for legionellosis?
- How is legionellosis spread?
- Where is the Legionella bacterium found?
- What is being done to prevent legionellosis?

Legionellosis is an infection caused by the bacterium *Legionella pneumophila*. The disease has two distinct forms:

- Legionnaires' disease, the more severe form of infection which includes pneumonia, and
- Pontiac fever, a milder illness.

Legionnaires' disease acquired its name in 1976 when an outbreak of pneumonia occurred among persons attending a convention of the American Legion in Philadelphia. Later, the bacterium causing the illness was named *Legionella*.

How common is legionellosis in the United States?

An estimated 8,000 to 18,000 people get Legionnaires' disease in the United States each year. Some people can be infected with the *Legionella* bacterium and have mild symptoms or no illness at all.

Outbreaks of Legionnaires' disease receive significant media attention. However, this disease usually occurs as a single, isolated case not associated with any recognized outbreak. When outbreaks do occur, they are usually recognized in the summer and early fall, but cases may occur year-round. About 5% to 30% of people who have Legionnaires' disease die.

What are the usual symptoms of legionellosis?

Patients with Legionnaires' disease usually have fever, chills, and a cough, which may be dry or may produce sputum. Some patients also have muscle aches, headache, tiredness, loss of appetite, and, occasionally, diarrhea. Laboratory tests may show that these patients' kidneys are not functioning properly. Chest X-rays often show pneumonia. It is difficult to distinguish Legionnaires' disease from other types of pneumonia by symptoms alone; other tests are required for diagnosis.

Persons with Pontiac fever experience fever and muscle aches and do not have pneumonia. They generally recover in 2 to 5 days without treatment.

The time between the patient's exposure to the bacterium and the onset of illness for Legionnaires' disease is 2 to 10 days; for Pontiac fever, it is shorter, generally a few hours to 2 days.

How is legionellosis diagnosed?

The diagnosis of legionellosis requires special tests not routinely performed on persons with fever or pneumonia. Therefore, a physician must consider the possibility of legionellosis in order to obtain the right tests.

Several types of tests are available. The most useful tests detect the bacteria in sputum, find *Legionella* antigens in urine samples, or compare antibody levels to *Legionella* in two blood samples obtained 3 to 6 weeks apart.

Who gets legionellosis?

People of any age may get Legionnaires' disease, but the illness most often affects middle-aged and older persons, particularly those who smoke cigarettes or have chronic lung disease. Also at increased risk are persons whose immune system is suppressed by diseases such as cancer, kidney failure requiring dialysis, diabetes, or AIDS. Those that take drugs that suppress the immune system are also at higher risk.

Pontiac fever most commonly occurs in persons who are otherwise healthy.

What is the treatment for legionellosis?

Erythromycin is the antibiotic currently recommended for treating persons with Legionnaires' disease. In severe cases, a second drug, rifampin, may be used in addition. Other drugs are available for patients unable to tolerate erythromycin.

Pontiac fever requires no specific treatment.

How is legionellosis spread?

Outbreaks of legionellosis have occurred after persons have breathed mists that come from a water source (e.g., air conditioning cooling towers, whirlpool spas, showers) contaminated with *Legionella* bacteria. Persons may be exposed to these mists in homes, workplaces, hospitals, or public places. Legionellosis is not passed from person to person, and there is no evidence of persons becoming infected from auto air conditioners or household window air-conditioning units.

Where is the *Legionella* bacterium found?

Legionella organisms can be found in many types of water systems. However, the bacteria reproduce to high numbers in warm, stagnant water (90°-105° F), such as that found in certain plumbing systems and hot water tanks, cooling towers and evaporative condensers of large air-conditioning systems, and whirlpool spas. Cases of legionellosis have been identified throughout the United States and in several foreign countries. It is believed to occur worldwide.

What is being done to prevent legionellosis?

Improved design and maintenance of cooling towers and plumbing systems to limit the growth and spread of *Legionella* organisms are the foundations of legionellosis prevention.

During outbreaks, CDC and health department investigators seek to identify the source of disease transmission and recommend appropriate prevention and control measures, such as decontamination of the water source. Current research will likely identify additional prevention strategies.

http://www.cdc.gov/ncidod/dbmd/diseaseinfo/legionellosis_g.htm

Meningitis

- What is meningitis?
- What are the signs and symptoms of meningitis?
- How is meningitis diagnosed?
- Can meningitis be treated?
- Is meningitis contagious?
- Are there vaccines against meningitis?

What is meningitis?

Meningitis is an infection of the fluid of a person's spinal cord and the fluid that surrounds the brain. People sometimes refer to it as spinal meningitis. Meningitis is usually caused by a viral or bacterial infection. Knowing whether meningitis is caused by a virus or bacterium is important because the severity of illness and the treatment differ. Viral meningitis is generally less severe and resolves without specific treatment, while bacterial meningitis can be quite severe and may result in brain damage, hearing loss, or learning disability. For bacterial meningitis, it is also important to know which type of bacteria is causing the meningitis because antibiotics can prevent some types from spreading and infecting other people. Before the 1990s, *Haemophilus influenzae* type b (Hib) was the leading cause of bacterial meningitis, but new vaccines being given to all children as part of their routine immunizations have reduced the occurrence of invasive disease due to *H. influenzae*. Today, *Streptococcus pneumoniae* and *Neisseria meningitidis* are the leading causes of bacterial meningitis.

What are the signs and symptoms of meningitis?

High fever, headache, and stiff neck are common symptoms of meningitis in anyone over the age of 2 years. These symptoms can develop over several hours, or they may take 1 to 2 days. Other symptoms may include nausea, vomiting, discomfort looking into bright lights, confusion, and sleepiness. In newborns and small infants, the classic symptoms of fever, headache, and neck stiffness may be absent or difficult to detect, and the infant may only appear slow or inactive, or be irritable, have vomiting, or be feeding poorly. As the disease progresses, patients of any age may have seizures.

How is meningitis diagnosed?

Early diagnosis and treatment are very important. If symptoms occur, the patient should see a doctor immediately. The diagnosis is usually made by growing bacteria from a sample of spinal fluid. The spinal fluid is obtained by performing a spinal tap, in which a needle is inserted into an area in the lower back where fluid in the spinal canal is readily accessible. Identification of the type of bacteria responsible is important for selection of correct antibiotics.

Can meningitis be treated?

Bacterial meningitis can be treated with a number of effective antibiotics. It is important, however, that treatment be started early in the course of the disease. Appropriate antibiotic treatment of most common types of bacterial meningitis should reduce the risk of dying from meningitis to below 15%, although the risk is higher among the elderly.

Is meningitis contagious?

Yes, some forms of bacterial meningitis are contagious. The bacteria are spread through the exchange of respiratory and throat secretions (i.e., coughing, kissing). Fortunately, none of the bacteria that cause meningitis are as contagious as things like the common cold or the flu, and they are not spread by casual contact or by simply breathing the air where a person with meningitis has been.

However, sometimes the bacteria that cause meningitis have spread to other people who have had close or prolonged contact with a patient with meningitis caused by *Neisseria meningitidis* (also called meningococcal meningitis) or Hib. People in the same household or day-care center, or anyone with direct contact with a patient's oral secretions (such as a boyfriend or girlfriend) would be considered at increased risk of acquiring the infection. People who qualify as close contacts of a person with meningitis caused by *N. meningitidis* should receive antibiotics to prevent them from getting the disease. Antibiotics for contacts of a person with Hib meningitis disease are no longer recommended if all contacts 4 years of age or younger are fully vaccinated against Hib disease (see below).

Are there vaccines against meningitis?

Yes, there are vaccines against Hib and against some strains of *N. meningitidis* and many types of *Streptococcus pneumoniae*. The vaccines against Hib are very safe and highly effective.

There is also a vaccine that protects against four strains of *N. meningitidis*, but it is not routinely used in the United States. The vaccine against *N. meningitidis* is sometimes used to control outbreaks of some types of meningococcal meningitis in the United States. Meningitis cases should be reported to state or local health departments to assure follow-up of close contacts and recognize outbreaks. College freshman, especially those who live in dormitories are at higher risk for meningococcal disease and should be educated about the availability of a safe and effective vaccine which can decrease their risk. Although large epidemics of meningococcal meningitis do not occur in the United States, some countries experience large, periodic epidemics. Overseas travelers should check to see if meningococcal vaccine is recommended for their destination. Travelers should receive the vaccine at least 1 week before departure, if possible. Information on areas for which meningococcal vaccine is recommended can be obtained by calling the Centers for Disease Control and Prevention at (404)-332-4565.

There are vaccines to prevent meningitis due to *S. pneumoniae* (also called pneumococcal meningitis) which can also prevent other forms of infection due to *S. pneumoniae*. The pneumococcal polysaccharide vaccine is recommended for all persons over 65 years of age and younger persons at least 2 years old with certain

chronic medical problems. There is a newly licensed vaccine (pneumococcal conjugate vaccine) that appears to be effective in infants for the prevention of pneumococcal infections and is routinely recommended for all children greater than 2 years of age.

http://www.cdc.gov/ncidod/dbmd/diseaseinfo/meningococcal_g.htm

Viral (Aseptic) Meningitis

What is meningitis?

Meningitis is an illness in which there is inflammation of the tissues that cover the brain and spinal cord. Viral or aseptic meningitis, which is the most common type, is caused by an infection with one of several types of viruses. Meningitis can also be caused by infections with several types of bacteria or fungi.

What are the symptoms of meningitis?

The symptoms of meningitis may not be the same for every person. The more common symptoms are fever, severe headache, stiff neck, bright lights hurt the eyes, drowsiness or confusion, and nausea and vomiting. In babies, the symptoms are more difficult to identify. They may include fever, fretfulness or irritability, difficulty in awakening the baby, or the baby refuses to eat.

Is viral meningitis a serious disease?

Viral (aseptic) meningitis is serious but rarely fatal in persons with normal immune systems. Usually, the symptoms last from 7 to 10 days and the person recovers completely. Bacterial meningitis, on the other hand, can be very serious and result in disability or death if not treated promptly. Often, the symptoms of viral meningitis and bacterial meningitis are the same. For this reason, if you think you or your child has meningitis, see your doctor as soon as possible.

What causes viral meningitis?

Many different viruses can cause meningitis. About 90% of cases of viral meningitis are caused by members of a group of viruses known as enteroviruses, such as coxsackieviruses and echoviruses. Herpesviruses and the mumps virus can also cause viral meningitis.

How is viral meningitis diagnosed?

Viral meningitis is usually diagnosed by laboratory tests of spinal fluid obtained with a spinal tap. It can also be diagnosed by tests that identify the virus in specimens collected from the patient, but these tests are not usually done.

How is viral meningitis treated?

No specific treatment for viral meningitis exists at this time. Most patients recover completely on their own, and doctors often will recommend bed rest, plenty of fluids, and medicine to relieve fever and headache.

Can I get viral meningitis if I'm around someone who has it?

The viruses that cause viral meningitis are contagious. Enteroviruses, for example, are very common during the summer and early fall, and many people are exposed to them. However, most infected persons either have no symptoms or develop only a

cold or rash with low-grade fever. Typically, fewer than 1 of every 1000 persons infected actually develop meningitis. Therefore, if you are around someone who has viral meningitis, you have a moderate chance of becoming infected, but a very small chance of developing meningitis.

How is the virus spread?

Enteroviruses, the most common cause of viral meningitis, are most often spread through direct contact with respiratory secretions (e.g., saliva, sputum, or nasal mucus) of an infected person. This usually happens by shaking hands with an infected person or touching something they have handled, and then rubbing your own nose, mouth or eyes. The virus can also be found in the stool of persons who are infected. The virus is spread through this route mainly among small children who are not yet toilet trained. It can also be spread this way to adults changing the diapers of an infected infant. The incubation period for enteroviruses is usually between 3 and 7 days from the time you are infected until you develop symptoms. You can usually spread the virus to someone else beginning about 3 days after you are infected until about 10 days after you develop symptoms.

How can I reduce my chances of becoming infected?

Because most persons who are infected with enteroviruses do not become sick, it can be difficult to prevent the spread of the virus. If you are in contact with someone who has viral meningitis, however, the most effective method of prevention is to wash your hands thoroughly and often. In institutional settings such as child care centers, washing objects and surfaces with a dilute bleach solution (made by mixing 1 capful of chlorine-containing household bleach with 1 gallon water) can be a very effective way to inactivate the virus.

For further information, please contact the Respiratory and Enteric Viruses Branch, National Center for Infectious Diseases, at 404-639-3607 (telephone) or 404-639-4960 (facsimile).

http://www.cdc.gov/ncidod/dvrd/revb/enterovirus/viral_meningitis.htm

Mold in My Home: What Do I Do?

California Department of Health Services Indoor Air Quality Info Sheet

Revised July 2001

This is an update of our March 1998 info sheet to provide basic information to people who have experienced water damage to their home. It describes health concerns related to mold exposure, and it also provides general guidelines on prevention, mold detection, as well as cleanup of mold-contaminated materials. Additional resources and documents are referenced.

ABOUT MOLD

What are Molds?

Molds are simple, microscopic organisms, present virtually everywhere, indoors and outdoors. Molds, along with mushrooms and yeasts, are *fungi* and are needed to break down dead material and recycle nutrients in the environment. For molds to grow and reproduce, they need only a food source – any organic material, such as leaves, wood, paper, or dirt— and moisture. Because molds grow by digesting the organic material, they gradually destroy whatever they grow on. Sometimes, new molds grow on old mold colonies. Mold growth on surfaces can often be seen in the form of discoloration, frequently green, gray, brown, or black but also white and other colors. Molds release countless tiny, lightweight spores, which travel through the air.

How am I exposed to indoor molds?

Everyone is exposed to some mold on a daily basis without evident harm. It is common to find mold spores in the air inside homes, and most of the airborne spores found indoors come from outdoor sources. Mold spores primarily cause health problems when they are present in large numbers and people *inhale* many of them. This occurs primarily when there is *active* mold growth within home, office or school where people live or work. People can also be exposed to mold by touching contaminated materials and by eating contaminated foods.

Can mold become a problem in my home?

Molds will grow and multiply whenever conditions are right—sufficient moisture is available and organic material is present. Be on the lookout in your home for common sources of indoor moisture that may lead to mold problems:

- Flooding
- Leaky roofs
- Sprinkler spray hitting the house
- Plumbing leaks
- Overflow from sinks or sewers
- Damp basement or crawl space
- Steam from shower or cooking
- Humidifiers
- Wet clothes drying indoors or clothes dryers exhausting indoors

Warping floors and discoloration of walls and ceilings can be indications of moisture problems. *Condensation on windows or walls* is also an important indication, but it can sometimes be caused by an indoor combustion problem! *Have fuel-burning appliances routinely inspected by your local utility or a professional heating contractor.*

Should I be concerned about mold in my home?

Yes, if indoor mold contamination is extensive, it can cause very high and persistent airborne spore exposures. Persons exposed to high spore levels can become sensitized and develop allergies to the mold or other health problems. Mold growth can damage your furnishings, such as carpets, sofas and cabinets. Clothes and shoes in damp closets can become soiled. In time, unchecked mold growth can cause serious damage to the structural elements in your home.

HEALTH EFFECTS

What symptoms are commonly seen with mold exposure?

Molds produce health effects through inflammation, allergy, or infection. Allergic reactions (often referred to as hay fever) are most common following mold exposure. Typical symptoms that mold-exposed persons report (alone or in combination) include:

- Respiratory problems, such as wheezing, difficulty breathing, and shortness of breath
- Nasal and sinus congestion
- Eye irritation (burning, watery, or reddened eyes)
- Dry, hacking cough
- Nose or throat irritation
- Skin rashes or irritation

Headaches, memory problems, mood swings, nosebleeds, body aches and pains, and fevers are occasionally reported in mold cases, but their cause is not understood.

How much mold can make me sick?

It depends. For some people, a relatively small number of mold spores can trigger an asthma attack or lead to other health problems. For other persons, symptoms may occur only when exposure levels are much higher. Nonetheless, indoor mold growth is unsanitary and undesirable. Basically, *if you can see or smell mold* inside your home, take steps to identify and eliminate the excess moisture and to cleanup and remove the mold.

Are some molds more hazardous than others?

Allergic persons vary in their sensitivities to mold, both as to the amount and the types to which they react. In addition to their allergic properties, certain types of molds, such as *Stachybotris chartarum*, may produce compounds that have toxic properties, which are called mycotoxins. Mycotoxins are not always produced, and whether a mold produces mycotoxins while growing in a building depends on what

the mold is growing on, conditions such as temperature, pH, humidity or other unknown factors. When mycotoxins are present, they occur in both living and dead mold spores and may be present in materials that have become contaminated with molds. While *Stachybotrys* is growing, a wet slime layer covers its spores, preventing them from becoming airborne. However, when the mold dies and dries up, air currents or physical handling can cause spores to become airborne.

At present there is no environmental test to determine whether *Stachybotrys* growth found in buildings is producing toxins. There is also no blood or urine test that can establish if an individual has been exposed to *Stachybotrys chartarum* spores or its toxins.

Who is at greater risk when exposed to mold?

Exposure to mold is not healthy for anyone inside buildings. Therefore, it is always best to identify and correct high moisture conditions quickly before mold grows and health problems develop.

Some people may have more severe symptoms or become ill more rapidly than others:

- Individuals with existing respiratory conditions, such as allergies, chemical sensitivities, or asthma.
- Persons with weakened immune systems (such as people with HIV infection, cancer chemotherapy patients, and so forth)
- Infants and young children
- The elderly

Anyone with health problems they believe due to molds should consult a medical professional.

Additional fact sheets on Mold and Health Effects are available from CDHS:

- *Health Effects of Toxin-Producing Molds in California*
- *Stachybotrys chartarum (atra) – a mold that may be found in water-damaged homes*
- *Fungi and Indoor Air Quality*
- *Misinterpretation of Stachybotrys Serology*

These documents are available from the Environmental Health Investigation Branch, (510) 622-4500, or on the web at www.dhs.ca.gov/ehib/.

DETECTION OF MOLD

How can I tell if I have mold in my house?

You may suspect that you have mold if you see discolored patches or cottony or speckled growth on walls or furniture or if you *smell* an earthy or musty odor. You also may suspect mold contamination if mold-allergic individuals *experience* some of the symptoms listed above when in the house. *Evidence of past or ongoing water*

damage should also trigger more thorough inspection. You may find mold growth underneath water-damaged surfaces or behind walls, floors or ceilings.

Should I test my home for mold?

The California Department of Health Services does not recommend testing as a first step to determine if you have a mold problem. Reliable air sampling for mold can be expensive and requires expertise and equipment that is not available to the general public. Owners of individual private homes and apartment generally will need to pay a contractor to carry out such sampling, because insurance companies and public health agencies seldom provide this service. Mold inspection and cleanup is usually considered a housekeeping task that is the responsibility of homeowner or landlord, as are roof and plumbing repairs, house cleaning, and yard maintenance.

Another reason the health department does not recommend testing for mold contamination is that there are few available standards for judging what is an acceptable quantity of mold. In all locations, there is some level of airborne mold outdoors. If sampling is carried out in a home, an outdoor air sample also must be collected at the same time as the indoor samples, to provide a baseline measurement. Because individual susceptibility varies so greatly, sampling is at best a general guide.

The simplest way to deal with a suspicion of mold contamination is: **If you can see or smell mold, you likely have a problem and should take the steps outlined below.** Mold growth is likely to recur unless the source of moisture that is allowing mold to grow is removed and the contaminated area is cleaned.

GENERAL CLEAN-UP PROCEDURES

The following is intended as an overview for homeowners or apartment dwellers. We recommend that you consult one of several more thorough documents currently available as guidance, listed in the USEFUL PUBLICATIONS section below.

Elements of the Clean-up Procedures

- Identify and eliminate sources of moisture
- Identify and assess the magnitude and area of mold contamination
- Clean and dry moldy areas – use containment of affected areas
- Bag and dispose of all material that may have moldy residues, such as rags, paper, leaves, and debris.

Assessing the Size of a Mold Contamination Problem

There will be a significant difference in the approach used for a small mold problem – total area affected is less than 10 ft² – and a large contamination problem – more than 100 ft². In the case of a relatively small area, the clean-up can be handled by the homeowner or maintenance staff, using personal protective equipment (see below). However, for cases of much larger areas, it is advisable that an experienced, professional contractor be used. For in-between sized cases, the type of

containment and personal protection equipment to be used will be a matter of judgment.

Can cleaning up mold be hazardous to my health?

Yes. During the cleaning process, you may be exposed to mold, strong detergents, and disinfectants. Spore counts may be 10 to 1000 times higher than background levels when mold-contaminated materials are disturbed. Take steps to protect you and your family's health during cleanup:

- When handling or cleaning moldy materials, it is important to use a respirator to protect yourself from inhaling airborne spores.

Respirators can be purchased from hardware stores; select one that is effective for particle removal (sometimes referred to as an N-95 particulate respirator). However, respirators that remove particles will not protect you from fumes (such as bleach). Minimize exposure when using bleach or other disinfectants by ensuring good ventilation of the area.

- Wear protective clothing that is easily cleaned or discarded.
- Use rubber gloves.
- Try cleaning a test area first. If you feel that this activity adversely affected your health, you should consider paying a licensed contractor or other experienced professional to carry out the work.
- Ask family members or bystanders to leave areas that are being cleaned.
- Work for short time periods and rest in a location with fresh air.
- Air out your house well during and after the work.

Never use a gasoline engine indoors (e.g., water pump, pressure washer or generator), as you could expose your family to toxic carbon monoxide.

Removal of Moldy Materials

Clean up should begin *after* the moisture source is fixed and excess water has been removed. Wear gloves when handling moldy materials.

- Discard porous materials (for example, ceiling tiles, sheetrock, carpeting, and wood products).
- Bag and discard moldy items; if properly enclosed, items can be disposed with household trash.
- Dry affected areas for 2 or 3 days.

Spores are more easily released when moldy materials dry out, hence it is advisable to remove moldy items as soon as possible.

If there was flooding, sheetrock should be removed to a level above the high-water mark. Visually inspect the wall interior and remove any mold-contaminated materials.

What can I save? What should I toss?

You should discard moldy items that are porous and from which it will be difficult to remove mold completely: paper, rags, wallboard, rotten wood, carpet, drapes, and upholstered furniture. Contaminated carpet is often difficult to thoroughly clean, especially when the backing and/or padding can become moldy. Solid materials – glass, plastic, and metal – can generally be kept after they are thoroughly cleaned.

Clean-up

When attempting to clean less porous items (i.e., solid items such as floors, cabinets, solid furniture), the first step is to remove as much mold as possible. A cleaning detergent is effective for this purpose. Wear gloves, mask and eye protection when doing this cleanup.

- Use non-ammonia soap or detergent, or a commercial cleaner, in hot water, and scrub the entire area that is affected by the mold.
- Use a stiff brush or cleaning pad on cement-block walls or other uneven surfaces.
- Rinse cleaned items with water and dry thoroughly. A wet/dry vacuum cleaner is helpful for removing water and cleaning items.

Disinfection of Contaminated Materials

Disinfecting agents can be toxic for humans, not just molds. They should be used only when necessary and should be handled with caution.

Disinfectants are intended to be applied to thoroughly cleaned materials and are used to ensure that most microorganisms have been killed. *Therefore, do not use disinfectants instead of, or before, cleaning materials with soap or detergent.* Removal of mold growth from nonporous materials usually is sufficient. Wear gloves, mask and eye protection when using disinfectants

- After thoroughly cleaning and rinsing contaminated materials, a solution of 10% household bleach (for example, 1½ cup household bleach per gallon of water) can be used as a disinfectant.
- **Using bleach straight from the bottle is actually LESS effective than diluted bleach.**
- Keep the disinfectant on the treated material for the prescribed time before rinsing or drying; typically 10 minutes is recommended for a bleach solution
- **Bleach fumes can irritate the eyes, nose, and throat, and damage clothing and shoes. Make sure working areas are well ventilated.**
- When disinfecting a large structure, make sure that the entire surface is wetted (for example, the floors, joists, and posts).
- Properly collect and dispose extra disinfectant and runoff.
- **Never mix bleach with ammonia; toxic fumes may be produced.**

Can air ducts become contaminated with mold?

Yes. Air duct systems can become contaminated with mold. Duct systems may be constructed of bare sheet metal, sheet metal with fibrous glass insulation on the exterior, or sheet metal with an internal fibrous glass liner, or they may be made

entirely of fibrous glass. Bare sheet metal systems and sheet metal with exterior fibrous glass insulation can be cleaned and disinfected. If water damaged, ductwork made of sheet metal with an **internal** fibrous glass liner or made entirely of fibrous glass will often need to be removed and discarded. Ductwork in difficult-to-reach locations may have to be abandoned. If you have other questions, contact an air duct cleaning professional or licensed contractor.

Can ozone air cleaners help remove indoor mold or reduce odors?

Sometimes air cleaners are promoted to remove indoor mold or associated odors, and some of these are designed to produce ozone. Ozone is a strong oxidizing agent that is used as a disinfectant in water and sometimes to eliminate odors. However, ozone is a known lung irritant. Ozone generators have been shown to sometimes produce indoor levels above the safe limit. Furthermore, it has been shown that **ozone is not effective in controlling molds and other microbial contamination**, even at concentrations far above safe health levels. Also, ozone may damage materials in the home, for example, cause rubber items to become brittle. For these reasons, **the California Department of Health Services strongly recommends that you NOT use an ozone air cleaner in any occupied space**. Refer to the CDHS IAQ Info Sheet: *Health Hazards of Ozone-generating Air Cleaning Devices* (January 1998), available on the CDHS-IAQS web site.

How can I *prevent* indoor mold problems in my home?

Inspect your home regularly for the indications and sources of indoor moisture and mold listed on Page 1. Take steps to eliminate sources of water as quickly as possible. If a leak or flooding occurs, it is essential to act *quickly*:

- Stop the source of leak or flooding.
- Remove excess water with mops or wet vacuum.
- Whenever possible, move wet items to a dry and well ventilated area or outside to expedite drying. Move rugs and pull up areas of wet carpet as soon as possible.
- Open closet and cabinet doors and move furniture away from walls to increase circulation.
- Run portable fans to increase air circulation. Do NOT use the home's central blower if flooding has occurred in it or in any of the ducts. Do NOT use fans if mold may have already started to grow -- more than 48 h since flooding.
- Run dehumidifiers and window air conditioners to lower humidity.
- Do NOT turn up the heat or use heaters in confined areas, as higher temperatures *increase* the rate of mold growth.
- If water has soaked inside the walls, it may be necessary to open wall cavities, remove baseboards, and/or pry open wall paneling.

<http://www.cal-iaq.org/mold0107.htm>

SARS

Severe acute respiratory syndrome (SARS) is a respiratory illness that has recently been reported in Asia, North America, and Europe. This fact sheet provides basic information about the disease and what is being done to combat its spread. To find out more about SARS, go to www.cdc.gov/ncidod/sars/ and www.who.int/csr/sars/en/ . The Web sites are updated daily.

Symptoms of SARS

In general, SARS begins with a fever greater than 100.4°F [$>38.0^{\circ}\text{C}$]. Other symptoms may include headache, an overall feeling of discomfort, and body aches. Some people also experience mild respiratory symptoms. After 2 to 7 days, SARS patients may develop a dry cough and have trouble breathing.

How SARS spreads

The primary way that SARS appears to spread is by close person-to-person contact. Most cases of SARS have involved people who cared for or lived with someone with SARS, or had direct contact with infectious material (for example, respiratory secretions) from a person who has SARS. Potential ways in which SARS can be spread include touching the skin of other people or objects that are contaminated with infectious droplets and then touching your eye(s), nose, or mouth. This can happen when someone who is sick with SARS coughs or sneezes droplets onto themselves, other people, or nearby surfaces. It also is possible that SARS can be spread more broadly through the air or by other ways that are currently not known.

Who is at risk for SARS

Most of the U.S. cases of SARS have occurred among travelers returning to the United States from other parts of the world with SARS. There have been very few cases as a result of spread to close contacts such as family members and health care workers. Currently, there is no evidence that SARS is spreading more widely in the community in the United States.

Possible cause of SARS

Scientists at CDC and other laboratories have detected a previously unrecognized coronavirus in patients with SARS. The new coronavirus is the leading hypothesis for the cause of SARS.

What the CDC is doing about SARS

CDC is working closely with the World Health Organization (WHO) and other partners in a global effort to address the SARS outbreak. For its part, CDC has taken the following actions:

- Activated its Emergency Operations Center to provide round-the-clock coordination and response.

- Committed more than 300 medical experts and support staff to work on the SARS response.
- Deployed medical officers, epidemiologists, and other specialists to assist with on-site investigations around the world.
- Provided ongoing assistance to state and local health departments in investigating possible cases of SARS in the United States.
- Conducted extensive laboratory testing of clinical specimens from SARS patients to identify the cause of the disease.
- Initiated a system for distributing health alert notices to travelers who may have been exposed to cases of SARS.

CDC RECOMMENDATIONS

CDC has issued recommendations and guidelines for people who may be affected by this outbreak.

For individuals considering travel to areas with SARS:

CDC has issued two types of notices to travelers: advisories and alerts. A ***travel advisory*** recommends that nonessential travel be deferred; a ***travel alert*** does not advise against travel, but informs travelers of a health concern and provides advice about specific precautions. CDC updates information on its website on the travel status of other areas with SARS as the situation evolves.

For individuals who must travel to an area with SARS:

CDC advises that travelers in an area with SARS should wash their hands frequently to protect against SARS infection. In addition, CDC advises that travelers may wish to avoid close contact with large numbers of people as much as possible to minimize the possibility of infection. CDC does not recommend the routine use of masks or other personal protective equipment while in public areas. For more information, read the Interim Guidelines about Severe Acute Respiratory Syndrome (SARS) for Persons Traveling to Areas with SARS.

For individuals who think they might have SARS:

People with symptoms of SARS (fever greater than 100.4°F [$>38.0^{\circ}\text{C}$] accompanied by a cough and/or difficulty breathing) should consult a health-care provider. To help the health-care provider make a diagnosis, tell them about any recent travel to places where SARS has been reported or whether there was contact with someone who had these symptoms.

For family members caring for someone with SARS:

CDC has developed interim infection control recommendations for patients with suspected SARS in the household. These basic precautions should be followed for 10 days after respiratory symptoms and fever is gone. During that time, SARS patients are asked to limit interactions outside the home (not go to work, school, or other public areas).

For health-care workers:

Worldwide, several health-care workers have been reported to develop Severe Acute Respiratory Syndrome (SARS) after caring for patients with SARS. Transmission to health-care workers appears to have occurred after close contact with symptomatic individuals (e.g., persons with fever or respiratory symptoms) before recommended infection control precautions for SARS were implemented (i.e., unprotected exposures). Personal protective equipment appropriate for standard, contact, and airborne precautions (e.g., hand hygiene, gown, gloves, and N95 respirator) in addition to eye protection, have been recommended for health-care workers to prevent transmission of SARS in health-care settings.

For more information, visit CDC's SARS Web site, or call the CDC public response hotline at (888) 246-2675 (English), (888) 246-2857 (Español), or (866) 874-2646 (TTY)

<http://www.cdc.gov/ncidod/sars/factsheet.htm>

TB - Tuberculosis

Introduction

What is TB?
How is TB spread?
What is latent TB infection?
What is TB disease?

Latent TB Infection

How can I get tested for TB?
What if I have been vaccinated with BCG?
If I have latent TB infection, how can I keep from developing TB disease?
What if I have HIV infection?

TB Disease

How is TB disease treated?
What are the side effects of drugs for TB?
Why do I need to take TB medicine regularly?
How can I remember to take my medicine?
How can I keep from spreading TB?
What is multidrug-resistant TB?

For definitions of common terms related to TB, see the glossary at the end of this document.

Introduction

What is TB?

TB, or tuberculosis, is a disease caused by bacteria called *Mycobacterium tuberculosis*. The bacteria can attack any part of your body, but they usually attack the lungs. TB disease was once the leading cause of death in the United States.

In the 1940s, scientists discovered the first of several drugs now used to treat TB. As a result, TB slowly began to disappear in the United States. But TB has come back. Between 1985 and 1992, the number of TB cases increased. The country became complacent about TB and funding of TB programs was decreased. However, with increased funding and attention to the TB problem, we have had a steady decline in the number of persons with TB. But TB is still a problem; more than 16,000 cases were reported in 2000 in the United States.

TB is spread through the air from one person to another. The bacteria are put into the air when a person with TB disease of the lungs or throat coughs or sneezes. People nearby may breathe in these bacteria and become infected.

People who are infected with latent TB do not feel sick, do not have any symptoms, and cannot spread TB. But they may develop TB disease at some time in the future.

People with TB disease can be treated and cured if they seek medical help. Even better, people who have latent TB infection but are not yet sick can take medicine so that they will never develop TB disease.

This document answers common questions about TB. Please ask your doctor or nurse if you have other questions about latent TB infection or TB disease.

How is TB spread?

TB is spread through the air from one person to another. The bacteria are put into the air when a person with TB disease of the lungs or throat coughs or sneezes. People nearby may breathe in these bacteria and become infected.

When a person breathes in TB bacteria, the bacteria can settle in the lungs and begin to grow. From there, they can move through the blood to other parts of the body, such as the kidney, spine, and brain.

TB in the lungs or throat can be infectious. This means that the bacteria can be spread to other people. TB in other parts of the body, such as the kidney or spine, is usually not infectious.

People with TB disease are most likely to spread it to people they spend time with every day. This includes family members, friends, and coworkers.

What is latent TB infection?

In most people who breathe in TB bacteria and become infected, the body is able to fight the bacteria to stop them from growing. The bacteria become inactive, but they remain alive in the body and can become active later. This is called latent TB infection. People with latent TB infection

- have no symptoms
- don't feel sick
- can't spread TB to others
- usually have a positive skin test reaction
- can develop TB disease later in life if they do not receive treatment for latent TB infection

Many people who have latent TB infection never develop TB disease. In these people, the TB bacteria remain inactive for a lifetime without causing disease. But in other people, especially people who have weak immune systems, the bacteria become active and cause TB disease.

What is TB disease?

TB bacteria become active if the immune system can't stop them from growing. The active bacteria begin to multiply in the body and cause TB disease. Some people develop TB disease soon after becoming infected, before their immune system can fight the TB bacteria. Other people may get sick later, when their immune system becomes weak for some reason.

Babies and young children often have weak immune systems. People infected with HIV, the virus that causes AIDS, have very weak immune systems. Other people can have weak immune systems, too, especially people with any of these conditions

- substance abuse
- diabetes mellitus
- silicosis
- cancer of the head or neck
- leukemia or Hodgkin's disease
- severe kidney disease
- low body weight
- certain medical treatments (such as corticosteroid treatment or organ transplants)

Symptoms of TB depend on where in the body the TB bacteria are growing. TB bacteria usually grow in the lungs. TB in the lungs may cause

- a bad cough that lasts longer than 2 weeks
- pain in the chest
- coughing up blood or sputum (phlegm from deep inside the lungs)

Other symptoms of TB disease are

- weakness or fatigue
- weight loss
- no appetite
- chills
- fever
- sweating at night

Difference Between Latent TB Infection and TB Disease	
Latent TB Infection	TB Disease
<ul style="list-style-type: none"> • Have no symptoms • Do not feel sick • Cannot spread TB to others • Usually have a positive skin test • Chest x-ray and sputum test normal 	<ul style="list-style-type: none"> • Symptoms include <ul style="list-style-type: none"> ○ a bad cough that lasts longer than 2 weeks ○ pain in the chest ○ coughing up blood or sputum ○ weakness or fatigue ○ weight loss ○ no appetite ○ chills ○ fever ○ sweating at night • May spread TB to others • Usually have a positive skin test • May have abnormal chest x-ray, and/or positive sputum smear or culture

Latent TB Infection

How can I get tested for TB?

A TB skin test is the only way to find out if you have latent TB infection. You can get a skin test at the health department or at your doctor's office. You should get tested for TB if:

- you have spent time with a person with known or suspected to have TB disease
- you have HIV infection or another condition that puts you at high risk for TB disease
- you think you might have TB disease
- you are from a country where TB disease is very common (most countries in Latin America and the Caribbean, Africa, Asia, Eastern Europe, and Russia)
- you inject drugs
- you live somewhere in the U.S. where TB disease is more common (homeless shelters, migrant farm camps, prisons and jails, and some nursing homes).

A health care worker can give you the TB skin test. The health care worker will inject a small amount of testing fluid (called tuberculin) just under the skin on the lower part of your arm. After 2 or 3 days, the health care worker will measure your reaction to the test. You may have a small bump where the tuberculin was injected. The health care worker will measure this bump and tell you if your reaction to the test is positive or negative. A positive reaction usually means that you have latent TB infection.

If you have a positive reaction to the skin test, your doctor or nurse may do other tests to see if you have TB disease. These tests usually include a chest x-ray and a test of the phlegm you cough up. Because the TB bacteria may be found somewhere besides your lungs, your doctor or nurse may check your blood or urine, or do other tests. If you have TB disease, you will need to take medicine to cure the disease.

If you have recently spent time with someone with infectious TB, your skin test reaction may not be positive yet. You may need a second skin test 10 to 12 weeks after the last time you spent time with the infectious person. This is because it can take several weeks after infection for your immune system to be able to react to the TB skin test. If your reaction to the second test is negative, you probably do not have latent TB infection.

What if I have been vaccinated with BCG?

BCG is a vaccine for TB. This vaccine is not widely used in the United States, but it is often given to infants and small children in other countries where TB is common. BCG vaccine does not always protect people from TB.

If you were vaccinated with BCG, you may have a positive reaction to a TB skin test. This reaction may be due to the BCG vaccine itself or to latent TB infection. But your positive reaction probably means that you have latent TB infection if:

- you recently spent time with a person who has TB disease

- you are from an area of the world where TB disease is very common (most countries in Latin America and the Caribbean, Africa, Asia, Eastern Europe, and Russia) you spend time where TB is common (homeless shelters, drug-treatment centers, health care clinics, jails, prisons).

If I have TB infection, how can I keep from developing TB disease?

Many people who have latent TB infection never develop TB disease. But some people who have latent TB infection are more likely to develop TB disease than others. These people are at **high risk** for TB disease. They include:

- people with HIV infection
- people who became infected with TB bacteria in the last 2 years
- babies and young children
- people who inject drugs
- people who are sick with other diseases that weaken the immune system
- elderly people
- people who were not treated correctly for TB in the past

If you have latent TB infection (a positive skin test reaction) and you are in one of these high-risk groups, you need to take medicine to keep from developing TB disease. This is called treatment for latent TB infection. There are many treatment options. You and your health care provider must decide which treatment is best for you.

The medicine usually used for the treatment of latent TB infection is a drug called isoniazid or INH. INH kills the TB bacteria that are in the body. If you take your medicine as prescribed, treatment for latent TB infection will keep you from ever developing TB disease.

Most people must take INH for at least 6 to 9 months. Children and people with HIV infection may need to take INH for a longer time.

Sometimes people are given treatment for latent TB infection even if their skin test reaction is not positive. This is often done with infants, children, and HIV-infected people who have recently spent time with someone with infectious TB disease. This is because they are at very high risk of developing serious TB disease soon after they become infected with TB bacteria.

It is important that you take all the pills prescribed for you so that your treatment for latent TB infection is effective. If you start taking INH, you will need to see your doctor or nurse on a regular schedule. He or she will check on how you are doing. Very few people have serious side effects to INH. However, if you have any of the following side effects call your doctor or nurse right away:

- no appetite
- nausea
- vomiting
- yellowish skin or eyes
- fever for 3 or more days
- abdominal pain

- tingling in the fingers and toes

Warning: Drinking alcoholic beverages (wine, beer, and liquor) while taking INH can be dangerous. Check with your doctor or nurse for more information.

People who have latent TB infection but do not receive treatment for latent TB infection need to know the symptoms of TB. If they develop symptoms of TB disease later on, they should see a doctor right away.

What if I have HIV infection?

A person can have latent TB infection for years without any signs of disease. But if that person's immune system gets weak, the infection can quickly turn into TB disease. Also, if a person who has a weak immune system spends time with someone with infectious TB, he or she may become infected with TB bacteria and quickly develop TB disease.

Because HIV infection weakens the immune system, people with latent TB infection and HIV infection are at **very high risk** of developing TB disease. All HIV-infected people should be given a TB skin test to find out if they have latent TB infection. If they have latent TB infection, they need treatment for latent TB infection **as soon as possible** to prevent them from developing TB disease. If they have TB disease, they must take medicine to cure the disease.

TB disease can be prevented and cured, even in people with HIV infection.

TB Disease

How is TB disease treated?

There is good news for people with TB disease! TB disease can almost always be cured with medicine. But the medicine must be taken as the doctor or nurse tells you.

The most common drugs used to fight TB are:

- isoniazid (INH)
- rifampin
- pyrazinamide
- ethambutol
- streptomycin

If you have TB disease, you will need to take several different drugs. This is because there are many bacteria to be killed. Taking several drugs will do a better job of killing all of the bacteria and preventing them from becoming resistant to the drugs.

If you have TB of the lungs or throat, you are probably infectious. You need to stay home from work or school so that you don't spread TB bacteria to other people. After taking your medicine for a few weeks, you will feel better and you may no longer be infectious to others. Your doctor or nurse will tell you when you can return to work or school.

Having TB should not stop you from leading a normal life. When you are no longer infectious or feeling sick, you can do the same things you did before you had TB. The medicine that you are taking should not affect your strength, sexual function, or ability to work. If you take your medicine as your doctor or nurse tells you, the medicine will kill all the TB bacteria. This will keep you from becoming sick again.

What are the side effects of drugs for TB?

Medicine for TB is relatively safe. Occasionally, the drugs may cause side effects. Some side effects are minor problems. Others are more serious. If you have a serious side effect, **call your doctor or nurse immediately**. You may be told to stop taking your medicine or to return to the clinic for tests.

The side effects listed below are **serious**. If you have any of these symptoms, call your doctor or nurse immediately:

- no appetite
- nausea
- vomiting
- yellowish skin or eyes
- fever for 3 or more days
- abdominal pain
- tingling fingers or toes
- skin rash
- easy bleeding
- aching joints
- dizziness
- tingling or numbness around the mouth
- easy bruising
- blurred or changed vision
- ringing in the ears
- hearing loss

The side effects listed below are **minor** problems. If you have any of these side effects, you can continue taking your medicine:

- Rifampin can turn urine, saliva, or tears orange. The doctor or nurse may advise you not to wear soft contact lenses because they may get stained.
- Rifampin can make you more sensitive to the sun. This means you should use a good sunscreen and cover exposed areas so you don't burn.
- Rifampin also makes birth control pills and implants less effective. Women who take rifampin should use another form of birth control.

If you are taking rifampin as well as methadone (used to treat drug addiction), you may have withdrawal symptoms. Your doctor or nurse may want to adjust your methadone dosage.

Why do I need to take TB medicine regularly?

TB bacteria die very slowly. It takes at least 6 months for the medicine to kill all the TB bacteria. You will probably start feeling well after only a few weeks of treatment.

But beware! The TB bacteria are still alive in your body. You must continue to take your medicine until all the TB bacteria are dead, even though you may feel better and have no more symptoms of TB disease.

If you don't continue taking your medicine or you aren't taking your medicine regularly, this can be very dangerous. The TB bacteria will grow again and you will remain sick for a longer time. The bacteria may also become resistant to the drugs you are taking. You may need new, different drugs to kill the TB bacteria if the old drugs no longer work. These new drugs must be taken for a longer time and usually have more serious side effects.

If you become infectious again, you could give TB bacteria to your family, friends, or anyone else who spends time with you. It is **very important** to take your medicine the way your doctor or nurse tells you.

How can I remember to take my medicine?

The only way to get well is to take your medicine exactly as your doctor or nurse tells you. This may not be easy! You will be taking your medicine for a long time (6 months or longer), so you should get into a routine. Here are some ways to remember to take your medicine:

- Participate in the directly observed therapy (DOT) program at your health department.
- Take your pills at the same time every day -- for example, you can take them before eating breakfast, during a coffee break, or after brushing your teeth.
- Ask a family member or a friend to remind you to take your pills.
- Mark off each day on a calendar as you take your medicine.
- Put your pills in a weekly pill dispenser. Keep it by your bed or in your purse or pocket.

NOTE: Remember to keep all medicine out of reach of children.

If you forget to take your pills one day, skip that dose and take the next scheduled dose. Tell your doctor or nurse that you missed a dose. You may also call your doctor or nurse for instructions.

The best way to remember to take your medicine is to get directly observed therapy (DOT). If you get DOT, you will meet with a health care worker every day or several times a week. You will meet at a place you both agree on. This can be the TB clinic, your home or work, or any other convenient location. You will take your medicine at this place.

DOT helps in several ways. The health care worker can help you remember to take your medicine and complete your treatment. This means you will get well as soon as possible. With DOT, you may need to take medicine only 2 or 3 times each week instead of every day. The health care worker will make sure that the medicine is working as it should. This person will also watch for side effects and answer questions you have about TB.

Even if you are not getting DOT, you must be checked at different times to make sure everything is going well. You should see your doctor or nurse regularly while you are taking your medicine. This will continue until you are cured.

How can I keep from spreading TB?

The most important way to keep from spreading TB is to take all your medicine, exactly as directed by your doctor or nurse. You should also keep all of your clinic appointments! Your doctor or nurse needs to see how you are doing. You may need another chest x-ray or a test of the phlegm you may cough up. These tests will show whether the medicine is working. They will also show whether you can still give TB bacteria to others. Be sure to tell the doctor about anything you think is wrong.

If you are sick enough with TB to go to a hospital, you may be put in a special room. These rooms use air vents that keep TB bacteria from spreading. People who work in these rooms must wear a special face mask to protect themselves from TB bacteria. You must stay in the room so that you will not spread TB bacteria to other people. Ask a nurse if you need anything that is not in your room.

If you are infectious while you are at home, there are certain things you can do to protect yourself and others near you. Your doctor may tell you to follow these guidelines to protect yourself and others:

- The most important thing is to take your medicine.
- Always cover your mouth with a tissue when you cough, sneeze, or laugh. Put the tissue in a closed paper sack and throw it away.
- Do not go to work or school. Separate yourself from others and avoid close contact with anyone. Sleep in a bedroom away from other family members.
- Air out your room often to the outside of the building (if it is not too cold outside). TB spreads in small closed spaces where air doesn't move. Put a fan in your window to blow out (exhaust) air that may be filled with TB bacteria. If you open other windows in the room, the fan also will pull in fresh air. This will reduce the chances that TB bacteria stay in the room and infect someone who breathes the air.

Remember, TB is spread through the air. People cannot get infected with TB bacteria through handshakes, sitting on toilet seats, or sharing dishes and utensils with someone who has TB.

After you take medicine for about 2 or 3 weeks, you may no longer be able to spread TB bacteria to others. If your doctor or nurse agrees, you will be able to go back to your daily routine. Remember, you will get well only if you take your medicine exactly as your doctor or nurse tells you.

Think about people who may have spent time with you, such as family members, close friends, and coworkers. The local health department may need to test them for latent TB infection. TB is especially dangerous for children and people with HIV infection. If infected with TB bacteria, these people need preventive therapy right away to keep from developing TB disease.

What is multidrug-resistant TB (MDR TB)?

When TB patients do not take their medicine as prescribed, the TB bacteria may become resistant to a certain drug. This means that the drug can no longer kill the bacteria.

Drug resistance is more common in people who:

- have spent time with someone with drug-resistant TB disease
- do not take their medicine regularly
- do not take all of their prescribed medicine
- develop TB disease again, after having taken TB medicine in the past
- come from areas where drug-resistant TB is common

Sometimes the bacteria become resistant to more than one drug. This is called multidrug-resistant TB, or MDR TB. This is a **very serious** problem. People with MDR TB disease must be treated with special drugs. These drugs are not as good as the usual drugs for TB and they may cause more side effects. Also, some people with MDR TB disease must see a TB expert who can closely observe their treatment to make sure it is working.

People who have spent time with someone sick with MDR TB disease can become infected with TB bacteria that are resistant to several drugs. If they have a positive skin test reaction, they may be given preventive therapy. This is **very important** for people who are at high risk of developing MDR TB disease, such as children and HIV-infected people.

Glossary of Terms Related to TB

BCG - A vaccine for TB named after the French scientists Calmette and Guérin. BCG is not widely used in the United States, but it is often given to infants and small children in other countries where TB is common.

Cavity - A hole in the lung where TB bacteria have eaten away the surrounding tissue. If a cavity shows up on your chest x-ray, you are more likely to cough up bacteria and be infectious.

Chest x-ray - A picture of the inside of your chest. A chest x-ray is made by exposing a film to x-rays that pass through your chest. A doctor can look at this film to see whether TB bacteria have damaged your lungs.

Contact - A person who has spent time with a person with infectious TB.

Culture - A test to see whether there are TB bacteria in your phlegm or other body fluids. This test can take 2 to 4 weeks in most laboratories.

Directly observed therapy (DOT) - A way of helping patients take their medicine for TB. If you get DOT, you will meet with a health care worker every day or several times a week. You will meet at a place you both agree on. This can be the TB clinic, your home or work, or any other convenient location. You will take your medicine at this place.

Extra-pulmonary TB - TB disease in any part of the body other than the lungs (for example, the kidney or lymph nodes).

HIV infection - Infection with the human immunodeficiency virus, the virus that causes AIDS (acquired immunodeficiency syndrome). A person with both latent TB infection and HIV infection is at very high risk for TB disease.

Infectious TB - TB disease of the lungs or throat, which can be spread to other people.

Infectious person - A person who can spread TB to others because he or she is coughing TB bacteria into the air.

INH or isoniazid - A drug used to prevent TB disease in people who have latent TB infection. INH is also one of the five drugs often used to treat TB disease.

Latent TB infection - A condition in which TB bacteria are alive but inactive in the body. People with latent TB infection have no symptoms, don't feel sick, can't spread TB to others, and usually have a positive skin test reaction. But they may develop TB disease later in life if they do not receive treatment for latent TB infection.

Miliary TB - TB disease that has spread to the whole body through the bloodstream.

Multidrug-resistant TB (MDR TB) - TB disease caused by bacteria resistant to more than one drug often used to treat TB.

M. tuberculosis - Bacteria that cause latent TB infection and TB disease.

Negative - Usually refers to a test result. If you have a negative TB skin test reaction, you probably do not have latent TB infection.

Positive - Usually refers to a test result. If you have a positive TB skin test reaction, you probably have latent TB infection.

Pulmonary TB - TB disease that occurs in the lungs, usually producing a cough that lasts longer than 2 weeks. Most TB disease is pulmonary.

Resistant bacteria - Bacteria that can no longer be killed by a certain drug.

TB skin test - A test that is often used to detect latent TB infection. A liquid called tuberculin is injected under the skin on the lower part of your arm. If you have a positive reaction to this test, you probably have latent TB infection.

Treatment for latent TB infection - Treatment for people with latent TB infection that prevents them from developing TB disease.

Smear - A test to see whether there are TB bacteria in your phlegm. To do this test, lab workers smear the phlegm on a glass slide, stain the slide with a special stain, and look for any TB bacteria on the slide. This test usually takes 1 day.

Sputum - Phlegm coughed up from deep inside the lungs. Sputum is examined for TB bacteria using a smear; part of the sputum can also be used to do a culture.

TB disease - An illness in which TB bacteria are multiplying and attacking different parts of the body. The symptoms of TB disease include weakness, weight loss, fever, no appetite, chills, and sweating at night. Other symptoms of TB disease depend on where in the body the bacteria are growing. If TB disease is in the lungs (pulmonary TB), the symptoms may include a bad cough, pain in the chest, and coughing up blood.

Tuberculin - A liquid that is injected under the skin on the lower part of your arm during a TB skin test. If you have latent TB infection, you will probably have a positive reaction to the tuberculin.

<http://www.cdc.gov/nchstp/tb/faqs/qa.htm>

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OCCUPATIONAL EXPOSURES TO BLOOD

Introduction

How can occupational exposures be prevented?

IF AN EXPOSURE OCCURS

What should I do if I am exposed to the blood of a patient?

RISK OF INFECTION AFTER EXPOSURE

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What is known about the safety and side effects of these drugs?

Can pregnant health-care workers take the drugs recommended for post exposure treatment?

How soon after exposure to a bloodborne pathogen should treatment start?

FOLLOW-UP AFTER AN EXPOSURE

What follow-up should be done after an exposure?

What precautions should be taken during the follow-up period?

OTHER SOURCES OF INFORMATION

HBV and HCV

Introduction

Health-care workers are at risk for occupational exposure to Bloodborne pathogens, including hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV). Exposures occur through needle sticks or cuts from other sharp instruments contaminated with an infected patient's blood or through contact of the eye, nose, mouth, or skin with a patient's blood. Important factors that may determine the overall risk for occupational transmission of a bloodborne pathogen include the number of infected individuals in the patient population, the chance of becoming infected after a single blood contact from an infected patient, and the type and number of blood contacts.

Most exposures do not result in infection. Following a specific exposure, the risk of infection may vary with factors such as these:

- The pathogen involved
- The type of exposure

- The amount of blood involved in the exposure
- The amount of virus in the patient's blood at the time of exposure

Your employer should have in place a system for reporting exposures in order to quickly evaluate the risk of infection, inform you about treatments available to help prevent infection, monitor you for side effects of treatments, and to determine if infection occurs. This may involve testing your blood and that of the source patient and offering appropriate post exposure treatment.

How can occupational exposures be prevented?

Many needle sticks and other cuts can be prevented by using safer techniques (e.g., not recapping needles by hand), disposing of used needles in appropriate sharps disposal containers, and using medical devices with safety features designed to prevent injuries. Many exposures to the eyes, nose, mouth, or skin can be prevented by using appropriate barriers (e.g., gloves, eye and face protection, gowns) when contact with blood is expected.

IF AN EXPOSURE OCCURS

What should I do if I am exposed to the blood of a patient?

Immediately following an exposure to blood:

- Wash needle sticks and cuts with soap and water
- Flush splashes to the nose, mouth, or skin with water
- Irrigate eyes with clean water, saline, or sterile irrigants

No scientific evidence shows that using antiseptics or squeezing the wound will reduce the risk of transmission of a bloodborne pathogen. Using a caustic agent such as bleach is not recommended.

Following any blood exposure you should:

Report the exposure to the department (e.g., occupational health, infection control) responsible for managing exposures. Prompt reporting is essential because, in some cases, post exposure treatment may be recommended and it should be started as soon as possible. Discuss the possible risks of acquiring HBV, HCV, and HIV and the need for post exposure treatment with the provider managing your exposure. You should have already received hepatitis B vaccine, which is extremely safe and effective in preventing HBV infection.

RISK OF INFECTION AFTER EXPOSURE

What is the risk of infection after an occupational exposure?

HBV

Health-care workers who have received hepatitis B vaccine and have developed immunity to the virus are at virtually no risk for infection. For an unvaccinated person, the risk from a single needle stick or a cut exposure to HBV-infected blood

ranges from 6-30% and depends on the hepatitis B e antigen (HBeAg) status of the source individual. Individuals who are both hepatitis B surface antigen (HBsAg) positive and HBeAg positive have more virus in their blood and are more likely to transmit HBV.

HCV

Based on limited studies, the risk for infection after a needle stick or cut exposure to HCV-infected blood is approximately 1.8%. The risk following a blood splash is unknown, but is believed to be very small; however, HCV infection from such an exposure has been reported.

HIV

The average risk of HIV infection after a needle stick or cut exposure to HIV-infected blood is 0.3% (i.e., three-tenths of one percent, or about 1 in 300). Stated another way, 99.7% of needle stick/cut exposures do not lead to infection.

The risk after exposure of the eye, nose, or mouth to HIV-infected blood is estimated to be, on average, 0.1% (1 in 1,000).

The risk after exposure of the skin to HIV-infected blood is estimated to be less than 0.1%. A small amount of blood on intact skin probably poses no risk at all. There have been no documented cases of HIV transmission due to an exposure involving a small amount of blood on intact skin (a few drops of blood on skin for a short period of time). The risk may be higher if the skin is damaged (for example, by a recent cut) or if the contact involves a large area of skin or is prolonged (for example, being covered in blood for hours).

How many health-care workers have been infected with Bloodborne pathogens?

HBV

The annual number of occupational infections has decreased sharply since hepatitis B vaccine became available in 1982 (i.e., there has been a 90% decrease in the number of estimated cases from 1985 to 1996). Nonetheless, approximately 800 health-care workers become infected with HBV each year following an occupational exposure.

HCV

There are no exact estimates on the number of health-care workers occupationally infected with HCV. However, studies have shown that 1% of hospital health-care workers have evidence of HCV infection (about

1.8% of the U.S. population has evidence of infection). The number of these workers who may have been infected through an occupational exposure is unknown.

HIV

As of December 1998, CDC had received reports of 54 documented cases and 134 possible cases of occupationally acquired HIV infection among health-care workers in the United States since reporting began in 1985.

TREATMENT FOR THE EXPOSURE

Is vaccine or treatment available to prevent infections with bloodborne pathogens?

HBV

As mentioned above, hepatitis B vaccine has been available since 1982 to prevent HBV infection. All health-care workers who have a reasonable chance of exposure to blood or body fluids should receive hepatitis B vaccine. Vaccination ideally should occur during the health-care worker's training period. Workers should be tested 1-2 months after the vaccine series to make sure that vaccination has provided immunity to HBV infection.

Hepatitis B immune globulin (HBIG) is effective in preventing HBV infection after an exposure. The decision to begin treatment is based on several factors, such as:

- Whether the source individual is positive for hepatitis B surface antigen.
- Whether you have been vaccinated.
- Whether the vaccine provided you immunity.

HCV

There is no vaccine against hepatitis C and no treatment after an exposure that will prevent infection. Immune globulin is not recommended. For these reasons, following recommended infection control practices is imperative.

HIV

There is no vaccine against HIV. However, results from a small number of studies suggest that the use of zidovudine after certain occupational exposures may reduce the chance of HIV transmission.

Post exposure treatment is not recommended for all occupational exposures to HIV because most exposures do not lead to HIV infection and because the drugs used to prevent infection may have serious side effects.

Taking these drugs for exposures that pose a lower risk for infection may not be worth the risk of the side effects. You should discuss the risks and side effects with a health-care provider before starting post exposure treatment for HIV.

What about exposures to blood from an individual whose infection status is unknown?

HBV–HCV–HIV

If the source individual cannot be identified or tested, decisions regarding follow-up should be based on the exposure risk and whether the source is likely to be a person who is infected with a bloodborne pathogen. Follow-up testing should be available to all workers who are concerned about possible infection through occupational exposure.

What specific drugs are recommended for post exposure treatment?

HBV

If you have not been vaccinated, then hepatitis B vaccination is recommended for any exposure regardless of the source person's hepatitis B status. HBIG and/or hepatitis B vaccine may be recommended depending on your immunity to hepatitis B and the source person's infection status.

HCV

Currently there is no recommended post exposure treatment that will prevent HCV infection.

HIV

The Public Health Service recommends a 4-week course of two drugs (zidovudine and lamivudine) for most HIV exposures, or zidovudine and lamivudine plus a protease inhibitor (indinavir or nelfinavir) for exposures that may pose a greater risk for transmitting HIV (such as those involving a larger volume of blood with a larger amount of HIV or a concern about drug-resistant HIV). Differences in side effects associated with the use of these two drugs may influence which drug is selected in a specific situation. These recommendations are intended to provide guidance to clinicians and may be modified on a case-by-case basis.

Determining which drugs and how many drugs to use or when to change a treatment regimen is largely a matter of judgment. Whenever possible, consulting an expert with experience in the use of antiviral drugs is advised, especially if a recommended drug is not available, if the source patient's virus is likely to be resistant to one or more recommended drugs, or if the drugs are poorly tolerated.

How soon after exposure to a bloodborne pathogen should treatment start?

HBV

Post exposure treatment should begin as soon as possible after exposure, preferably within 24 hours, and no later than 7 days.

HIV

Treatment should be started promptly, preferably within hours as opposed to days, after the exposure. Although animal studies suggest that treatment is not effective when started more than 24-36 hours after exposure, it is not known if this time frame is the same for humans.

Starting treatment after a longer period (e.g., 1-2 weeks) may be considered for the highest risk exposures; even if HIV infection is not prevented, early treatment of initial HIV infection may lessen the severity of symptoms and delay the onset of AIDS.

Has the FDA approved these drugs to prevent blood-borne pathogen infection following an occupational exposure?

HBV

Yes. Both hepatitis B vaccine and HBIG are approved for this use.

HIV

No. The FDA has approved these drugs for the treatment of existing HIV infection, but not as a treatment to prevent infection. However, physicians may prescribe any approved drug when, in their professional judgment, the use of the drug is warranted.

What is known about the safety and side effects of these drugs?

HBV

Hepatitis B vaccine is very safe. There is no information that the vaccine causes any chronic illnesses. Most illnesses reported after an HBV vaccination are often related to other causes and not the vaccine. However, you should report any unusual reaction after a hepatitis B vaccination to your health-care provider.

HIV

All of the antiviral drugs for HIV have been associated with side effects.

The most common side effects include upset stomach (nausea, vomiting, and diarrhea), tiredness, or headache. The few serious side effects that have been reported in health-care workers using combination post exposure treatment have included kidney stones, hepatitis, and suppressed blood cell production. Protease inhibitors (indinavir and nevirapin) may interact with other medicines and cause serious side effects and should not be used in combination with certain other drugs, such as prescription antihistamines. It is important to tell the health-care provider managing your exposure about any medications you are currently taking, if you need to take antiviral drugs for an HIV exposure.

Can pregnant health-care workers take the drugs recommended for post exposure treatment?

HBV

Yes. Women who are pregnant or breast feeding can be vaccinated against HBV infection and/or get HBIG. Pregnant women who are exposed to blood should be vaccinated against HBV infection, because infection during pregnancy can cause severe illness in the mother and a chronic infection in the newborn. The vaccine does not harm the fetus.

HIV

Pregnancy should not rule out the use of post exposure treatment when it is warranted. If you are pregnant you should understand what is known and not known regarding the potential benefits and risks associated with the use of antiviral drugs in order to make an informed decision about treatment.

FOLLOW-UP AFTER AN EXPOSURE

What follow-up should be done after an exposure?

HBV

Because post exposure treatment is highly effective in preventing HBV infection, CDC does not recommend routine follow-up after treatment. However, any symptoms suggesting hepatitis (e.g., yellow eyes or skin, loss of appetite, nausea, vomiting, fever, stomach or joint pain, extreme tiredness) should be reported to your health-care provider.

HCV

You should have an antibody test for hepatitis C virus and a liver enzyme test (alanine aminotransferase activity) as soon as possible after the exposure (baseline) and at 4-6 months after the exposure. Some clinicians may also recommend another test (HCV RNA) to detect HCV infection 4-6 weeks after the exposure. Report any symptoms suggesting hepatitis (mentioned above) to your health-care provider.

HIV

You should be tested for HIV antibody as soon as possible after exposure (baseline) and periodically for at least 6 months after the exposure (e.g., at 6 weeks, 12 weeks, and 6 months). If you take antiviral drugs for post exposure treatment, you should be checked for drug toxicity by having a complete blood count and kidney and liver function tests just before starting treatment and 2 weeks after starting treatment. You should report any sudden or severe flu-like illness that occurs during the follow-up period, especially if it involves fever, rash, muscle aches, tiredness, malaise, or swollen glands. Any of these may suggest HIV infection, drug reaction, or other medical conditions. You should contact the health-care provider managing your exposure if you have any questions or problems during the follow-up period.

What precautions should be taken during the follow-up period?

HBV

If you are exposed to HBV and receive post exposure treatment, it is unlikely that you will become infected and pass the infection on to others. No precautions are recommended.

HCV

Because the risk of becoming infected and passing the infection on to others after an exposure to HCV is low, no precautions are recommended.

HIV

During the follow-up period, especially the first 6-12 weeks when most infected persons are expected to show signs of infection, you should follow recommendations for preventing transmission of HIV. These include not donating blood, semen, or organs and not having sexual intercourse. If you choose to have sexual intercourse, using a condom consistently and correctly may reduce the risk of HIV transmission. In addition, women should consider not breast-feeding infants during the follow-up period to prevent exposing their infants to HIV in breast milk.

OTHER SOURCES OF INFORMATION

HBV and HCV

For additional information about hepatitis B and hepatitis C you can call the hepatitis information line at 1-888-4-HEPCDC (1-888-443-7232) or visit CDC's hepatitis website at www.cdc.gov/ncidod/diseases/hepatitis/index.htm

Anyone believing they have had a reaction or adverse event should report it to his/her health care provider

The Vaccine Adverse Event Reporting System (1-800-822-7967) receives reports from health-care providers and others about vaccine side effects.

HIV

Information specialists who staff the CDC National AIDS Hotline (1-800-342-2437) can answer questions or provide information on HIV infection and AIDS and the resources available in your area. The HIV/AIDS Treatment Information Service (1-800-448-0440) can also be contacted for information on the clinical treatment of HIV/AIDS.

Additional information about occupational exposures to bloodborne pathogens is available on CDC's Hospital Infections Program's website at www.cdc.gov/ncidod/hip or on CDC's National Institute of Occupational Safety and Health's website at www.cdc.gov/niosh or call 1-800-35 NIOSH (1-800-356-4674).

New Estimates of U.S. HIV Prevalence, 2006

October 2008

The Centers for Disease Control and Prevention (CDC) has developed new estimates of HIV prevalence, or the total number of people living with HIV in the United States. CDC's analysis reveals that there were more than a million people—an estimated 1,106,400 adults and adolescents—living with HIV infection in the United States at the end of 2006 (95% Confidence Interval: 1,056,400–1,156,400)¹, and that gay and bisexual men of all races, African Americans, and Hispanics/Latinos were most heavily affected. The new estimates are published in the October 3, 2008 issue of CDC's *Morbidity and Mortality Weekly Report*.

These numbers include those whose HIV infection has progressed to AIDS.

(a) Growing Population Living with HIV

Since CDC's last estimate of HIV prevalence for 2003 (released in 2005), there have been several improvements to the national HIV reporting data set upon which these estimates are based. Importantly, data from ten additional states with reliable HIV reporting data have been added and extensive de-duplication efforts have been implemented at the national level. Based on this improved data set, researchers have also refined the estimate for HIV prevalence at the end of 2003. Results indicate that approximately 994,000 individuals were living with HIV at the end of 2003, and that HIV prevalence increased by approximately 112,000 (or 11%) from 2003 to 2006 (from 994,000 to 1,106,400 total persons). This increase was expected, due to the fact that antiretroviral treatment has greatly extended the life spans of people with HIV, and because more people become infected with HIV than die from the disease each year.

(b) Knowledge of HIV Status

In addition to estimating overall prevalence, CDC also updated its estimates of the percentage of individuals infected with HIV who were unaware of their infection. The new analysis indicates that approximately one in five people living with HIV in 2006—21 %, or 232,700 total persons—were unaware of their infections. This represents a slight decline from an estimated 25 % unaware in 2003.

Definitions

HIV prevalence: The number of people living with HIV—with or without a diagnosis of AIDS—at a point in time.

HIV incidence: The number of people who become newly infected with HIV in a given period.

HIV diagnoses: The number of HIV diagnoses during a given period, regardless of when the persons became infected.

AIDS diagnoses: The number of AIDS diagnoses during a given period. AIDS is diagnosed when an HIV-infected person's immune system becomes severely compromised (measured by CD4 cell count) and/or the person becomes ill with an

opportunistic infection. In the absence of treatment, AIDS usually develops 8 to 10 years after initial HIV infection. With early HIV diagnosis and treatment, an AIDS diagnosis may be delayed by many years.

The reduction in the proportion unaware since 2003 reflects increased diagnoses among the population infected with HIV (both previously infected and undiagnosed, as well newly infected during this time period) and a decline in deaths among persons living with HIV. While this is a promising sign that HIV testing efforts across the nation are having an impact, there remain far too many undiagnosed individuals. To address this need and further reduce the number of Americans who are unaware of their HIV status, CDC has intensified HIV testing efforts in recent years.

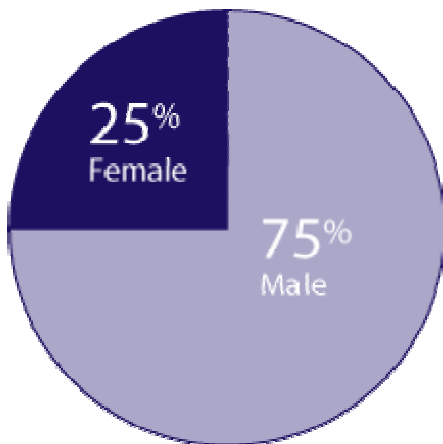
(c) HIV Prevalence among Specific Populations

The new estimates indicate that gay and bisexual men of all races, African Americans, and Hispanics/Latinos continue to represent the majority of persons living with HIV in the United States.

Gender

Most persons living with HIV in the United States continue to be men. In 2006, men made up three quarters of people living with HIV (828,000 persons), and women made up one-quarter (278,400 persons).

Estimated HIV Prevalence, by Gender, 2006



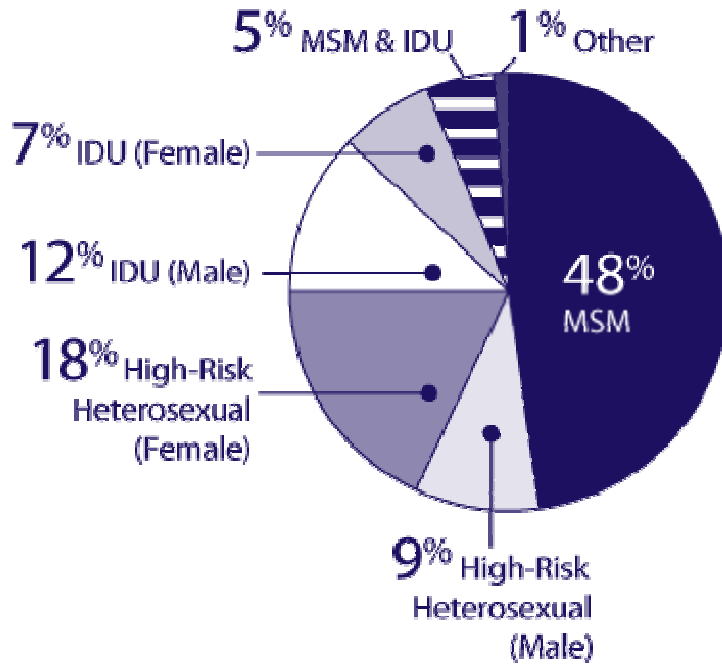
Transmission Category

Nearly half of all people living with HIV in the U.S. in 2006 (48%, or 532,000 total persons) were men who have sex with men (MSM)¹. Among men, MSM accounted for 64% of those living with HIV.

People infected through high-risk heterosexual contact² accounted for more than one-quarter of all people living with HIV (28%, or 305,700 persons). Thirteen percent of men (104,000 persons) and 72% of women (201,700 persons) living with HIV were infected through high-risk heterosexual contact.

People infected through injection drug use accounted for 19% of all people living with HIV (204,600 persons). Sixteen percent of men (131,500 persons) and 26% of women (73,100 persons) living with HIV were infected through injection drug use.

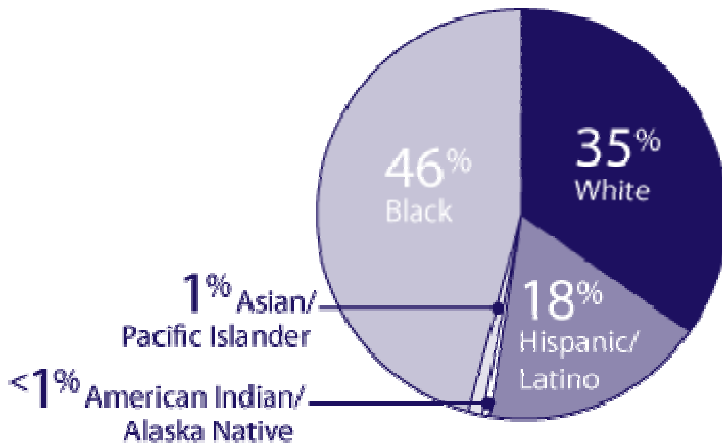
Estimated HIV Prevalence, by Transmission Category, 2006



Race/Ethnicity

HIV takes a disproportionate toll on communities of color, with the most severe impact among African Americans, followed by Hispanics/Latinos.

Estimated HIV Prevalence, by Race/Ethnicity, 2006



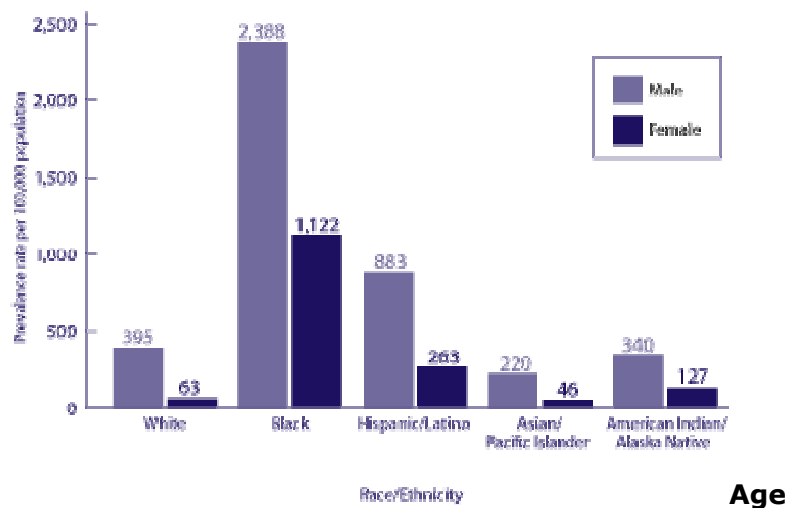
While blacks make up only 12% of the U.S. population, they represented nearly half of all people living with HIV in the U.S. in 2006 (46%, or 510,100 total persons). Overall, the HIV prevalence rate for blacks (1,715 per 100,000 population) was almost eight times as high as that of

whites (224 per 100,000). African American men bear the greatest burden of HIV; the prevalence rate for black men (2,388 per 100,000) was six times as high as the rate for white men (395 per 100,000). African American women are also severely affected. The prevalence rate for black women (1,122 per 100,000) was 18 times the rate for white women (63 per 100,000).

Hispanics/Latinos are also disproportionately affected by HIV. Although Hispanics/Latinos account for 15% of the population, they accounted for 18% of people living with HIV in 2006 (194,000 total persons). The overall prevalence rate for Hispanics/Latinos (585 per 100,000) was nearly three times the rate for whites (224 per 100,000). The prevalence rate for Hispanic/Latino men (883 per 100,000) was more than two times the rate for white men (395 per 100,000), while the prevalence rate for Hispanic/Latino women (263 per 100,000) was four times the rate for white women (63 per 100,000).

Although prevalence rates among whites were significantly less than those of blacks or Hispanics, whites made up more than one-third of all people living with HIV (35%, or 382,600 total persons). Asian/Pacific Islanders made up approximately 1% of persons living with HIV, while American Indian/Alaska Natives made up less than 1%.

Estimated HIV Prevalence Rate (per 100,000 population) by Race/Ethnicity and Sex, United States—2006



Seventy percent of people living with HIV in 2006 were between the ages of 25 and 49 (770,000 persons), 25% were age 50 and older (280,000 persons), and 5% were between the ages of 13 and 24 (56,500 persons). It is important to note that because HIV prevalence is the population living with, not newly infected with, HIV, this is not an indication of the likely age of infection.

(d) Implications of the New Estimate

The growing number of people living with HIV in the United States points to an increased need for HIV testing, treatment, and prevention services to slow the U.S. epidemic. With more HIV-infected individuals, and with those persons living longer,

there is a growing population of HIV-infected men and women who must be reached with testing, medical care, and prevention services. As the number of persons living with HIV grows, so does the cost of providing medical services to this population and the burden on health care systems. In order to reduce these increased costs of care in the future, greater attention needs to be paid to preventing these infections in the first place. Growing HIV prevalence also means increased opportunities for transmission to HIV-negative individuals. Efforts to reduce the number of new infections must therefore be designed to meet the needs of both infected and uninfected populations.

Ensuring everyone infected with HIV knows their status is a critical part of the solution. While the new HIV prevalence estimates indicate that more infected individuals know their status, far too many HIV-infected people in the U.S. are still diagnosed late in the course of infection—38% within a year of developing AIDS [1]. HIV testing is the essential first step in linking HIV-infected people to life-extending medical care, and studies show that once people learn they are HIV-infected, most take steps to protect others. It is estimated that the majority of new infections are transmitted by those who are unaware of their infection [2]; therefore, early testing and diagnosis play a key role in reducing HIV transmission.

HIV testing and prevention work when we apply what we know. While the total number of people living with HIV in the U.S. is increasing, data from a separate CDC analysis [3] indicate that new infections overall have remained stable in recent years. This stability is an important sign of progress, since a growing number of people living with HIV would be expected to increase opportunities for HIV transmission. To slow the spread of HIV in the United States, action is needed on every front—from government, businesses, individuals, and communities—to increase access to testing and prevention in order to reach everyone in need.

Methods

HIV prevalence cannot be measured directly, because not all HIV-infected individuals have been tested, not all states yet have reliable HIV reporting data, and not all diagnosed cases are reported. Instead, prevalence must be estimated based on the best available data and complex statistical modeling. As the epidemic and HIV surveillance methods have evolved over time, CDC has periodically published new estimates of prevalence.

To derive the new estimates, CDC utilized information on new HIV diagnoses (taken from 40 states with reliable, name-based HIV data) and AIDS diagnoses and deaths (taken from all 50 states plus the District of Columbia), along with a statistical method called “back-calculation.”

Back-calculation begins with the number of new HIV diagnoses—regardless of stage of disease—in specific populations and works backward to calculate the total number of HIV infections that would have to occur over time to produce this number of reported HIV diagnoses. Information on the stage of disease at diagnosis is also considered, specifically whether newly diagnosed cases are reported as HIV only or also have AIDS diagnosed within the same calendar year. By examining only new diagnoses of HIV infection, researchers were able to create the estimates without needing to adjust for the effect of antiretroviral treatment, which delays the onset of AIDS. For states without reliable data on HIV (not AIDS) diagnoses, researchers

estimated the number of diagnoses based on the trends seen in HIV and AIDS cases in similar geographic areas as a part of the statistical modeling procedures.

HIV prevalence over time is calculated by subtracting the total number of deaths among persons with HIV and/or AIDS from the total number of new infections estimated to have occurred through back-calculation.

For more information on HIV prevalence, visit

<http://www.cdc.gov/hiv/topics/surveillance>**References:**

1. CDC. [HIV/AIDS Surveillance Report, 2006. Vol. 18](#). Atlanta: US Department of Health and Human Services, CDC; 2008.
2. Marks G, Crepaz N, Janssen R. [Estimating sexual transmission of HIV from persons aware and unaware that they are infected with the virus in the USA.](#) *AIDS*. 2006;20:1447-1450.
3. Hall HI, Song R, Rhodes P, et al. [Estimation of HIV Incidence in the United States.](#) *JAMA*. 2008;300:520-529.

¹ The term men who have sex with men is used in CDC surveillance systems because it indicates the behaviors that transmit HIV infection, rather than how individuals self-identify in terms of their sexuality.

² The term high-risk heterosexual contact is used to describe persons who report specific heterosexual contact with a person known to have, or to be at high risk for, HIV infection (e.g., an injection drug user).

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[Divisions of HIV/AIDS Prevention](#)

[National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention](#)

Hepatitis A

FAQs for the Public

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What is hepatitis?

"Hepatitis" means inflammation of the liver. Toxins, certain drugs, some diseases, heavy alcohol use, and bacterial and viral infections can all cause hepatitis. Hepatitis is also the name of a family of viral infections that affect the liver; the most common types are hepatitis A, hepatitis B, and hepatitis C.

What is the difference between hepatitis A, hepatitis B, and hepatitis C?

[Hepatitis A](#), [hepatitis B](#), and [hepatitis C](#) are diseases caused by three different viruses. Although each can cause similar symptoms, they have different modes of transmission and can affect the liver differently. Hepatitis A appears only as an acute or newly occurring infection and does not become chronic. People with hepatitis A usually improve without treatment. Hepatitis B and hepatitis C can also begin as acute infections, but in some people, the virus remains in the body, resulting in chronic disease and long term liver problems. There are vaccines to prevent hepatitis A and B; however, there is not one for hepatitis C. If a person has had one type of viral hepatitis in the past, it is still possible to get the other types.

What is hepatitis A?

Hepatitis A is a contagious liver disease that results from infection with the hepatitis A virus. It can range in severity from a mild illness lasting a few weeks to a severe illness lasting several months. Hepatitis A is usually spread when a person ingests fecal matter — even in microscopic amounts — from contact with objects, food, or drinks contaminated by the feces, or stool, of an infected person.

How common is hepatitis A in the United States?

In the United States, there were an estimated 32,000 new hepatitis A virus infections in 2006. (However, the official number of reported hepatitis A cases is much lower since many people who are infected never have symptoms and are never reported to public health officials.)

Is hepatitis A decreasing in the United States?

Yes. Rates of hepatitis A in the United States are the lowest they have been in 40 years. The hepatitis A vaccine was introduced in 1995 and health professionals now routinely vaccinate all children, travelers to certain countries, and persons at risk for the disease. Many experts believe hepatitis A vaccination has dramatically affected rates of the disease in the United States.

How is hepatitis A spread?

Hepatitis A is usually spread when the hepatitis A virus is taken in by mouth from contact with objects, food, or drinks contaminated by the feces (or stool) of an infected person. A person can get hepatitis A through:

- Person to person contact
 - when an infected person does not wash his or her hands properly after going to the bathroom and touches other objects or food
 - when a parent or caregiver does not properly wash his or her hands after changing diapers or cleaning up the stool of an infected person
 - when someone engages in certain sexual activities, such as oral-anal contact with an infected person
- Contaminated food or water
 - Hepatitis A can be spread by eating or drinking food or water contaminated with the virus. This is more likely to occur in countries where hepatitis A is common and in areas where there are poor sanitary conditions or poor personal hygiene. The food and drinks most

likely to be contaminated are fruits, vegetables, shellfish, ice, and water. In the United States, chlorination of water kills hepatitis A virus that enters the water supply.

Who is at risk for hepatitis A?

Although anyone can get hepatitis A, in the United States, certain groups of people are at higher risk, such as those who:

- Travel to or live in [countries where hepatitis A is common](#)
- Are men who have sexual contact with other men
- Use illegal drugs, whether injected or not
- Have clotting-factor disorders, such as hemophilia
- Live with someone who has hepatitis A
- Have oral-anal sexual contact with someone who has hepatitis A

Does hepatitis A cause symptoms?

Not always. Some people get hepatitis A and have no symptoms of the disease. Adults are more likely to have symptoms than children.

What are the symptoms of hepatitis A?

Some people with hepatitis A do not have any symptoms. If you do have symptoms, they may include the following:

- Fever
- Fatigue
- Loss of appetite
- Nausea
- Vomiting
- Abdominal pain
- Dark urine
- Clay-colored bowel movements
- Joint pain
- Jaundice (a yellowing of the skin or eyes)

How soon after exposure to hepatitis A will symptoms appear?

If symptoms occur, they usually appear anywhere from 2 to 6 weeks after exposure. Symptoms usually develop over a period of several days.

How long do hepatitis A symptoms last?

Symptoms usually last less than 2 months, although some people can be ill for as long as 6 months.

Can a person spread hepatitis A without having symptoms?

Yes. Many people, especially children, have no symptoms. In addition, a person can transmit the virus to others up to 2 weeks before symptoms appear.

How serious is hepatitis A?

Almost all people who get hepatitis A recover completely and do not have any lasting liver damage, although they may feel sick for months. Hepatitis A can sometimes cause liver failure and death, although this is rare and occurs more commonly in persons 50 years of age or older and persons with other liver diseases, such as hepatitis B or C.

How will I know if I have hepatitis A?

A doctor can determine if you have hepatitis A by discussing your symptoms and taking a blood sample.

How is hepatitis A treated?

There are no special treatments for hepatitis A. Most people with hepatitis A will feel sick for a few months before they begin to feel better. A few people will need to be hospitalized. During this time, doctors usually recommend rest, adequate nutrition, and fluids. People with hepatitis A should check with a health professional before taking any prescription pills, supplements, or over-the-counter medications, which can potentially damage the liver. Alcohol should be avoided.

If I have had hepatitis A in the past, can I get it again?

No. Once you recover from hepatitis A, you develop antibodies that protect you from the virus for life. An antibody is a substance found in the blood that the body produces in response to a virus. Antibodies protect the body from disease by attaching to the virus and destroying it.

Can I donate blood if I have had hepatitis A?

If you had hepatitis A when you were 11 years of age or older, you cannot donate blood. If you had hepatitis A before age 11, you may be able donate blood. Check with your blood donation center.

How long does hepatitis A virus survive outside the body?

The hepatitis A virus is extremely hearty. It is able to survive the body's highly acidic digestive tract and can live outside the body for months. High temperatures, such as boiling or cooking food or liquids for at least 1 minute at 185°F (85°C), kill the virus, although freezing temperatures do not.

Can hepatitis A be prevented?

Yes. The best way to prevent hepatitis A is through vaccination with the hepatitis A vaccine. Vaccination is recommended for all children, for travelers to certain countries, and for people at high risk for infection with the virus. Frequent handwashing with soap and warm water after using the bathroom, changing a diaper, or before preparing food can help prevent the spread of hepatitis A.

What is the hepatitis A vaccine?

The hepatitis A vaccine is a shot of inactive hepatitis A virus that stimulates the body's natural immune system. After the vaccine is given, the body makes antibodies that protect a person against the virus. An antibody is a substance found in the blood that is produced in response to a virus invading the body. These antibodies are then stored in the body and will fight off the infection if a person is exposed to the virus in the future.

Who should get vaccinated against hepatitis A?

Hepatitis A vaccination is recommended for:

- All children at age 1 year
- Travelers to countries that have high rates of hepatitis A
- Men who have sexual contact with other men
- Users of injection and non-injection illegal drugs
- People with chronic (lifelong) liver diseases, such as hepatitis B or hepatitis C
- People who are treated with clotting-factor concentrates
- People who work with hepatitis A infected animals or in a hepatitis A research laboratory

How is the hepatitis A vaccine given?

The hepatitis A vaccine is given as 2 shots, 6 months apart. The hepatitis A vaccine also comes in a combination form, containing both hepatitis A and B vaccine, that can be given to persons 18 years of age and older. This form is given as 3 shots, over a period of 6 months.

Is the hepatitis A vaccine effective?

Yes, the hepatitis A vaccine is highly effective in preventing hepatitis A virus infection. Protection begins approximately 2 to 4 weeks after the first injection. A second injection results in long-term protection.

Is the hepatitis A vaccine safe?

Yes, the hepatitis A vaccine is safe. No serious side effects have resulted from the hepatitis A vaccine. Soreness at the injection site is the most common side effect reported. As with any medicine, there are very small risks that a serious problem could occur after someone gets the vaccine. However, the potential risks associated with hepatitis A are much greater than the potential risks associated with the hepatitis A vaccine. Before the hepatitis A vaccine became available in the United States, more than 250,000 people were infected with hepatitis A virus each year. Since the licensure of the first hepatitis A vaccine in 1995, millions of doses of hepatitis A vaccine have been given in the United States and worldwide.

Who should not receive the hepatitis A vaccine?

People who have ever had a serious allergic reaction to the hepatitis A vaccine or who are known to be allergic to any part of the hepatitis A vaccine should not receive the vaccine. Tell your doctor if you have any severe allergies. Also, the vaccine is not licensed for use in infants under age 1 year.

Who should get the hepatitis A vaccine before traveling?

Anyone traveling to or working in countries with high rates of hepatitis A should talk to a health professional about getting vaccinated. He or she is likely to recommend vaccination or a shot of immune globulin before traveling to countries in Central or South America, Mexico, and certain parts of Asia, Africa, and Eastern Europe. CDC's Travelers' Health site provides detailed information about hepatitis A and other recommended vaccines at www.cdc.gov/travel/yellowBookCH4-HepA.aspx.

What is immune globulin?

Immune globulin is a substance made from human blood plasma that contains antibodies that protect against infection. It is given as a shot and provides short-term protection (approximately 3 months) against hepatitis A. Immune globulin can be given either before exposure to the hepatitis A virus (such as before travel to a country where hepatitis A is common) or to prevent infection after exposure to the hepatitis A virus. Immune globulin must be given within 2 weeks after exposure for the best protection.

Why is the hepatitis A vaccine recommended before traveling?

Traveling to [places where hepatitis A virus is common](#) puts a person at high risk for hepatitis A. The risk exists even for travelers to urban areas, those who stay in luxury hotels, and those who report that they have good hygiene and are careful about what they eat and drink. Travelers can minimize their risk by avoiding potentially contaminated water or food, such as drinking beverages (with or without ice) of unknown purity, eating uncooked shellfish, and eating uncooked fruits or vegetables that are not peeled or prepared by the traveler personally. Risk for infection increases with duration of travel and is highest for those who live in or visit rural areas, trek in back-country areas, or frequently eat or drink in settings with poor sanitation. Since a simple, safe vaccine exists, experts recommend that travelers to certain countries be vaccinated.

How soon before travel should the hepatitis A vaccine be given?

The first dose of hepatitis A vaccine should be given as soon as travel is planned. Two weeks or more before departure is ideal, but anytime before travel will provide some protection.

I'm leaving for my trip in a few days. Can I still get the hepatitis A vaccine?

Experts now say that the first dose of hepatitis A vaccine can be given at any time before departure. This will provide some protection for most healthy persons.

Will the hepatitis A vaccine protect someone from other forms of hepatitis?

Hepatitis A vaccine will only protect someone from hepatitis A. A separate vaccine is available for hepatitis B. There is also a combination vaccine that protects a person from hepatitis A and hepatitis B. No vaccine is available for hepatitis C at this time.

Can hepatitis A vaccine be given to immunocompromised persons, such as hemodialysis patients or persons with AIDS?

Yes. Because hepatitis A vaccine is inactivated (not “live”), it can be given to people with compromised immune systems.

Is it harmful to have an extra dose of hepatitis A vaccine or to repeat the entire hepatitis A vaccine series?

No, getting extra doses of hepatitis A vaccine is not harmful.

What should be done if the last dose of hepatitis A vaccine is delayed?

The second or last dose should be given by a health professional as soon as possible. The first dose does not need to be given again.

Where can I get the hepatitis A vaccine?

Speak with your health professional or call your local public health department. Some clinics offering free or low-cost vaccines for adults are listed at www.hepclinics.com and for children at www.cdc.gov/vaccines/programs/vfc/parents/where-get-vaccs.htm.

I think I have been exposed to hepatitis A. What should I do?

If you have any questions about potential exposure to hepatitis A, call your health professional or your local or [state health department](#).

If you were recently exposed to hepatitis A virus and have not been vaccinated against hepatitis A, you might benefit from an injection of either [immune globulin](#) or hepatitis A vaccine. However, the vaccine or immune globulin must be given within the first 2 weeks after exposure to be effective. A health professional can decide what is best on the basis of your age and overall health.

What is postexposure prophylaxis or PEP?

PEP or postexposure prophylaxis refers to trying to prevent or treat a disease after someone is exposed to it.

Who should get PEP after being exposed to hepatitis A?

A health professional can decide whether or not a person needs PEP after exposure to hepatitis A. People who might benefit from PEP include those who:

- Live with someone who has hepatitis A
- Have recently had sexual contact with someone who has hepatitis A
- Have recently shared injection or non-injection illegal drugs with someone who has hepatitis A
- Have had ongoing, close personal contact with a person with hepatitis A, such as a regular babysitter or caregiver
- Have been exposed to food or water known to be contaminated with hepatitis A virus

What should I do if I ate at a restaurant that had an outbreak of hepatitis A?

Talk to your health professional or a local health department official for guidance. Outbreaks usually result from one of two sources of contamination: an infected food handler or an infected food source. Your health department will investigate the cause of the outbreak.

Keep in mind that most people do not get sick when someone at a restaurant has hepatitis A. However, if an infected food handler is infectious and has poor hygiene, the risk goes up for patrons of that restaurant. In such cases, health officials might try to identify patrons and provide hepatitis A vaccine or immune globulin if they can find them within 2 weeks of exposure.

On rare occasions, the source of the infection can be traced to contaminated food. Foods can become contaminated at any point along the process: growing, harvesting, processing, handling, and even after cooking. In these cases, health officials will try to determine the source of the contamination and the best ways to minimize health threats to the public.

Page last modified: June 23, 2008

Hepatitis B

<http://www.cdc.gov/hepatitis/B/bFAQ.htm>

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What is hepatitis?

“Hepatitis” means inflammation of the liver. Toxins, certain drugs, some diseases, heavy alcohol use, and bacterial and viral infections can all cause hepatitis. Hepatitis is also the name of a family of viral infections that affect the liver; the most common types are hepatitis A, hepatitis B, and hepatitis C.

What is the difference between hepatitis A, hepatitis B, and hepatitis C?

[Hepatitis A](#), [hepatitis B](#), and [hepatitis C](#) are diseases caused by three different viruses. Although each can cause similar symptoms, they have different modes of transmission and can affect the liver differently. Hepatitis A appears only as an acute or newly occurring infection and does not become chronic. People with hepatitis A usually improve without treatment. Hepatitis B and hepatitis C can also begin as acute infections, but in some people, the virus remains in the body, resulting in chronic disease and long-term liver problems. There are vaccines to prevent hepatitis A and B; however, there is not one for hepatitis C. If a person has had one type of viral hepatitis in the past, it is still possible to get the other types.

What is hepatitis B?

Hepatitis B is a contagious liver disease that ranges in severity from a mild illness lasting a few weeks to a serious, lifelong illness. It results from infection with the hepatitis B virus. Hepatitis B can be either “acute” or “chronic.”

Acute hepatitis B virus infection is a short-term illness that occurs within the first 6 months after someone is exposed to the hepatitis B virus. Acute infection can — but does not always — lead to chronic infection.

Chronic hepatitis B virus infection is a long-term illness that occurs when the hepatitis B virus remains in a person’s body.

How serious is chronic hepatitis B?

Chronic hepatitis B is a serious disease that can result in long-term health problems, including liver damage, liver failure, liver cancer, or even death. Approximately 2,000–4,000 people die every year from hepatitis B-related liver disease.

How common is acute hepatitis B in the United States?

In 2006, there were an estimated 46,000 new hepatitis B virus infections in the United States. However, the official number of reported hepatitis B cases is much lower. Many people don't know they are infected or may not have symptoms and therefore never seek the attention of medical or public health officials.

Has the number of people in the United States with acute hepatitis B been decreasing?

Yes, rates of acute hepatitis B in the United States have declined by approximately 80% since 1991. At that time, routine hepatitis B vaccination of children was implemented and has dramatically decreased the rates of the disease in the United States, particularly among children.

How common is chronic hepatitis B in the United States?

In the United States, an estimated 800,000 to 1.4 million persons have chronic hepatitis B virus infection.

How common is chronic hepatitis B outside the United States?

Globally, chronic hepatitis B affects approximately 350 million people and contributes to an estimated 620,000 deaths worldwide each year.

How likely is it that acute hepatitis B will become chronic?

The likelihood depends upon the age at which someone becomes infected. The younger a person is when infected with hepatitis B virus, the greater his or her chance of developing chronic hepatitis B. Approximately 90% of infected infants will develop chronic infection. The risk goes down as a child gets older. Approximately 25%–50% of children infected between the ages of 1 and 5 years will develop chronic hepatitis. The risk drops to 6%–10% when a person is infected over 5 years of age. Worldwide, most people with chronic hepatitis B were infected at birth or during early childhood.

How is hepatitis B spread?

Hepatitis B is spread when blood, semen, or other body fluid infected with the hepatitis B virus enters the body of a person who is not infected. People can become infected with the virus during activities such as:

- Birth (spread from an infected mother to her baby during birth)
- Sex with an infected partner
- Sharing needles, syringes, or other drug-injection equipment
- Sharing items such as razors or toothbrushes with an infected person
- Direct contact with the blood or open sores of an infected person
- Exposure to blood from needlesticks or other sharp instruments

Can a person spread hepatitis B and not know it?

Yes. Many people with chronic hepatitis B virus infection do not know they are infected since they do not feel or look sick. However, they still can spread the virus to others and are at risk of serious health problems themselves.

Can hepatitis B be spread through sex?

Yes. Among adults in the United States, hepatitis B is most commonly spread through sexual contact and accounts for nearly two-thirds of acute hepatitis B cases. In fact, hepatitis B is 50–100 times more infectious than HIV and can be passed through the exchange of body fluids, such as semen, vaginal fluids, and blood.

Can hepatitis B be spread through food?

Unlike hepatitis A, it is not spread routinely through food or water. However, there have been instances in which hepatitis B has been spread to babies when they have received food pre-chewed by an infected person.

What are ways hepatitis B is not spread?

Hepatitis B virus is not spread by sharing eating utensils, breastfeeding, hugging, kissing, holding hands, coughing, or sneezing.

Who is at risk for hepatitis B?

Although anyone can get hepatitis B, some people are at greater risk, such as those who:

- Have sex with an infected person
- Have multiple sex partners
- Have a sexually transmitted disease
- Are men who have sexual contact with other men
- Inject drugs or share needles, syringes, or other drug equipment
- Live with a person who has chronic hepatitis B
- Are infants born to infected mothers
- Are exposed to blood on the job
- Are hemodialysis patients
- Travel to countries with moderate to high rates of hepatitis B

Does acute hepatitis B cause symptoms?

Sometimes. Although a majority of adults develop symptoms from acute hepatitis B virus infection, many young children do not. Adults and children over the age of 5 years are more likely to have symptoms. Seventy percent of adults will develop symptoms from the infection.

What are the symptoms of acute hepatitis B?

Symptoms of acute hepatitis B, if they appear, can include:

- Fever
- Fatigue

- Loss of appetite
- Nausea
- Vomiting
- Abdominal pain
- Dark urine
- Clay-colored bowel movements
- Joint pain
- Jaundice (yellow color in the skin or the eyes)

How soon after exposure to hepatitis B will symptoms appear?

On average, symptoms appear 90 days (or 3 months) after exposure, but they can appear any time between 6 weeks and 6 months after exposure.

How long do acute hepatitis B symptoms last?

Symptoms usually last a few weeks, but some people can be ill for as long as 6 months.

Can a person spread hepatitis B without having symptoms?

Yes. Many people with hepatitis B have no symptoms, but these people can still spread the virus.

What are the symptoms of chronic hepatitis B?

Some people have ongoing symptoms similar to acute hepatitis B, but most individuals with chronic hepatitis B remain symptom free for as long as 20 or 30 years. About 15%–25% of people with chronic hepatitis B develop serious liver conditions, such as cirrhosis (scarring of the liver) or liver cancer. Even as the liver becomes diseased, some people still do not have symptoms, although certain blood tests for liver function might begin to show some abnormalities.

How will I know if I have hepatitis B?

Talk to your health professional. Since many people with hepatitis B do not have symptoms, doctors diagnose the disease by one or more blood tests. These tests look for the presence of antibodies or antigens and can help determine whether you:

- have acute or chronic infection
- have recovered from infection
- are immune to hepatitis B
- could benefit from vaccination

What are antigens and antibodies?

An antigen is a substance on the surface of a virus that causes a person's immune system to recognize and respond to it. When the body is exposed to an antigen, the body views it as foreign material and takes steps to neutralize the antigen by producing antibodies. An antibody is a substance found in the blood that the body produces in response to a virus. Antibodies protect the body from disease by attaching to the virus and destroying it.

What are the common blood tests available to diagnose hepatitis B?

There are many different blood tests available to diagnose hepatitis B. They can be ordered as an individual test or as a series of tests. Ask your health professional to explain what he or she hopes to learn from the tests and when you will get the results. Below are some of the common tests and their meanings. But remember: only your doctor can interpret your individual test results.

Hepatitis B Surface Antigen (HBsAg) is a protein on the surface of the hepatitis B virus. It can be detected in the blood during acute or chronic hepatitis B virus infection. The body normally produces antibodies to HBsAg as part of the normal immune response to infection.

A positive test means:

- A person has an acute or chronic hepatitis B virus infection and can pass the virus to others

A negative test means:

- A person does not have the hepatitis B virus in his or her blood

Hepatitis B Surface Antibody (anti-HBs) is an antibody that is produced by the body in response to the hepatitis B surface antigen.

A positive test means:

- A person is protected or immune from getting the hepatitis B virus for one of two reasons:
 - he or she was successfully vaccinated against hepatitis B
 - OR
 - he or she recovered from an acute infection (and can't get hepatitis B again)

Total Hepatitis B Core Antibody (anti-HBc) is an antibody that is produced by the body in response to a part of the hepatitis B virus called the "core antigen." The meaning of this test often depends on the results of two other tests, anti-HBs and HBsAg.

A positive test means:

- A person is either currently infected with the hepatitis B virus or was infected in the past

IgM Antibody to Hepatitis B Core Antigen (IgM anti-HBc) is used to detect an

acute infection.

A positive test means:

- A person was infected with hepatitis B virus within the last 6 months

Hepatitis B "e" Antigen (HBeAg) is a protein found in the blood when the hepatitis B virus is present during an active hepatitis B virus infection.

A positive test means:

- A person has high levels of virus in his or her blood and can easily spread the virus to others

This test is also used to monitor the effectiveness of treatment for chronic hepatitis B.

Hepatitis B e Antibody (HBeAb or anti-HBe) is an antibody that is produced by the body in response to the hepatitis B "e" antigen.

A positive test means:

- A person has chronic hepatitis B virus infection but is at lower risk of liver problems due to low levels of hepatitis B virus in his or her blood

Hepatitis B Viral DNA refers to a test to detect the presence of hepatitis B virus DNA in a person's blood.

A positive test means:

- The virus is multiplying in a person's body and he or she is highly contagious and can pass the virus to others
 - If a person has a chronic hepatitis B virus infection, the presence of viral DNA means that a person is possibly at increased risk for liver damage

This test is also used to monitor the effectiveness of drug therapy for chronic hepatitis B virus infection.

How is acute hepatitis B treated?

There is no medication available to treat acute hepatitis B. During this short-term infection, doctors usually recommend rest, adequate nutrition, and fluids, although some people may need to be hospitalized.

How is chronic hepatitis B treated?

It depends. People with chronic hepatitis B virus infection should seek the care or consultation of a doctor with experience treating hepatitis B. This can include some internists or family medicine practitioners, as well as specialists such as infectious disease physicians, gastroenterologists, or hepatologists (liver specialists). People with chronic hepatitis B should be monitored regularly for signs of liver disease and evaluated for possible treatment. Several medications have been approved for hepatitis B treatment, and new drugs are in development. However, not every person with chronic hepatitis B needs to be on medication, and the drugs may cause side effects in some patients.

What can people with chronic hepatitis B do to take care of their liver?

People with chronic hepatitis B should be monitored regularly by a doctor experienced in caring for people with hepatitis B. They should avoid alcohol because it can cause additional liver damage. They also should check with a health professional before taking any prescription pills, supplements, or over-the-counter medications, as these can potentially damage the liver.

If I had hepatitis B in the past, can I get it again?

No, once you recover from hepatitis B, you develop antibodies that protect you from the virus for life. An antibody is a substance found in the blood that the body produces in response to a virus. Antibodies protect the body from disease by attaching to the virus and destroying it. However, some people, especially those infected during early childhood, remain infected for life because they never clear the virus from their bodies.

Can I donate blood, organs, or semen if I have hepatitis B?

No, if you have ever tested positive for the hepatitis B virus, experts recommend that you not donate blood, organs, or semen because this can put the recipient at great risk for getting hepatitis.

How long does the hepatitis B virus survive outside the body?

Hepatitis B virus can survive outside the body at least 7 days. During that time, the virus can still cause infection if it enters the body of a person who is not infected.

How should blood spills be cleaned from surfaces to make sure that hepatitis B virus is gone?

All blood spills — including those that have already dried — should be cleaned and disinfected with a mixture of bleach and water (one part household bleach to 10 parts water). Gloves should always be used when cleaning up any blood spills. Even dried blood can present a risk to others.

Can hepatitis B be prevented?

Yes. The best way to prevent hepatitis B is by getting the hepatitis B vaccine. The hepatitis B vaccine is safe and effective and is usually given as 3-4 shots over a 6-month period.

What is the hepatitis B vaccine series?

The hepatitis B vaccine series is a sequence of shots that stimulate a person's natural immune system to protect against HBV. After the vaccine is given, the body makes antibodies that protect a person against the virus. An antibody is a substance found in the blood that is produced in response to a virus invading the body. These antibodies are then stored in the body and will fight off the infection if a person is exposed to the hepatitis B virus in the future.

Who should get vaccinated against hepatitis B?

Hepatitis B vaccination is recommended for:

- All infants, starting with the first dose of hepatitis B vaccine at birth
- All children and adolescents younger than 19 years of age who have not been vaccinated
- People whose sex partners have hepatitis B
- Sexually active persons who are not in a long-term, mutually monogamous relationship.
- Persons seeking evaluation or treatment for a sexually transmitted disease
- Men who have sexual contact with other men
- People who share needles, syringes, or other drug-injection equipment
- People who have close household contact with someone infected with the hepatitis B virus
- Healthcare and public safety workers at risk for exposure to blood or blood-contaminated body fluids on the job
- People with end-stage renal disease, including predialysis, hemodialysis, peritoneal dialysis, and home dialysis patients
- Residents and staff of facilities for developmentally disabled persons
- Travelers to [regions with moderate or high rates of hepatitis B](#)
- People with chronic liver disease
- People with HIV infection
- Anyone who wishes to be protected from hepatitis B virus infection

In order to reach individuals at risk for hepatitis B, vaccination is also recommended for anyone in or seeking treatment from the following:

- Sexually transmitted disease treatment facilities
- HIV testing and treatment facilities
- Facilities providing drug-abuse treatment and prevention services
- Healthcare settings targeting services to injection drug users
- Healthcare settings targeting services to men who have sex with men
- Chronic hemodialysis facilities and end-stage renal disease programs
- Correctional facilities
- Institutions and nonresidential day care facilities for developmentally disabled persons

When should a person get the hepatitis B vaccine series?

Children and Adolescents

- All children should get their first dose of hepatitis B vaccine at birth and complete the vaccine series by 6–18 months of age.

- All children and adolescents younger than 19 years of age who have not yet gotten the vaccine should also be vaccinated. "Catch-up" vaccination is recommended for children and adolescents who were never vaccinated or who did not get the entire vaccine series.

Adults:

- Any adult who is at risk for hepatitis B virus infection or who wants to be vaccinated should talk to a health professional about getting the vaccine series.

For more information about hepatitis B and other vaccines, see <http://www.cdc.gov/vaccines/recs/schedules/default.htm>.

Is the hepatitis B vaccine recommended before international travel?

The risk for hepatitis B virus infection in international travelers is generally low, although people traveling to certain countries are at risk. Travelers to [regions with moderate or high rates of hepatitis B](#) should get the hepatitis B vaccine.

How is the hepatitis B vaccine series given?

The hepatitis B vaccine is usually given as a series of 3 or 4 shots over a 6-month period.

Is the hepatitis B vaccine series effective?

Yes, the hepatitis B vaccine is very effective at preventing hepatitis B virus infection. After receiving all three doses, hepatitis B vaccine provides greater than 90% protection to infants, children, and adults immunized before being exposed to the virus.

Is the hepatitis B vaccine safe?

Yes, the hepatitis B vaccine is safe. Soreness at the injection site is the most common side effect reported. As with any medicine, there are very small risks that a serious problem could occur after getting the vaccine. However, the potential risks associated with hepatitis B are much greater than the risks the vaccine poses. Since the vaccine became available in 1982, more than 100 million people have received hepatitis B vaccine in the United States and no serious side effects have been reported.

Is it harmful to have an extra dose of hepatitis B vaccine or to repeat the entire hepatitis B vaccine series?

No, getting extra doses of hepatitis B vaccine is not harmful.

What should be done if hepatitis B vaccine series was not completed?

Talk to your health professional to resume the vaccine series as soon as possible. The series does not need to be restarted.

Who should not receive the hepatitis B vaccine?

The hepatitis B vaccine is not recommended for people who have had serious allergic reactions to a prior dose of hepatitis B vaccine or to any part of the vaccine. Also, it is not recommended for anyone who is allergic to yeast because yeast is used when making the vaccine. Tell your doctor if you have any severe allergies.

Are booster doses of hepatitis B vaccine necessary?

It depends. A "booster" dose of hepatitis B vaccine is a dose that increases or extends the effectiveness of the vaccine. Booster doses are recommended only for hemodialysis patients and can be considered for other people with a weakened immune system. Booster doses are not recommended for persons with normal immune status who have been fully vaccinated.

Is there a vaccine that will protect me from both hepatitis A and hepatitis B?

Yes, there is a combination vaccine that protects people from both hepatitis A and hepatitis B. The combined hepatitis A and B vaccine is usually given as three separate doses over a 6-month period.

Can I get the hepatitis B vaccine at the same time as other vaccines?

Yes. Getting two different vaccines at the same time has not been shown to be harmful.

Where can I get the hepatitis B vaccine?

Talk to your doctor or health professional or call your health department. Some clinics offer free or low-cost vaccines.

If I think I have been exposed to the hepatitis B virus, what should I do?

If you are concerned that you might have been exposed to the hepatitis B virus, call your health professional or your health department. If a person who has been exposed to hepatitis B virus gets the hepatitis B vaccine and/or a shot called "HBIG" (hepatitis B immune globulin) within 24 hours, hepatitis B infection may be prevented.

What is hepatitis B immune globulin (HBIG)?

Hepatitis B immune globulin is a substance made from human blood samples that contains antibodies against the hepatitis B virus. It is given as a shot and can provide short-term protection (approximately 3 months) against hepatitis B.

(g) Pregnancy and Hepatitis B

Are pregnant women tested for hepatitis B?

Yes. When a pregnant woman comes in for prenatal care, she will be given a series of routine blood tests, including one that checks for the presence of hepatitis B virus infection. This test is important because women infected with this virus can pass hepatitis B to their babies during birth. But this can be prevented by giving the infant HBIG and the first hepatitis B vaccine at birth, and then completing the series.

What if a pregnant woman has hepatitis B?

If a pregnant woman has hepatitis B, she can pass the infection to her baby during birth. But this can be prevented through a series of vaccinations and HBIG for her baby beginning at birth. Without vaccination, babies born to women with hepatitis B virus infection can develop chronic infection, which can lead to serious health problems.

How does a baby get hepatitis B?

A baby can get hepatitis B from an infected mother during childbirth.

Can a baby be protected from getting hepatitis B from his or her mother during birth?

Yes, almost all cases of hepatitis B can be prevented if a baby born to an infected woman receives the necessary shots at the recommended times. The infant should receive a shot called hepatitis B immune globulin (HBIG) and the first dose of hepatitis B vaccine within 12 hours of birth. Two or 3 additional shots of vaccine are needed over the next 1–15 months to help prevent hepatitis B. The timing and total number of shots will be influenced by several factors, including the type of vaccine and the baby's age and weight. In addition, experts recommend that the baby be tested after completion of the vaccine series to make sure he or she is protected from the disease. To best protect your baby, follow the advice of his or her doctor.

What happens if a baby gets hepatitis B?

Most newborns who become infected with hepatitis B virus do not have symptoms, but they have a 90% chance of developing chronic hepatitis B. This can eventually lead to serious health problems, including liver damage, liver cancer, and even death.

Do babies need the hepatitis B vaccine even if a pregnant woman does not have hepatitis B?

Yes. The hepatitis B vaccine is recommended for all infants. CDC recommends that the infant get the first shot before leaving the hospital.

Why is the hepatitis B vaccine recommended for all babies?

Hepatitis B vaccine is recommended for all babies so that they will be protected from a serious but preventable disease. Babies and young children are at much greater risk for developing a chronic infection if infected, but the vaccine can prevent this.

Hepatitis C

<http://www.cdc.gov/hepatitis/C/cFAQ.htm>

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What is hepatitis?

“Hepatitis” means inflammation of the liver. Toxins, certain drugs, some diseases, heavy alcohol use, and bacterial and viral infections can all cause hepatitis. Hepatitis is also the name of a family of viral infections that affect the liver; the most common types are hepatitis A, hepatitis B, and hepatitis C.

What is the difference between hepatitis A, hepatitis B, and hepatitis C?

[Hepatitis A](#), [hepatitis B](#), and [hepatitis C](#) are diseases caused by three different viruses. Although each can cause similar symptoms, they have different modes of transmission and can affect the liver differently. Hepatitis A appears only as an acute or newly occurring infection and does not become chronic. People with hepatitis A usually improve without treatment. Hepatitis B and hepatitis C can also begin as acute infections, but in some people, the virus remains in the body, resulting in chronic disease and long-term liver problems. There are vaccines to prevent hepatitis A and B; however, there is not one for hepatitis C. If a person has had one type of viral hepatitis in the past, it is still possible to get the other types.

What is hepatitis C?

Hepatitis C is a contagious liver disease that ranges in severity from a mild illness lasting a few weeks to a serious, lifelong illness that attacks the liver. It results from infection with the hepatitis C virus (HCV), which is spread primarily through contact with the blood of an infected person. Hepatitis C can be either “acute” or “chronic.”

Acute hepatitis C virus infection is a short-term illness that occurs within the first 6 months after someone is exposed to the hepatitis C virus. For most people, acute infection leads to chronic infection.

Chronic hepatitis C virus infection is a long-term illness that occurs when the hepatitis C virus remains in a person’s body. Hepatitis C virus infection can last a lifetime and lead to serious liver problems, including cirrhosis (scarring of the liver) or liver cancer.

How common is acute hepatitis C in the United States?

In 2006, there were an estimated 19,000 new hepatitis C virus infections in the United States. However, the official number of reported hepatitis C cases is much lower. Many people who are infected never have symptoms and therefore never come to the attention of medical or public health officials.

How common is chronic hepatitis C in the United States?

An estimated 3.2 million persons in the United States have chronic hepatitis C virus infection. Most people do not know they are infected because they don’t look or feel sick.

How likely is it that acute hepatitis C will become chronic?

Approximately 75%–85% of people who become infected with hepatitis C virus develop chronic infection.

How serious is chronic hepatitis C?

Chronic hepatitis C is a serious disease that can result in long-term health problems, including liver damage, liver failure, liver cancer, or even death. It is the leading cause of cirrhosis and liver cancer and the most common reason for liver

transplantation in the United States. Approximately 8,000–10,000 people die every year from hepatitis C related liver disease.

How is hepatitis C spread?

Hepatitis C is spread when blood from a person infected with the hepatitis C virus enters the body of someone who is not infected. Today, most people become infected with the hepatitis C virus by sharing needles or other equipment to inject drugs. Before 1992, when widespread screening of the blood supply began in the United States, hepatitis C was also commonly spread through blood transfusions and organ transplants.

People can become infected with the hepatitis C virus during such activities as

- Sharing needles, syringes, or other equipment to inject drugs
- Needlestick injuries in healthcare settings
- Being born to a mother who has hepatitis C

Less commonly, a person can also get hepatitis C virus infection through

- Sharing personal care items that may have come in contact with another person's blood, such as razors or toothbrushes
- Having sexual contact with a person infected with the hepatitis C virus

Can hepatitis C be spread through sexual contact?

Yes, but the risk of transmission from sexual contact is believed to be low. The risk increases for those who have multiple sex partners, have a sexually transmitted disease, engage in rough sex, or are infected with HIV. More research is needed to better understand how and when hepatitis C can be spread through sexual contact.

Can you get hepatitis C by getting a tattoo or piercing?

A few major research studies have not shown hepatitis C to be spread through licensed, commercial tattooing facilities. However, transmission of hepatitis C (and other infectious diseases) is possible when poor infection-control practices are used during tattooing or piercing. Body art is becoming increasingly popular in the United States, and unregulated tattooing and piercing are known to occur in prisons and other informal or unregulated settings. Further research is needed to determine if these types of settings and exposures are responsible for hepatitis C virus transmission.

Can hepatitis C be spread within a household?

Yes, but this does not occur very often. If hepatitis C virus is spread within a household, it is most likely a result of direct, through-the-skin exposure to the blood of an infected household member.

What are ways hepatitis C is not spread?

Hepatitis C virus is not spread by sharing eating utensils, breastfeeding, hugging, kissing, holding hands, coughing, or sneezing. It is also not spread through food or water.

Who is at risk for hepatitis C?

Some people are at increased risk for hepatitis C, including

- Current injection drug users (currently the most common way hepatitis C virus is spread in the United States)
- Past injection drug users, including those who injected only one time or many years ago
- Recipients of donated blood, blood products, and organs (once a common means of transmission but now rare in the United States since blood screening became available in 1992)
- People who received a blood product for clotting problems made before 1987
- Hemodialysis patients or persons who spent many years on dialysis for kidney failure
- People who received body piercing or tattoos done with non-sterile instruments
- People with known exposures to the hepatitis C virus, such as
 - Healthcare workers injured by needlesticks
 - Recipients of blood or organs from a donor who tested positive for the hepatitis C virus
- HIV-infected persons
- Children born to mothers infected with the hepatitis C virus

Less common risks include:

- Having sexual contact with a person who is infected with the hepatitis C virus
- Sharing personal care items, such as razors or toothbrushes, that may have come in contact with the blood of an infected person

What is the risk of a pregnant woman passing hepatitis C to her baby?

Hepatitis C is rarely passed from a pregnant woman to her baby. About 4 of every 100 infants born to mothers with hepatitis C become infected with the virus. However, the risk becomes greater if the mother has both HIV infection and hepatitis C.

What are the symptoms of acute hepatitis C?

Approximately 70%–80% of people with acute hepatitis C do not have any symptoms. Some people, however, can have mild to severe symptoms soon after being infected, including

- Fever
- Fatigue
- Loss of appetite
- Nausea
- Vomiting
- Abdominal pain
- Dark urine
- Clay-colored bowel movements
- Joint pain
- Jaundice (yellow color in the skin or eyes)

How soon after exposure to hepatitis C do symptoms appear?

If symptoms occur, the average time is 6–7 weeks after exposure, but this can range from 2 weeks to 6 months. However, many people infected with the hepatitis C virus do not develop symptoms.

Can a person spread hepatitis C without having symptoms?

Yes, even if a person with hepatitis C has no symptoms, he or she can still spread the virus to others.

Is it possible to have hepatitis C and not know it?

Yes, many people who are infected with the hepatitis C virus do not know they are infected because they do not look or feel sick.

What are the symptoms of chronic hepatitis C?

Most people with chronic hepatitis C do not have any symptoms. However, if a person has been infected for many years, his or her liver may be damaged. In many cases, there are no symptoms of the disease until liver problems have developed. In persons without symptoms, hepatitis C is often detected during routine blood tests to measure liver function and liver enzyme (protein produced by the liver) level.

Can a person have normal liver enzyme (e.g., ALT) results and still have hepatitis C?

Yes. It is common for persons with chronic hepatitis C to have a liver enzyme level that goes up and down, with periodic returns to normal or near normal. Some infected persons have liver enzyme levels that are normal for over a year even though they have chronic liver disease. If the liver enzyme level is normal, persons should have their enzyme level re-checked several times over a 6–12 month period. If the liver enzyme level remains normal, the doctor may check it less frequently, such as once a year.

Who should get tested for hepatitis C?

Talk to your doctor about being tested for hepatitis C if any of the following are true:

- You are a current or former injection drug user, even if you injected only one time or many years ago.
- You were treated for a blood clotting problem before 1987.
- You received a blood transfusion or organ transplant before July 1992.
- You are on long-term hemodialysis treatment.
- You have abnormal liver tests or liver disease.
- You work in healthcare or public safety and were exposed to blood through a needlestick or other sharp object injury.
- You are infected with HIV.

If you are pregnant, should you be tested for hepatitis C?

No, getting tested for hepatitis C is not part of routine prenatal care. However, if a pregnant woman has [risk factors](#) for hepatitis C virus infection, she should speak with her doctor about getting tested.

What blood tests are used to test for hepatitis C?

Several different blood tests are used to test for hepatitis C. A doctor may order just one or a combination of these tests. Typically, a person will first get a screening test that will show whether he or she has developed antibodies to the hepatitis C virus. (An antibody is a substance found in the blood that the body produces in response to a virus.) Having a positive antibody test means that a person was exposed to the virus at some time in his or her life. If the antibody test is positive, a doctor will most likely order a second test to confirm whether the virus is still present in the person's bloodstream.

How is acute hepatitis C treated?

There is no medication available to treat acute hepatitis C infection. Doctors usually recommend rest, adequate nutrition, and fluids.

How is chronic hepatitis C treated?

Each person should discuss treatment options with a doctor who specializes in treating hepatitis. This can include some internists, family practitioners, infectious disease doctors, or hepatologists (liver specialists). People with chronic hepatitis C should be monitored regularly for signs of liver disease and evaluated for treatment. The treatment most often used for hepatitis C is a combination of two medicines, interferon and ribavirin. However, not every person with chronic hepatitis C needs or will benefit from treatment. In addition, the drugs may cause serious side effects in some patients.

What are the long-term effects of hepatitis C?

Of every 100 people infected with the hepatitis C virus, about

- 75–85 people will develop chronic hepatitis C virus infection; of those,
 - 60–70 people will go on to develop chronic liver disease
 - 5–20 people will go on to develop cirrhosis over a period of 20–30 years
 - 1–5 people will die from cirrhosis or liver cancer

Is it possible to get over hepatitis C?

Yes, approximately 15%–25% of people who get hepatitis C will clear the virus from their bodies without treatment and will not develop chronic infection. Experts do not fully understand why this happens for some people.

What can a person with chronic hepatitis C do to take care of his or her liver?

People with chronic hepatitis C should be monitored regularly by an experienced doctor. They should avoid alcohol because it can cause additional liver damage. They also should check with a health professional before taking any prescription pills, supplements, or over-the-counter medications, as these can potentially damage the liver. If liver damage is present, a person should check with his or her doctor about getting vaccinated against hepatitis A and hepatitis B.

Should a person infected with the hepatitis C virus be restricted from working in certain jobs or settings?

CDC's [recommendations](#) for prevention and control of the hepatitis C virus infection state that people should not be excluded from work, school, play, child care, or other settings because they have hepatitis C. There is no evidence that people can get hepatitis C from food handlers, teachers, or other service providers without blood-to-blood contact.

What is HIV and hepatitis C virus coinfection?

HIV and hepatitis C virus coinfection refers to being infected with both HIV and the hepatitis C virus. Coinfection is more common in persons who inject drugs. In fact, 50%–90% of HIV-infected persons who use injection drugs are also infected with the hepatitis C virus. To learn more about coinfection, visit <http://www.cdc.gov/hiv/resources/factsheets/coinfection.htm>.

Can I donate blood, organs, or semen if I have hepatitis C?

No, if you ever tested positive for the hepatitis C virus (or hepatitis B virus), experts recommend never donating blood, organs, or semen because this can spread the infection to the recipient.

Is there a vaccine that can prevent hepatitis C?

Not yet. Vaccines are available only for hepatitis A and hepatitis B. Research into the development of a vaccine is under way.

Can a person get hepatitis C from a mosquito or other insect bite?

Hepatitis C virus has not been shown to be transmitted by mosquitoes or other insects.

How long does the hepatitis C virus survive outside the body?

The hepatitis C virus can survive outside the body at room temperature, on environmental surfaces, for at least 16 hours but no longer than 4 days.

How should blood spills be cleaned from surfaces to make sure that hepatitis C virus is gone?

Any blood spills — including dried blood, which can still be infectious — should be cleaned using a dilution of one part household bleach to 10 parts water. Gloves should be worn when cleaning up blood spills.

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Amebiasis

(am-e-BI-a-sis)

What is amebiasis?

Amebiasis is a disease caused by a one-celled parasite called *Entamoeba histolytica* (*ent-a-ME-ba his-to-LI-ti-ka*).

Who is at risk for amebiasis?

Although anyone can have this disease, it is most common in people who live in developing countries that have poor sanitary conditions. In the United States, amebiasis is most often found in immigrants from developing countries. It also is found in people who have traveled to developing countries and in people who live in institutions that have poor sanitary conditions. Men who have sex with men can become infected and can get sick from the infection, but they often do not have symptoms.

How can I become infected with *E. histolytica*?

- By putting anything into your mouth that has touched the stool of a person who is infected with *E. histolytica*.
- By swallowing something, such as water or food, that is contaminated with *E. histolytica*.
- By touching and bringing to your mouth cysts (eggs) picked up from surfaces that are contaminated with *E. histolytica*.

What are the symptoms of amebiasis?

On average, about one in 10 people who are infected with *E. histolytica* becomes sick from the infection. The symptoms often are quite mild and can include loose stools, stomach pain, and stomach cramping. Amebic dysentery is a severe form of amebiasis associated with stomach pain, bloody stools, and fever. Rarely, *E. histolytica* invades the liver and forms an abscess. Even less commonly, it spreads to other parts of the body, such as the lungs or brain.

If I swallowed *E. histolytica*, how quickly would I become sick?

Usually 1 to 4 weeks later but sometimes more quickly or more slowly.

What should I do if I think I have amebiasis?

See your health care provider.

How is amebiasis diagnosed?

Your health care provider will ask you to submit stool samples. Because *E. histolytica* is not always found in every stool sample, you may be asked to submit several stool samples from several different days.

Diagnosis of amebiasis can be very difficult. One problem is that other parasites and cells can look very similar to *E. histolytica* when seen under a microscope. Therefore, sometimes people are told that they are infected with *E. histolytica* even though they are not. *Entamoeba histolytica* and another amoeba, *Entamoeba dispar*, which is about 10 times more common, look the same when seen under a microscope. Unlike infection with *E. histolytica*, which sometimes makes people sick, infection with *E. dispar* never makes people sick and therefore does not need to be treated.

If you have been told that you are infected with *E. histolytica* but you are feeling fine, you might be infected with *E. dispar* instead. Unfortunately, most laboratories do not yet have the tests that can tell whether a person is infected with *E. histolytica* or with *E. dispar*. Until these tests become more widely available, it usually is best to assume that the parasite is *E. histolytica*.

A blood test is also available. However, the test is recommended only when your health care provider thinks that your infection has invaded the wall of the intestine (gut) or some other organ of your body, such as the liver. One problem is that the blood test may still be positive if you had amebiasis in the past, even if you are no longer infected now.

How is amebiasis treated?

Several antibiotics are available to treat amebiasis. Treatment must be prescribed by a physician. You will be treated with only one antibiotic if your *E. histolytica* infection has **not** made you sick. You probably will be treated with two antibiotics (first one and then the other) if your infection **has** made you sick.

I am going to travel to a country that has poor sanitary conditions. What should I eat and drink there so I will NOT become infected with *E. histolytica* or other such germs?

- Drink only bottled or boiled (for 1 minute) water or carbonated (bubbly) drinks in cans or bottles. Do **not** drink fountain drinks or any drinks with ice cubes. Another way to make water safe is by filtering it through an "absolute 1 micron or less" filter **and** dissolving iodine tablets in the filtered water. "Absolute 1 micron" filters can be found in camping/outdoor supply stores.
- Do **not** eat fresh fruit or vegetables that you did not peel yourself.
- Do **not** eat or drink milk, cheese, or dairy products that may not have been pasteurized.
- Do **not** eat or drink anything sold by street vendors.

Should I be concerned about spreading infection to the rest of my household?

Yes. However, the risk of spreading infection is low if the infected person is treated with antibiotics and practices good personal hygiene. This includes thorough hand washing with soap and water after using the toilet, after changing diapers, and before handling food.

http://www.cdc.gov/ncidod/dpd/parasites/amebiasis/factsht_amebiasis.htm

Ascaris Infection

(Ass-kuh-ris)

What is an ascaris infection?

An ascarid is a worm that lives in the small intestine. Infection with ascarids is called ascariasis (ass-kuh-rye-uh-sis). Adult female worms can grow over 12 inches in length, adult males are smaller.

How common is ascariasis?

Ascariasis is the most common human worm infection. Infection occurs worldwide and is most common in tropical and subtropical areas where sanitation and hygiene are poor. Children are infected more often than adults. In the United States, infection is rare, but most common in rural areas of the southeast.

What are the signs and symptoms of an ascaris infection?

Most people have no symptoms. If you are heavily infected, you may have abdominal pain. Sometimes, while the immature worms migrate through the lungs, you may cough and have difficulty breathing. If you have a very heavy worm infection, your intestines may become blocked.

How is an ascaris infection spread?

Ascarid eggs are found in the soil. Infection occurs when a person accidentally ingests (swallows) infective ascarid eggs. Once in the stomach, larvae (immature worms) hatch from the eggs. The larvae are carried through the lungs then to the throat where they are then swallowed. Once swallowed, they reach the intestines and develop into adult worms. Adult female worms lay eggs that are then passed in feces; this cycle will take between 2-3 months.

Pigs can be infected with ascarids. Occasionally, a pig ascarid infection can be spread to humans; this occurs when infective eggs, found in the soil and manure, are ingested. Infection is more likely if pig feces are used as fertilizer in the garden; crops then become contaminated with ascarid eggs.

How can I get ascariasis?

You or your children can become infected after touching your mouth with your hands contaminated with eggs from soil or other contaminated surfaces.

What should I do if I think I have ascariasis?

See your health care provider.

How is diagnosis of ascaris made?

Your health care provider will ask you to provide stool samples for testing. Some people notice infection when a worm is passed in stool or is coughed up. If this happens, bring in the worm specimen to your health care provider for diagnosis. There is no blood test used to diagnose an ascarid infection.

What is the treatment for ascariasis?

In the United States, ascaris infections are generally treated for 1-3 days with medication prescribed by your health care provider. The drugs are effective and appear to have few side-effects. Your health care provider will likely request additional stool exams 1 to 2 weeks after therapy; if the infection is still present, treatment will be repeated.

I am pregnant and have just been diagnosed with ascariasis. Can I be treated?

Infection with ascarid worms is generally light and is not considered an emergency. Unless your infection is heavy, and your health may be at risk, treatment is generally postponed until after delivery of the baby.

How can I prevent infection with ascarids?

- Avoid contacting soil that may be contaminated with human feces.
- Do not defecate outdoors.
- Dispose of diapers properly.
- Wash hands with soap and water before handling food.
- When traveling to countries where sanitation and hygiene are poor, avoid water or food that may be contaminated.
- Wash, peel or cook all raw vegetables and fruits before eating.

Should I be concerned about spreading infection to the rest of my household?

No. Infection is not spread from person to person.

For more information:

Sarinas PS, Chitkara RK. Ascariasis and hookworm. *Semin Respir Infect* 1997 Jun;12(2):130-7

This fact sheet is for information only and is not meant to be used for self-diagnosis or as a substitute for consultation with a health care provider. If you have any questions about the disease described above or think that you may have a parasitic infection, consult a health care provider.

http://www.cdc.gov/ncidod/dpd/parasites/ascaris/factsht_ascaris.htm

Foodborne Illness

- What is foodborne disease?
- What are the most common foodborne diseases?
- Are the types of foodborne diseases changing?
- What happens in the body after the microbes that produce illness are swallowed?
- How are foodborne diseases diagnosed?
- How are foodborne diseases treated?
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- How many cases of foodborne disease are there in the United States?
- How do public health departments track foodborne diseases?
- What is a foodborne disease outbreak and why do they occur?
- Why do public health officials investigate outbreaks?
- How are outbreaks of foodborne disease detected?
- How is a foodborne disease outbreak investigated?
- How does food become contaminated?
- What foods are most associated with foodborne illness?
- What can consumers do to protect themselves from foodborne illness?
- Are some people more likely to contract a foodborne illness? If so, are there special precautions they should take?
- What can consumers do when they eat in restaurants?
- There is only so much the consumer can do. How can food be made safer in the first place?
- What is CDC doing to control and prevent foodborne disease?
- What are some critical unsolved problems in foodborne disease?
- Where can I learn more about foodborne diseases?

What is foodborne disease?

Foodborne disease is caused by consuming contaminated foods or beverages. Many different disease-causing microbes, or pathogens, can contaminate foods, so there are many different foodborne infections. In addition, poisonous chemicals, or other harmful substances can cause foodborne diseases if they are present in food.

More than 250 different foodborne diseases have been described. Most of these diseases are infections, caused by a variety of bacteria, viruses, and parasites that can be foodborne. Other diseases are poisonings, caused by harmful toxins or chemicals that have contaminated the food, for example, poisonous mushrooms. These different diseases have many different symptoms, so there is no one "syndrome" that is foodborne illness. However, the microbe or toxin enters the body through the gastrointestinal tract, and often causes the first symptoms there, so nausea, vomiting, abdominal cramps and diarrhea are common symptoms in many foodborne diseases.

Many microbes can spread in more than one way, so we cannot always know that a disease is foodborne. The distinction matters, because public health authorities need to know how a particular disease is spreading to take the appropriate steps to stop it. For example, *Escherichia coli* O157:H7 infections can spread through contaminated food, contaminated drinking water, contaminated swimming water, and from toddler to toddler at a day care center. Depending on which means of spread caused a case, the measures to stop other cases from occurring could range

from removing contaminated food from stores, chlorinating a swimming pool, or closing a child day care center.

What are the most common foodborne diseases?

The most commonly recognized foodborne infections are those caused by the bacteria *Campylobacter*, *Salmonella*, and *E. coli* O157:H7, and by a group of viruses called calicivirus, also known as the Norwalk and Norwalk-like viruses.

Campylobacter is a bacterial pathogen that causes fever, diarrhea, and abdominal cramps. It is the most commonly identified bacterial cause of diarrheal illness in the world. These bacteria live in the intestines of healthy birds, and most raw poultry meat has *Campylobacter* on it. Eating undercooked chicken, or other food that has been contaminated with juices dripping from raw chicken is the most frequent source of this infection.

Salmonella is also a bacterium that is widespread in the intestines of birds, reptiles and mammals. It can spread to humans via a variety of different foods of animal origin. The illness it causes, salmonellosis, typically includes fever, diarrhea and abdominal cramps. In persons with poor underlying health or weakened immune systems, it can invade the bloodstream and cause life-threatening infections.

E. coli O157:H7 is a bacterial pathogen that has a reservoir in cattle and other similar animals. Human illness typically follows consumption of food or water that has been contaminated with microscopic amounts of cow feces. The illness it causes is often a severe and bloody diarrhea and painful abdominal cramps, without much fever. In 3% to 5% of cases, a complication called hemolytic uremic syndrome (HUS) can occur several weeks after the initial symptoms. This severe complication includes temporary anemia,

In addition to disease caused by direct infection, some foodborne diseases are caused by the presence of a toxin in the food that was produced by a microbe in the food. For example, the bacterium *Staphylococcus aureus* can grow in some foods and produce a toxin that causes intense vomiting. The rare but deadly disease botulism occurs when the bacterium *Clostridium botulinum* grows and produces a powerful paralytic toxin in foods. These toxins can produce illness even if the microbes that produced them are no longer there.

Other toxins and poisonous chemicals can cause foodborne illness. People can become ill if a pesticide is inadvertently added to a food, or if naturally poisonous substances are used to prepare a meal. Every year, people become ill after mistaking poisonous mushrooms for safe species, or after eating poisonous reef fishes.

Are the types of foodborne diseases changing?

The spectrum of foodborne diseases is constantly changing. A century ago, typhoid fever, tuberculosis and cholera were common foodborne diseases. Improvements in food safety, such as pasteurization of milk, safe canning, and disinfection of water supplies have conquered those diseases. Today other foodborne infections have taken their place, including some that have only recently been discovered. For

example, in 1996, the parasite *Cyclospora* suddenly appeared as a cause of diarrheal illness related to Guatemalan raspberries. These berries had just started to be grown commercially in Guatemala, and somehow became contaminated in the field there with this unusual parasite. In 1998, a new strain of the bacterium *Vibrio parahaemolyticus* contaminated oyster beds in Galveston Bay and caused an epidemic of diarrheal illness in persons eating the oysters raw. The affected oyster beds were near the shipping lanes, which suggested that the bacterium arrived in the ballast water of freighters and tankers coming into the harbor from distant ports. Newly recognized microbes emerge as public health problems for several reasons: microbes can easily spread around the world, new microbes can evolve, the environment and ecology are changing, food production practices and consumption habits change, and because better laboratory tests can now identify microbes that were previously unrecognized.

In the last 15 years, several important diseases of unknown cause have turned out to be complications of foodborne infections. For example, we now know that the Guillain-Barre syndrome can be caused by *Campylobacter* infection, and that the most common cause of acute kidney failure in children, hemolytic uremic syndrome, is caused by infection with *E. coli* O157:H7 and related bacteria. In the future, other diseases whose origins are currently unknown may turn out to be related to foodborne infections.

What happens in the body after the microbes that produce illness are swallowed?

After they are swallowed, there is a delay, called the incubation period, before the symptoms of illness begin. This delay may range from hours to days, depending on the organism, and on how many of them were swallowed. During the incubation period, the microbes pass through the stomach into the intestine, attach to the cells lining the intestinal walls, and begin to multiply there. Some types of microbes stay in the intestine, some produce a toxin that is absorbed into the bloodstream, and some can directly invade the deeper body tissues. The symptoms produced depend greatly on the type of microbe. Numerous organisms cause similar symptoms, especially diarrhea, abdominal cramps, and nausea. There is so much overlap that it is rarely possible to say which microbe is likely to be causing a given illness unless laboratory tests are done to identify the microbe, or unless the illness is part of a recognized outbreak.

How are foodborne diseases diagnosed?

The infection is usually diagnosed by specific laboratory tests that identify the causative organism. Bacteria such as *Campylobacter*, *Salmonella*, *E. coli* O157 are found by culturing stool samples in the laboratory and identifying the bacteria that grow on the agar or other culture medium. Parasites can be identified by examining stools under the microscope. Viruses are more difficult to identify, as they are too small to see under a light microscope and are difficult to culture. Viruses are usually identified by testing stool samples for genetic markers that indicate a specific virus is present.

Many foodborne infections are not identified by routine laboratory procedures and require specialized, experimental, and/or expensive tests that are not generally available. If the diagnosis is to be made, the patient has to seek medical attention,

the physician must decide to order diagnostic tests, and the laboratory must use the appropriate procedures. Because many ill persons do not seek attention, and of those that do, many are not tested, many cases of foodborne illness go undiagnosed. For example, CDC estimates that 38 cases of salmonellosis actually occur for every case that is actually diagnosed and reported to public health authorities.

How are foodborne diseases treated?

There are many different kinds of foodborne diseases and they may require different treatments, depending on the symptoms they cause. Illnesses that are primarily diarrhea or vomiting can lead to dehydration if the person loses more body fluids and salts (electrolytes) than they take in. Replacing the lost fluids and electrolytes and keeping up with fluid intake are important. If diarrhea is severe, oral rehydration solution such as Ceralyte*, Pedialyte* or Oralyte*, should be drunk to replace the fluid losses and prevent dehydration. Sports drinks such as Gatorade* do not replace the losses correctly and should not be used for the treatment of diarrheal illness. Preparations of bismuth subsalicylate (e.g., Pepto-Bismol)* can reduce the duration and severity of simple diarrhea. If diarrhea and cramps occur, without bloody stools or fever, taking an antidiarrheal medication may provide symptomatic relief, but these medications should be avoided if there is high fever or blood in the stools because they may make the illness worse.

*CDC does not endorse commercial products or services.

When should I consult my doctor about a diarrheal illness?

A health care provider should be consulted for a diarrheal illness if accompanied by

- high fever (temperature over 101.5 F, measured orally)
- blood in the stools
- prolonged vomiting that prevents keeping liquids down (which can lead to dehydration)
- signs of dehydration, including a decrease in urination, a dry mouth and throat, and feeling dizzy when standing up.
- diarrheal illness that lasts more than 3 days

Do not be surprised if your doctor does not prescribe an antibiotic. Many diarrheal illnesses are caused by viruses and will improve in 2 or 3 days without antibiotic therapy. In fact, antibiotics have no effect on viruses, and using an antibiotic to treat a viral infection could cause more harm than good. It is often not necessary to take an antibiotic even in the case of a mild bacterial infection. Other treatments can help the symptoms, and careful handwashing can prevent the spread of infection to other people. Overuse of antibiotics is the principal reason many bacteria are becoming resistant. Resistant bacteria are no longer killed by the antibiotic. This means that it is important to use antibiotics only when they are really needed. Partial treatment can also cause bacteria to become resistant. If an antibiotic is prescribed, it is important to take all of the medication as prescribed, and not stop early just because the symptoms seem to be improving.

How many cases of foodborne disease are there in the United States?

An estimated 76 million cases of foodborne disease occur each year in the United States. The great majority of these cases are mild and cause symptoms for only a day or two. Some cases are more serious, and CDC estimates that there are 325,000 hospitalizations and 5,000 deaths related to foodborne diseases each year. The most severe cases tend to occur in the very old, the very young, those who have an illness already that reduces their immune system function, and in healthy people exposed to a very high dose of an organism.

How do public health departments track foodborne diseases?

Routine monitoring of important diseases by public health departments is called disease surveillance. Each state decides which diseases are to be under surveillance in that state. In most states, diagnosed cases of salmonellosis, *E. coli* O157:H7 and other serious infections are routinely reported to the health department. The county reports them to the state health department, which reports them to CDC. Tens of thousands of cases of these "notifiable conditions" are reported every year. For example, nearly 35,000 cases of *Salmonella* infection were reported to CDC in 1998. However, most foodborne infections go undiagnosed and unreported, either because the ill person does not see a doctor, or the doctor does not make a specific diagnosis. Also, infections with some microbes are not reportable in the first place.

To get more information about infections that might be diagnosed but not reported, CDC developed a special surveillance system called [FoodNet](#). FoodNet provides the best available information about specific foodborne infections in the United States, and summarizes them in an annual report.

In addition to tracking the number of reported cases of individual infections, states also collect information about foodborne outbreaks, and report a summary of that information to CDC. About 400-500 foodborne outbreaks investigated by local and state health departments are reported each year. This includes information about many diseases that are not notifiable and thus are not under individual surveillance, so it provides some useful general information about foodborne diseases.

What are foodborne disease outbreaks and why do they occur?

An outbreak of foodborne illness occurs when a group of people consume the same contaminated food and two or more of them come down with the same illness. It may be a group that ate a meal together somewhere, or it may be a group of people who do not know each other at all, but who all happened to buy and eat the same contaminated item from a grocery store or restaurant. For an outbreak to occur, something must have happened to contaminate a batch of food that was eaten by a the group of people. Often, a combination of events contributes to the outbreak. A contaminated food may be left out a room temperature for many hours, allowing the bacteria to multiply to high numbers, and then be insufficiently cooked to kill the bacteria.

Many outbreaks are local in nature. They are recognized when a group of people realize that they all became ill after a common meal, and someone calls the local health department. This classic local outbreak might follow a catered meal at a reception, a pot-luck supper, or eating a meal at an understaffed restaurant on a

particularly busy day. However, outbreaks are increasingly being recognized that are more widespread, that affect persons in many different places, and that are spread out over several weeks. For example, a recent outbreak of salmonellosis was traced to persons eating a breakfast cereal produced at a factory in Minnesota, and marketed under several different brand names in many different states. No one county or state had very many cases and the cases did not know each other. The outbreak was recognized because it was caused by an unusual strain of *Salmonella*, and because state public health laboratories that type *Salmonella* strains noticed a sudden increase in this one rare strain. In another recent outbreak, a particular peanut snack food caused the same illness in Israel, Europe and North America. Again, this was recognized as an increase in infections caused by a rare strain of *Salmonella*.

The vast majority of reported cases of foodborne illness are not part of recognized outbreaks, but occurs as individual or "sporadic" cases. It may be that many of these cases are actually part of unrecognized widespread or diffuse outbreaks. Detecting and investigating such widespread outbreaks is a major challenge to our public health system. This is the reason that new and more sophisticated laboratory methods are being used at CDC and in state public health department laboratories.

Why do public health officials investigate outbreaks?

A foodborne outbreak is an indication that something needs to be improved in our food safety system. Public health scientists investigate outbreaks to control them, and also to learn how similar outbreaks can be prevented in the future. Just as when a fire breaks out in a large building or when an airliner crashes, two activities are critical when an outbreak occurs. First, emergency action is needed to keep the immediate danger from spreading, and second, a detailed objective scientific investigation is needed to learn what went wrong, so that future similar events can be prevented. Much of what we know about foodborne disease and its prevention comes from detailed investigation of outbreaks. This is often how a new pathogen is identified, and this is how the critical information linking a pathogen to a specific food and animal reservoir is first gathered. The full investigation can require a team with multiple talents, including the epidemiologist, microbiologist, food sanitarian, food scientist, veterinarian, and factory process engineer.

How are outbreaks of foodborne disease detected?

The initial clue that an outbreak is occurring can come in various ways. It may be when a person realizes that several other people who were all together at an event have become ill and he or she calls the local health department. It may be when a physician realizes she has seen more than the usual number of patients with the same illness. It may be when a county health department gets an unusually large number of reports of illness. The hardest outbreaks to detect are those that are spread over a large geographic area, with only a few cases in each state. These outbreaks can be detected by combining surveillance reports at the regional or national level and looking for increases in infections of a specific type. This is why state public health laboratories determine the serotype of *Salmonella* bacteria isolated from people. New "DNA fingerprinting" technologies can make detecting outbreaks easier too. For example, the new molecular subtyping network, PulseNet, allows state laboratories and CDC to compare strains of *E. coli* O157:H7 and an

increasing number of other pathogens from all across the United States to detect widespread outbreaks.

After an apparent cluster of cases is detected, it is important to determine whether these cases represent a real increase above the expected number of cases and whether they really might be related. Sometimes a cluster of reported cases is caused by something other than an actual outbreak of illness. For example, if the person responsible for reporting has just returned from a vacation and is clearing up a backlog of cases by reporting them all at once, the sudden surge of reports is just a false cluster.

How is a foodborne disease outbreak investigated?

Once an outbreak is strongly suspected, an investigation begins. A search is made for more cases among persons who may have been exposed. The symptoms and time of onset and location of possible cases are determined, and a "case definition" is developed that describes these typical cases. The outbreak is systematically described by time, place, and person. A graph is drawn of the number of people who fell ill on each successive day to show pictorially when it occurred. A map of where the ill people live, work, or eat may be helpful to show where it occurred. Calculating the distribution of cases by age and sex shows who is affected. If the causative microbe is not known, samples of stool or blood are collected from ill people and sent to the public health laboratory to make the diagnosis.

To identify the food or other source of the outbreak, the investigators first interview a few persons with the most typical cases about exposures they may have had in the few days before they got sick. In this way, certain potential exposures may be excluded while others that are mentioned repeatedly emerge as possibilities. Combined with other information, such as the likely sources for the specific microbe involved, these hypotheses are then tested in a formal epidemiologic investigation. The investigators conduct systematic interviews about a list of possible exposures with the ill persons, and with a comparable group people who are not ill. By comparing how often an exposure is reported by ill people and by well people, investigators can measure the association of the exposure with illness. Using probability statistics, similar to those used to describe coin flips, the probability of no association is directly calculated.

For example, imagine that an outbreak has occurred after a catered event. Initial investigation suggested that Hollandaise sauce was eaten by at least some of the attendees, so it is on the list of possible hypotheses. Now, we interview 20 persons who attended the affair, 10 of whom became ill and 10 who remained well. Each ill or well person is interviewed about whether or not they ate the Hollandaise sauce, as well as various other food items. If half the people ate the sauce, but the sauce was not associated with the illness, then we would expect each person to have a 50/50 chance of reporting that they ate it, regardless of whether they were ill or not. Suppose, however, that we find that all 10 ill people but none of the well persons reported eating Hollandaise sauce at the event? This would be very unlikely to occur by chance alone if eating the Hollandaise sauce were not somehow related to the risk of illness. In fact, it would be about as unlikely as getting heads ten times in a row by flipping a coin (That is 50% multiplied by itself 10 times over, or a chance of just under 1 in 1000). So the epidemiologist concludes that eating the Hollandaise sauce was very likely to be associated with the risk of illness. Note that the investigator

can draw this conclusion even though there is no Hollandaise sauce left to test in a laboratory. The association is even stronger if she can show that those who ate second helpings of Hollandaise were even more likely to become ill, or that persons who ate leftover Hollandaise sauce that went home in doggie bags also became ill.

Once a food item is statistically implicated in this manner, further investigation into its ingredients and preparation, and microbiologic culture of leftover ingredients or the food itself (if available) may provide additional information about the nature of contamination. Perhaps the Hollandaise sauce was made using raw eggs. The source of the raw eggs can be determined, and it may even be possible to trace them back to the farm and show that chickens on the farm are carrying the same strain of *Salmonella* in their ovaries. If so, the eggs from that farm can be pasteurized to prevent them from causing other outbreaks.

Some might think that the best investigation method would be just to culture all the leftover foods in the kitchen, and conclude that the one that is positive is the one that caused the outbreak. The trouble is that this can be misleading, because it happens after the fact. What if the Hollandaise sauce is all gone, but the spoon that was in the sauce got placed in potato salad that was not served at the function? Now, cultures of the potato salad yield a pathogen, and the unwary tester might call that the source of the outbreak, even though the potato salad had nothing to do with it. This means that laboratory testing without epidemiologic investigation can lead to the wrong conclusion.

Even without isolating microbes from food, a well-conducted epidemiologic investigation can guide immediate efforts to control the outbreak. A strong and consistent statistical association between illness and a particular food item that explains the distribution of the outbreak in time, place and person should be acted upon immediately to stop further illness from occurring.

An outbreak ends when the critical exposure stops. This may happen because all the contaminated food is eaten or recalled, because a restaurant is closed or a food processor shuts down or changes its procedures, or an infected food handler is no longer infectious or is no longer working with food. An investigation that clarifies the nature and mechanism of contamination can provide critical information even if the outbreak is over. Understanding the contamination event well enough to prevent it can guide the decision to resume usual operations, and lead to more general prevention measures that reduce the risk of similar outbreaks happening elsewhere.

How does food become contaminated?

We live in a microbial world, and there are many opportunities for food to become contaminated as it is produced and prepared. Many foodborne microbes are present in healthy animals (usually in their intestines) raised for food. Meat and poultry carcasses can become contaminated during slaughter by contact with small amounts of intestinal contents. Similarly, fresh fruits and vegetables can be contaminated if they are washed or irrigated with water that is contaminated with animal manure or human sewage. Some types of *Salmonella* can infect a hen's ovary so that the internal contents of a normal looking egg can be contaminated with *Salmonella* even before the shell is formed. Oysters and other filter feeding shellfish can concentrate *Vibrio* bacteria that are naturally present in sea water, or other microbes that are present in human sewage dumped into the sea.

Later in food processing, other foodborne microbes can be introduced from infected humans who handle the food, or by cross contamination from some other raw agricultural product. For example, *Shigella* bacteria, hepatitis A virus and Norwalk virus can be introduced by the unwashed hands of food handlers who are themselves infected. In the kitchen, microbes can be transferred from one food to another food by using the same knife, cutting board or other utensil to prepare both without washing the surface or utensil in between. A food that is fully cooked can become recontaminated if it touches other raw foods or drippings from raw foods that contain pathogens.

The way that food is handled after it is contaminated can also make a difference in whether or not an outbreak occurs. Many bacterial microbes need to multiply to a larger number before enough are present in food to cause disease. Given warm moist conditions and an ample supply of nutrients, one bacterium that reproduces by dividing itself every half hour can produce 17 million progeny in 12 hours. As a result, lightly contaminated food left out overnight can be highly infectious by the next day. If the food were refrigerated promptly, the bacteria would not multiply at all. In general, refrigeration or freezing prevents virtually all bacteria from growing but generally preserves them in a state of suspended animation. This general rule has a few surprising exceptions. Two foodborne bacteria, *Listeria monocytogenes* and *Yersinia enterocolitica* can actually grow at refrigerator temperatures. High salt, high sugar or high acid levels keep bacteria from growing, which is why salted meats, jam, and pickled vegetables are traditional preserved foods.

Microbes are killed by heat. If food is heated to an internal temperature above 160°F, or 78°C, for even a few seconds this sufficient to kill parasites, viruses or bacteria, except for the *Clostridium* bacteria, which produce a heat-resistant form called a spore. *Clostridium* spores are killed only at temperatures above boiling. This is why canned foods must be cooked to a high temperature under pressure as part of the canning process.

The toxins produced by bacteria vary in their sensitivity to heat. The staphylococcal toxin which causes vomiting is not inactivated even if it is boiled. Fortunately, the potent toxin that causes botulism is completely inactivated by boiling.

What foods are most associated with foodborne illness?

Raw foods of animal origin are the most likely to be contaminated; that is, raw meat and poultry, raw eggs, unpasteurized milk, and raw shellfish. Because filter-feeding shellfish strain microbes from the sea over many months, they are particularly likely to be contaminated if there are any pathogens in the seawater. Foods that mingle the products of many individual animals, such as bulk raw milk, pooled raw eggs, or ground beef, are particularly hazardous because a pathogen present in any one of the animals may contaminate the whole batch. A single hamburger may contain meat from hundreds of animals. A single restaurant omelet may contain eggs from hundreds of chickens. A glass of raw milk may contain milk from hundreds of cows. A broiler chicken carcass can be exposed to the drippings and juices of many thousands of other birds that went through the same cold water tank after slaughter.

Fruits and vegetables consumed raw are a particular concern. Washing can decrease but not eliminate contamination, so the consumers can do little to protect themselves. Recently, a number of outbreak have been traced to fresh fruits and

vegetables that were processed under less than sanitary conditions. These outbreaks show that the quality of the water used for washing and chilling the produce after it is harvested is critical. Using water that is not clean can contaminate many boxes of produce. Fresh manure used to fertilize vegetables can also contaminate them. Alfalfa sprouts and other raw sprouts pose a particular challenge, as the conditions under which they are sprouted are ideal for growing microbes as well as sprouts, and because they are eaten without further cooking. That means that a few bacteria present on the seeds can grow to high numbers of pathogens on the sprouts. Unpasteurized fruit juice can also be contaminated if there are pathogens in or on the fruit that is used to make it.

What can consumers do to protect themselves from foodborne illness?

A few simple precautions can reduce the risk of foodborne diseases:

COOK meat, poultry and eggs thoroughly. Using a thermometer to measure the internal temperature of meat is a good way to be sure that it is cooked sufficiently to kill bacteria. For example, ground beef should be cooked to an internal temperature of 160° F. Eggs should be cooked until the yolk is firm.

SEPARATE: Don't cross-contaminate one food with another. Avoid cross-contaminating foods by washing hands, utensils, and cutting boards after they have been in contact with raw meat or poultry and before they touch another food. Put cooked meat on a clean platter, rather back on one that held the raw meat.

CHILL: Refrigerate leftovers promptly. Bacteria can grow quickly at room temperature, so refrigerate leftover foods if they are not going to be eaten within 4 hours. Large volumes of food will cool more quickly if they are divided into several shallow containers for refrigeration.

CLEAN: Wash produce. Rinse fresh fruits and vegetables in running tap water to remove visible dirt and grime. Remove and discard the outermost leaves of a head of lettuce or cabbage. Because bacteria can grow well on the cut surface of fruit or vegetable, be careful not to contaminate these foods while slicing them up on the cutting board, and avoid leaving cut produce at room temperature for many hours. Don't be a source of foodborne illness yourself. Wash your hands with soap and water before preparing food. Avoid preparing food for others if you yourself have a diarrheal illness. Changing a baby's diaper while preparing food is a bad idea that can easily spread illness.

REPORT: Report suspected foodborne illnesses to your local health department. The local public health department is an important part of the food safety system. Often calls from concerned citizens are how outbreaks are first detected. If a public health official contacts you to find out more about an illness you had, your cooperation is important. In public health investigations, it can be as important to talk to healthy people as to ill people. Your cooperation may be needed even if you are not ill.

Are some people more likely to contract a foodborne illness? If so, are there special precautions they should take?

Some persons at particularly high risk should take more precautions.

- Pregnant women, the elderly, and those weakened immune systems are at higher risk for severe infections such as *Listeria* and should be particularly careful not to consume undercooked animal products. They should avoid soft French style cheeses, pates, uncooked hot dogs and sliced deli meats, which have been sources of *Listeria* infections. Persons at high risk should also avoid alfalfa sprouts and unpasteurized juices.
- A bottle-fed infant is at higher risk for severe infections with *Salmonella* or other bacteria that can grow in a bottle of warm formula if it is left at room temperature for many hours. Particular care is needed to be sure the baby's bottle is cleaned and disinfected and that leftover milk formula or juice is not held in the bottle for many hours.
- Persons with liver disease are susceptible to infections with a rare but dangerous microbe called *Vibrio vulnificus*, found in oysters. They should avoid eating raw oysters.

What can consumers do when they eat in restaurants?

You can protect yourself first by choosing which restaurant to patronize. Restaurants are inspected by the local health department to make sure they are clean and have adequate kitchen facilities. Find out how restaurants did on their most recent inspections, and use that score to help guide your choice. In many jurisdictions, the latest inspection score is posted in the restaurant. Some restaurants have specifically trained their staff in principles of food safety. This is also good to know in deciding which restaurant to patronize.

You can also protect yourself from foodborne disease when ordering specific foods, just as you would at home. When ordering a hamburger, ask for it to be cooked to a temperature of 160°F and send it back if it is still pink in the middle. Before you order something that is made with many eggs pooled together, such as scrambled eggs, omelets or French toast, ask the waiter whether it was made with pasteurized egg, and choose something else if it was not.

There is only so much the consumer can do. How can food be made safer in the first place?

Making food safe in the first place is a major effort, involving the farm and fishery, the production plant or factory, and many other points from the farm to the table. Many different groups in public health, industry, regulatory agencies, and academia have roles to play in making the food supply less contaminated. Consumers can promote general food safety with their dollars, by purchasing foods that have been processed for safety. For example, milk pasteurization was a major advance in food safety that was developed 100 years ago. Buying pasteurized milk rather than raw unpasteurized milk still prevents an enormous number of foodborne diseases every day. Now juice pasteurization is a recent important step forward that prevents *E. coli* O157:H7 infections and many other diseases. Consumers can look for and buy pasteurized fruit juices and ciders. In the future, meat and other foods will be

available that has been treated for safety with irradiation. These new technologies are likely to be as important a step forward as the pasteurization of milk.

Foodborne diseases are largely preventable, though there is no simple one-step prevention measure like a vaccine. Instead, measures are needed to prevent or limit contamination all the way from farm to table. A variety of good agricultural and manufacturing practices can reduce the spread of microbes among animals and prevent the contamination of foods. Careful review of the whole food production process can identify the principal hazards, and the control points where contamination can be prevented, limited, or eliminated. A formal method for evaluating the control of risk in foods exists is called the Hazard Analysis Critical Control Point, or HACCP system. This was first developed by NASA to make sure that the food eaten by astronauts was safe. HACCP safety principles are now being applied to an increasing spectrum of foods, including meat, poultry, and seafood.

For some particularly risky foods, even the most careful hygiene and sanitation are insufficient to prevent contamination, and a definitive microbe-killing step must be included in the process. For example, early in the century, large botulism outbreaks occurred when canned foods were cooked insufficiently to kill the botulism spores. After research was done to find out exactly how much heat was needed to kill the spores, the canning industry and the government regulators went to great lengths to be sure every can was sufficiently cooked. As a result, botulism related to commercial canned foods has disappeared in this country. Similarly the introduction of careful pasteurization of milk eliminated a large number of milk-borne diseases. This occurred after sanitation in dairies had already reached a high level. In the future, other foods can be made much safer by new pasteurizing technologies, such as in-shell pasteurization of eggs, and irradiation of ground beef. Just as with milk, these new technologies should be implemented in addition to good sanitation, not as a replacement for it.

In the end, it is up to the consumer to demand a safe food supply; up to industry to produce it; up to researchers to develop better ways of doing so; and up to government to see that it happens, to make sure it works and to identify problems still in need of solutions.

What is CDC doing to control and prevent foodborne disease?

CDC is part of the U. S. Public Health Service, with a mission to use the best scientific information to monitor, investigate, control and prevent public health problems. Using the tools of epidemiology and laboratory science, CDC provides scientific assessment of public health threats. CDC works closely with state health departments to monitor the frequency of specific diseases and conducts national surveillance for them. CDC provides expert epidemiologic and microbiologic consultation to health departments and other federal agencies on a variety of public health issues, including foodborne disease, and it stations epidemiologists in state health departments to help with the surveillance and investigation of many problems. CDC can also send a team into the field to conduct emergency field investigations of large or unusual outbreaks, in collaboration with state public health officials. CDC researchers develop new methods for identifying, characterizing and fingerprinting the microbes that cause disease. We translate laboratory research into practical field methods that can be used by public health authorities in States and counties.

CDC is not a regulatory agency. Government regulation of food safety is carried out by the Food and Drug Administration (FDA) , the U.S. Department of Agriculture (USDA), the National Marine Fisheries Service, and other regulatory agencies. CDC maintains regular contact with the regulatory agencies.

When new public health threats appear, CDC learns what they are and how they can be controlled through rapid scientific field and laboratory investigation. CDC shares the results of these investigations with the states, with the regulatory federal agencies and with the industries themselves. Although we do not regulate the safety of food, CDC assesses the effectiveness of current prevention efforts. We provide independent scientific assessment of what the problems are, how they can be controlled, and of where there are gaps in our knowledge.

http://www.cdc.gov/ncidod/dbmd/diseaseinfo/foodborneinfections_g.htm

Escherichia coli

http://www.cdc.gov/nczved/dfbmd/disease_listing/stec_gi.html

What is *Escherichia coli*?

What are Shiga toxin-producing *E. coli*?

Are there important differences between *E. coli* O157 and other STEC?

Who gets STEC infections?

What are the symptoms of STEC infections?

What are the complications of STEC infections?

How soon do symptoms appear after exposure?

Where do STEC come from?

How are these infections spread?

Where did *my* infection come from?

How common are STEC infections?

How are STEC infections diagnosed?

How long can an infected person carry STEC?

What is the best treatment for STEC infection?

Should an infected person be excluded from school or work?

How can STEC infections be prevented?

What is *Escherichia coli*?

Escherichia coli (abbreviated as *E. coli*) are a large and diverse group of bacteria. Although most strains of *E. coli* are harmless, others can make you sick. Some kinds of *E. coli* can cause diarrhea, while others cause urinary tract infections, respiratory illness and pneumonia, and other illnesses. Still other kinds of *E. coli* are used as markers for water contamination—so you might hear about *E. coli* being found in drinking water, which are not themselves harmful, but indicate the water is contaminated. It does get a bit confusing—even to microbiologists.

What are Shiga toxin-producing *E. coli*?

Some kinds of *E. coli* cause disease by making a toxin called Shiga toxin. The bacteria that make these toxins are called “Shiga toxin-producing” *E. coli*, or STEC for short. You might hear them called verocytotoxic *E. coli* (VTEC) or enterohemorrhagic *E. coli* (EHEC); these all refer generally to the same group of bacteria. The most commonly identified STEC in North America is *E. coli* O157:H7 (often shortened to *E. coli* O157 or even just “O157”). When you hear news reports about outbreaks of “*E. coli*” infections, they are usually talking about *E. coli* O157.

In addition to *E. coli* O157, many other kinds (called serogroups) of STEC cause disease. These other kinds are sometimes called “non-O157 STEC.” *E. coli* serogroups O26, O111, and O103 are the non-O157 serogroups that most often cause illness in people in the United States.

Are there important differences between *E. coli* O157 and other STEC?

Most of what we know about STEC comes from outbreak investigations and studies of *E. coli* O157 infection, which was first identified as a pathogen in 1982. The non-O157 STEC are not nearly as well understood, partly because outbreaks due to them are rarely identified. As a whole, the non-O157

serogroup is less likely to cause severe illness than *E. coli* O157; however, some non-O157 STEC serogroups can cause the most severe manifestations of STEC illness.

Who gets STEC infections?

People of any age can become infected. Very young children and the elderly are more likely to develop severe illness and hemolytic uremic syndrome (HUS) than others, but even healthy older children and young adults can become seriously ill.

What are the symptoms of STEC infections?

The symptoms of STEC infections vary for each person but often include severe stomach cramps, diarrhea (often bloody), and vomiting. If there is fever, it usually is not very high (less than 101°F/less than 38.5°C). Most people get better within 5–7 days. Some infections are very mild, but others are severe or even life-threatening.

What are the complications of STEC infections?

Around 5–10% of those who are diagnosed with STEC infection develop a potentially life-threatening complication known as hemolytic uremic syndrome (HUS). Clues that a person is developing HUS include decreased frequency of urination, feeling very tired, and losing pink color in cheeks and inside the lower eyelids. Persons with HUS should be hospitalized because their kidneys may stop working and they may develop other serious problems. Most persons with HUS recover within a few weeks, but some suffer permanent damage or die.

How soon do symptoms appear after exposure?

The time between ingesting the STEC bacteria and feeling sick is called the “incubation period.” The incubation period is usually 3–4 days after the exposure, but may be as short as 1 day or as long as 10 days. The symptoms often begin slowly with mild belly pain or non-bloody diarrhea that worsens over several days. HUS, if it occurs, develops an average 7 days after the first symptoms, when the diarrhea is improving.

Where do STEC come from?

STEC live in the guts of ruminant animals, including cattle, goats, sheep, deer, and elk. The major source for human illnesses is cattle. STEC that cause human illness generally do not make animals sick. Other kinds of animals, including pigs and birds, sometimes pick up STEC from the environment and may spread it.

How are these infections spread?

Infections start when you swallow STEC—in other words, when you get tiny (usually invisible) amounts of human or animal feces in your mouth. Unfortunately, this happens more often than we would like to think about. Exposures that result in illness include consumption of contaminated food, consumption of unpasteurized (raw) milk, consumption of water that has not

been disinfected, contact with cattle, or contact with the feces of infected people. Some foods are considered to carry such a high risk of infection with *E. coli* O157 or another germ that health officials recommend that people avoid them completely. These foods include unpasteurized (raw) milk, unpasteurized apple cider, and soft cheeses made from raw milk. Sometimes the contact is pretty obvious (working with cows at a dairy or changing diapers, for example), but sometimes it is not (like eating an undercooked hamburger or a contaminated piece of lettuce). People have gotten infected by swallowing lake water while swimming, touching the environment in petting zoos and other animal exhibits, and by eating food prepared by people who did not wash their hands well after using the toilet. Almost everyone has some risk of infection.

Where did *my* infection come from?

Because there are so many possible sources, for most people we can only guess. If your infection happens to be part of the about 20% of cases that are part of a recognized outbreak, the health department might identify the source.

How common are STEC infections?

Experts think that there may be about 70,000 infections with *E. coli* O157 each year in the United States. We can only estimate because we know that many infected people do not seek medical care, many do not submit a stool specimen for testing, and many labs do not test for STEC. We think that a similar number of persons have diarrhea caused by non-O157 STEC. Many labs do not identify non-O157 STEC infection because it takes even more work than identifying *E. coli* O157.

How are STEC infections diagnosed?

STEC infections are usually diagnosed through lab testing of stool specimens (feces). Identifying the specific strain of STEC involved is very important for public health purposes, such as finding outbreaks. Most labs can determine if an STEC is present and can identify *E. coli* O157. To determine the O group of non-O157 STEC, strains must be sent to a State Public Health laboratory.

How long can an infected person carry STEC?

STEC typically disappear from the feces by the time the illness is resolved, but may be shed for several weeks, even after symptoms go away. Young children tend to carry STEC longer than adults. A few people keep shedding these bacteria for several months. Good hand-washing is always a smart idea to protect yourself, your family, and other persons.

What is the best treatment for STEC infection?

Non-specific supportive therapy, including hydration, is important. Antibiotics should not be used to treat this infection. There is no evidence that treatment with antibiotics is helpful, and taking antibiotics may increase the risk of HUS. Antidiarrheal agents like Imodium® may also increase that risk.

Should an infected person be excluded from school or work?

School and work exclusion policies differ by local jurisdiction. Check with your local or state health department to learn more about the laws where you live. In any case, good hand-washing after changing diapers, after using the toilet, and before preparing food is essential to prevent the spread of these and many other infections.

How can STEC infections be prevented?

WASH YOUR HANDS thoroughly after using the bathroom or changing diapers and before preparing or eating food. WASH YOUR HANDS after contact with animals or their environments (at farms, petting zoos, fairs, even your own backyard)

COOK meats thoroughly. Ground beef and meat that has been needletenderized should be cooked to a temperature of at least 160°F/70°C. It's best to use a thermometer, as color is not a very reliable indicator of "doneness."

AVOID raw milk, unpasteurized dairy products, and unpasteurized juices (like fresh apple cider).

AVOID swallowing water when swimming or playing in lakes, ponds, streams, swimming pools, and backyard "kiddie" pools.

PREVENT cross contamination in food preparation areas by thoroughly washing hands, counters, cutting boards, and utensils after they touch raw meat.

Salmonellosis

http://www.cdc.gov/nczved/dfbmd/disease_listing/salmonellosis_gi.html

Frequently Asked Questions

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What is salmonellosis?

Salmonellosis is an infection with bacteria called *Salmonella*. Most persons infected with *Salmonella* develop diarrhea, fever, and abdominal cramps 12 to 72 hours after infection. The illness usually lasts 4 to 7 days, and most persons recover without treatment. However, in some persons, the diarrhea may be so severe that the patient needs to be hospitalized. In these patients, the *Salmonella* infection may spread from the intestines to the blood stream, and then to other body sites and can cause death unless the person is treated promptly with antibiotics. The elderly, infants, and those with impaired immune systems are more likely to have a severe illness.

What sort of germ is Salmonella?

Salmonella is actually a group of bacteria that can cause diarrheal illness in humans. They are microscopic living creatures that pass from the feces of people or animals to other people or other animals. There are many different kinds of *Salmonella* bacteria. *Salmonella* serotype Typhimurium and [Salmonella serotype Enteritidis](#) are the most common in the United States. *Salmonella* germs have been known to cause illness for over 100 years. They were discovered by an American scientist named Salmon, for whom they are named.

How can Salmonella infections be diagnosed?

Many different kinds of illnesses can cause diarrhea, fever, or abdominal cramps. Determining that *Salmonella* is the cause of the illness depends on laboratory tests

that identify *Salmonella* in the stool of an infected person. Once *Salmonella* has been identified, further testing can determine its specific type.

How can *Salmonella* infections be treated?

Salmonella infections usually resolve in 5-7 days and often do not require treatment other than oral fluids. Persons with severe diarrhea may require rehydration with intravenous fluids. Antibiotics, such as ampicillin, trimethoprim-sulfamethoxazole, or ciprofloxacin, are not usually necessary unless the infection spreads from the intestines. Some *Salmonella* bacteria have become resistant to antibiotics, largely as a result of the use of antibiotics to promote the growth of food animals.

Are there long term consequences to a *Salmonella* infection?

Persons with diarrhea usually recover completely, although it may be several months before their bowel habits are entirely normal. A small number of persons with *Salmonella* develop pain in their joints, irritation of the eyes, and painful urination. This is called Reiter's syndrome. It can last for months or years, and can lead to chronic arthritis which is difficult to treat. Antibiotic treatment does not make a difference in whether or not the person develops arthritis.

How do people catch *Salmonella*?

Salmonella live in the intestinal tracts of humans and other animals, including birds. *Salmonella* are usually transmitted to humans by eating foods contaminated with animal feces. Contaminated foods usually look and smell normal. Contaminated foods are often of animal origin, such as beef, poultry, milk, or eggs, but any food, including vegetables, may become contaminated. Thorough cooking kills *Salmonella*. Food may also become contaminated by the hands of an infected food handler who did not wash hands with soap after using the bathroom.

Salmonella may also be found in the feces of some pets, especially those with diarrhea, and people can become infected if they do not wash their hands after contact with pets or pet feces. Reptiles, such as turtles, lizards, and snakes, are particularly likely to harbor *Salmonella*. Many chicks and young birds carry *Salmonella* in their feces. People should always wash their hands immediately after handling a reptile or bird, even if the animal is healthy. Adults should also assure that children wash their hands after handling a reptile or bird, or after touching its environment.

What can a person do to prevent this illness?

There is no vaccine to prevent salmonellosis. Because foods of animal origin may be contaminated with *Salmonella*, people should not eat raw or undercooked eggs, poultry, or meat. Raw eggs may be unrecognized in some foods, such as homemade Hollandaise sauce, Caesar and other homemade salad dressings, tiramisu, homemade ice cream, homemade mayonnaise, cookie dough, and frostings. Poultry and meat, including hamburgers, should be well-cooked, not pink in the middle. Persons also should not consume raw or unpasteurized milk or other dairy products. Produce should be thoroughly washed.

Cross-contamination of foods should be avoided. Uncooked meats should be kept separate from produce, cooked foods, and ready-to-eat foods. Hands, cutting boards, counters, knives, and other utensils should be washed thoroughly after touching uncooked foods. Hand should be washed before handling food, and between handling different food items.

People who have salmonellosis should not prepare food or pour water for others until their diarrhea has resolved. Many health departments require that restaurant workers with *Salmonella* infection have a stool test showing that they are no longer carrying the *Salmonella* bacterium before they return to work.

People should wash their hands after contact with animal feces. Because reptiles are particularly likely to have *Salmonella*, and it can contaminate their skin, everyone should immediately wash their hands after handling reptiles. Reptiles (including turtles) are not appropriate pets for small children and should not be in the same house as an infant. *Salmonella* carried in the intestines of chicks and ducklings contaminates their environment and the entire surface of the animal. Children can be exposed to the bacteria by simply holding, cuddling, or kissing the birds. Children should not handle baby chicks or other young birds. Everyone should immediately wash their hands after touching birds, including baby chicks and ducklings, or their environment.

How common is salmonellosis?

Every year, approximately 40,000 cases of salmonellosis are reported in the United States. Because many milder cases are not diagnosed or reported, the actual number of infections may be thirty or more times greater. Salmonellosis is more common in the summer than winter.

Children are the most likely to get salmonellosis. The rate of diagnosed infections in children less than five years old is about five times higher than the rate in all other persons. Young children, the elderly, and the immunocompromised are the most likely to have severe infections. It is estimated that approximately 400 persons die each year with acute salmonellosis.

What else can be done to prevent salmonellosis?

It is important for the public health department to know about cases of salmonellosis. It is important for clinical laboratories to send isolates of *Salmonella* to

the City, County, or State Public Health Laboratories so the specific type can be determined and compared with other *Salmonella* in the community. If many cases occur at the same time, it may mean that a restaurant, food or water supply has a problem that needs correction by the public health department.

Some prevention steps occur everyday without you thinking about it. Pasteurization of milk and treatment of municipal water supplies are highly effective prevention measures that have been in place for decades. In the 1970s, small pet turtles were a common source of salmonellosis in the United States, so in 1975, the sale of small turtles was banned in this country. However, in 2008, they were still being sold, and cases of *Salmonella* associated with pet turtles have been reported. Improvements in farm animal hygiene, in slaughter plant practices, and in vegetable and fruit harvesting and packing operations may help prevent salmonellosis caused by contaminated foods. Better education of food industry workers in basic food safety and restaurant inspection procedures may prevent cross-contamination and other food handling errors that can lead to outbreaks. Wider use of pasteurized egg in restaurants, hospitals, and nursing homes is an important prevention measure. In the future, irradiation or other treatments may greatly reduce contamination of raw meat.

What is the government doing about salmonellosis?

The Centers for Disease Control and Prevention (CDC) monitors the frequency of *Salmonella* infections in the country and assists the local and state health departments in investigating outbreaks and devising control measures. CDC also monitors the different types of *Salmonella* that are reported annually by public health laboratories of state and local health departments. The Food and Drug Administration (FDA) inspects imported foods, oversees inspection of milk pasteurization plants, promotes better food preparation techniques in restaurants and food processing plants, and regulates the sale of turtles. The FDA also regulates the use of specific antibiotics as growth promotants in food animals. The US Department of Agriculture monitors the health of food animals, inspects egg pasteurization plants, and is responsible for the quality of slaughtered and processed meat. The US Environmental Protection Agency regulates and monitors the safety of drinking water supplies.

How can I learn more about this and other public health problems?

You can discuss any medical concerns you may have with your doctor or other health care provider. Your local City or County Health Department can provide more information about this and other public health problems that are occurring in your area. General information about the public health of the nation is published every week in the "Morbidity and Mortality Weekly Report (MMWR)", by the CDC in Atlanta, GA. Every spring, the MMWR publishes a report of the incidence of *Salmonella* and other infections during the previous year in FoodNet sentinel surveillance sites. Epidemiologists in your local and state health departments are tracking many important public health problems, investigating special problems that arise, and helping to prevent them from occurring in the first place, and from spreading, when they occur.

What can I do to prevent salmonellosis?

- Cook poultry, ground beef, and eggs thoroughly. Do not eat or drink foods containing raw eggs, or raw (unpasteurized) milk.
- If you are served undercooked meat, poultry or eggs in a restaurant, don't hesitate to send it back to the kitchen for further cooking.
- Wash hands, kitchen work surfaces, and utensils with soap and water immediately after they have been in contact with raw meat or poultry.
- Be particularly careful with foods prepared for infants, the elderly, and the immunocompromised.
- Wash hands with soap after handling reptiles, birds, or baby chicks, and after contact with pet feces.
- Avoid direct or even indirect contact between reptiles (turtles, iguanas, other lizards, snakes) and infants or immunocompromised persons.
- Don't work with raw poultry or meat, and an infant (e.g., feed, change diaper) at the same time.
- Mother's milk is the safest food for young infants. Breastfeeding prevents salmonellosis and many other health problems.

Page last modified: May 21, 2008

Giardiasis

(GEE-are-DYE-uh-sis)

What is giardiasis?

Giardiasis (GEE-are-DYE-uh-sis) is a diarrheal illness caused by *Giardia intestinalis* (also known as *Giardia lamblia*), a one-celled, microscopic parasite that lives in the intestine of people and animals. The parasite is passed in the stool of an infected person or animal. The parasite is protected by an outer shell that allows it to survive outside the body and in the environment for long periods of time. During the past 2 decades, *Giardia* has become recognized as one of the most common causes of waterborne disease (drinking and recreational) in humans in the United States. The parasite is found in every region of the United States and throughout the world.

What are the symptoms of giardiasis?

Symptoms include diarrhea, loose or watery stool, stomach cramps, and upset stomach. These symptoms may lead to weight loss and dehydration. Some people have no symptoms.

How long after infection do symptoms appear?

Symptoms generally begin 1-2 weeks after being infected.

How long will symptoms last?

In otherwise healthy persons, symptoms may last 2-6 weeks. Occasionally, symptoms last longer.

How is giardiasis spread?

Giardia lives in the intestine of infected humans or animals. Millions of germs can be released in a bowel movement from an infected human or animal. You can become infected after accidentally swallowing the parasite. *Giardia* may be found in soil, food, water, or surfaces that have been contaminated with the feces from infected humans or animals. *Giardia* is **not** spread by contact with blood. *Giardia* can be spread:

- By putting something in your mouth or accidentally swallowing something that has come in contact with the stool of a person or animal infected with *Giardia*.
- By swallowing recreational water contaminated with *Giardia*. Recreational water is water in swimming pools, hot tubs, jacuzzis, fountains, lakes, rivers, springs, ponds, or streams that can be contaminated with sewage or feces from humans or animals.
- By eating uncooked food contaminated with *Giardia*. Thoroughly wash with uncontaminated water all vegetables and fruits you plan to eat raw. See below for information on making water safe.

- By accidentally swallowing *Giardia* picked up from surfaces (such as toys, bathroom fixtures, changing tables, diaper pails) contaminated with stool from an infected person.

Who is at risk?

Everyone. Persons at increased risk for giardiasis include child care workers; children who attend day care centers, including diaper-aged children; international travelers; hikers; campers, swimmers; and others who drink or accidentally swallow water from contaminated sources that is untreated (no heat inactivation, filtration, or chemical disinfection). Several community-wide outbreaks of giardiasis have been linked to drinking municipal water or recreational water contaminated with *Giardia*.

I have been diagnosed with a *Giardia* infection. Should I worry about spreading infection to others?

Yes, *Giardia* can be very contagious. Follow these guidelines to avoid spreading *Giardia* to others.

- Wash your hands with soap and water after using the toilet, changing diapers, and before eating or preparing food.
- Avoid swimming in recreational water (pools, hot tubs, lakes or rivers, the ocean, etc.) if you have *Giardia* and for at least 2 weeks after diarrhea stops. You can pass *Giardia* in your stool and contaminate water for several weeks after your symptoms have ended. This has resulted in outbreaks of *Giardia* among recreational water users.
- Avoid fecal exposure during sex.

What should I do if I think I have giardiasis?

See your health care provider.

How is a *Giardia* infection diagnosed?

Your health care provider will likely ask you to submit stool samples to see if you have the parasite. Because *Giardia* can be difficult to diagnose, he or she may ask you to submit several stool specimens over several days.

What is the treatment for giardiasis?

Several prescription drugs are available to treat *Giardia*. Consult with your health care provider. Although *Giardia* can infect all people, young children and pregnant women may be more susceptible to the dehydration resulting from diarrhea and should drink plenty of fluids while ill.

How can I prevent *Giardia* infection?

Practice good hygiene.

- Wash hands thoroughly with soap and water.
- Wash hands after using the toilet and before handling or eating food (especially for persons with diarrhea).
- Wash hands after every diaper change, especially if you work with diaper-aged children, even if you are wearing gloves.
- Protect others by not swimming if experiencing diarrhea (essential for children in diapers).

Avoid water that might be contaminated.

- Avoid swallowing recreational water.
- Avoid drinking untreated water from shallow wells, lakes, rivers, springs, ponds, and streams.
- Avoid drinking untreated water during community-wide outbreaks of disease caused by contaminated drinking water. In the United States, nationally distributed brands of bottled or canned carbonated soft drinks are safe to drink. Commercially packaged noncarbonated soft drinks and fruit juices that do not require refrigeration until after they are opened (those that are stored unrefrigerated on grocery shelves) also are safe. [Click here to find out how to choose bottled water that is also safe to drink.](#)
- Avoid using ice or drinking untreated water when traveling in countries where the water supply might be unsafe.
- If you are unable to avoid drinking or using water that might be contaminated, then treat the water yourself by:
Heating the water to a rolling boil for at least 1 minute.

OR

Using a filter that has an absolute pore size of at least 1 micron or one that has been NSF rated for "cyst removal." [Click here for information on choosing a water filter.](#)

If the methods above cannot be used, then try chemical inactivation of *Giardia* by chlorination or iodination. Chemical disinfection may be less effective than other methods because it is highly dependent on the temperature, pH, and cloudiness of the water.

Avoid food that might be contaminated.

- Wash and/or peel all raw vegetables and fruits before eating.
- Use uncontaminated water to wash all food that is to be eaten raw.
- Avoid eating uncooked foods when traveling in countries with minimal water treatment and sanitation systems.

Avoid fecal exposure during sex.

My water comes from a well; should I have my well water tested?

If you answer yes to the following questions, consider having your well water tested.

- *Are other members of your family or users of your well water ill?*

If yes, your well may be the source of infection.

- *Is your well located at the bottom of a hill or is it considered shallow?*

If so, runoff from rain or flood water may be draining directly into your well causing contamination.

- *Is your well in a rural area where animals graze?*

Well water can become fecally contaminated if animal waste seepage contaminates the ground water. This can occur if your well has cracked casings, is poorly constructed, or is too shallow.

Tests specifically for *Giardia* are expensive, difficult, and usually require hundreds of gallons of water to be pumped through a filter. If you answered yes to the above questions, consider testing your well for fecal coliforms or *E. coli* instead of *Giardia*. Although fecal coliforms or *E. coli* tests do not specifically test for *Giardia*, testing will show if your well has fecal contamination.

These tests are only useful if your well is not routinely disinfected with chlorine since chlorine kills fecal coliforms and *E. coli*. If the tests are positive, the water may also be contaminated with *Giardia*, as well as other harmful bacteria and viruses. Look in your local telephone directory for a laboratory or cooperative extension that offers water testing. If the fecal coliform test comes back positive, indicating that your well is fecally contaminated, contact your local water authority for instructions on how to disinfect your well.

My child was recently diagnosed as having giardiasis, but does not have any diarrhea. My health care provider says treatment is not necessary. Is this true?

In general, the answer by the American Academy of Pediatrics is that treatment is not necessary. However, there are a few exceptions. If your child does not have diarrhea, but is having nausea, or is fatigued, losing weight, or has a poor appetite, you and your health care provider may wish to consider treatment. If your child attends a day care center where an outbreak is continuing to occur despite efforts to control it, screening and treatment of children without obvious symptoms may be a good idea. The same is true if several family members are ill, or if a family member is pregnant and therefore not able to take the most effective anti-*Giardia* medications.

This fact sheet is for information only and is not meant to be used for self-diagnosis or as a substitute for consultation with a health care provider. If you have any questions about the disease described above or think that you may have a parasitic infection, consult a health care provider.

http://www.cdc.gov/ncidod/dpd/parasites/giardiasis/factsht_giardia.htm

Viral Gastroenteritis

What is viral gastroenteritis?

Gastroenteritis means inflammation of the stomach and small and large intestines. Viral gastroenteritis is an infection caused by a variety of viruses that results in vomiting or diarrhea. It is often called the "stomach flu," although it is not caused by the influenza viruses.

What causes viral gastroenteritis?

Many different viruses can cause gastroenteritis, including rotaviruses, adenoviruses, caliciviruses, astroviruses, Norwalk virus, and a group of Noroviruses. Viral gastroenteritis is not caused by bacteria (such as *Salmonella* or *Escherichia coli*) or parasites (such as *Giardia*), or by medications or other medical conditions, although the symptoms may be similar. Your doctor can determine if the diarrhea is caused by a virus or by something else.

What are the symptoms of viral gastroenteritis?

The main symptoms of viral gastroenteritis are watery diarrhea and vomiting. The affected person may also have headache, fever, and abdominal cramps ("stomach ache"). In general, the symptoms begin 1 to 2 days following infection with a virus that causes gastroenteritis and may last for 1 to 10 days, depending on which virus causes the illness.

Is viral gastroenteritis a serious illness?

For most people, it is not. People who get viral gastroenteritis almost always recover completely without any long-term problems. Gastroenteritis is a serious illness, however, for persons who are unable to drink enough fluids to replace what they lose through vomiting or diarrhea. Infants, young children, and persons who are unable to care for themselves, such as the disabled or elderly, are at risk for dehydration from loss of fluids. Immune compromised persons are at risk for dehydration because they may get a more serious illness, with greater vomiting or diarrhea. They may need to be hospitalized for treatment to correct or prevent dehydration.

Is the illness contagious? How are these viruses spread?

Yes, viral gastroenteritis is contagious. The viruses that cause gastroenteritis are spread through close contact with infected persons (for example, by sharing food, water, or eating utensils). Individuals may also become infected by eating or drinking contaminated foods or beverages.

How does food get contaminated by gastroenteritis viruses?

Food may be contaminated by food preparers or handlers who have viral gastroenteritis, especially if they do not wash their hands regularly after using the bathroom. Shellfish may be contaminated by sewage, and persons who eat raw or undercooked shellfish harvested from contaminated waters may get diarrhea.

Drinking water can also be contaminated by sewage and be a source of spread of these viruses.

Where and when does viral gastroenteritis occur?

Viral gastroenteritis affects people in all parts of the world. Each virus has its own seasonal activity. For example, in the United States, rotavirus and astrovirus infections occur during the cooler months of the year (October to April), whereas adenovirus infections occur throughout the year. Viral gastroenteritis outbreaks can occur in institutional settings, such as schools, child care facilities, and nursing homes, and can occur in other group settings, such as banquet halls, cruise ships, dormitories, and campgrounds.

Who gets viral gastroenteritis?

Anyone can get it. Viral gastroenteritis occurs in people of all ages and backgrounds. However, some viruses tend to cause diarrheal disease primarily among people in specific age groups. Rotavirus infection is the most common cause of diarrhea in infants and young children under 5 years old. Adenoviruses and astroviruses cause diarrhea mostly in young children, but older children and adults can also be affected. Norwalk and Noroviruses are more likely to cause diarrhea in older children and adults.

How is viral gastroenteritis diagnosed?

Generally, viral gastroenteritis is diagnosed by a physician on the basis of the symptoms and medical examination of the patient. Rotavirus infection can be diagnosed by laboratory testing of a stool specimen. Tests to detect other viruses that cause gastroenteritis are not in routine use.

How is viral gastroenteritis treated?

The most important of treating viral gastroenteritis in children and adults is to prevent severe loss of fluids (dehydration). This treatment should begin at home. Your physician may give you specific instructions about what kinds of fluid to give. CDC recommends that families with infants and young children keep a supply of oral rehydration solution (ORS) at home at all times and use the solution when diarrhea first occurs in the child. ORS is available at pharmacies without a prescription. Follow the written directions on the ORS package, and use clean or boiled water. Medications, including antibiotics (which have no effect on viruses) and other treatments, should be avoided unless specifically recommended by a physician.

Can viral gastroenteritis be prevented?

Yes. Persons can reduce their chance of getting infected by frequent handwashing, prompt disinfection of contaminated surfaces with household chlorine bleach-based cleaners, and prompt washing of soiled articles of clothing. If food or water is thought to be contaminated, it should be avoided.

Is there a vaccine for viral gastroenteritis?

There is no vaccine or medicine currently available that prevents viral gastroenteritis. A vaccine is being developed, however, that protects against severe diarrhea from rotavirus infection in infants and young children.

For further information, please contact the Respiratory and Enteric Viruses Branch, National Center for Infectious Diseases, at 404-639-3607 (telephone) or 404-639-4960 (facsimile).

<http://www.cdc.gov/ncidod/dvrd/revb/gastro/faq.htm>

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Arboviral Encephalitides

Arthropod-borne viruses, i.e., arboviruses, are viruses that are maintained in nature through biological transmission between susceptible vertebrate hosts by blood feeding arthropods (mosquitoes, psychodids, ceratopogonids, and ticks). Vertebrate infection occurs when the infected arthropod takes a blood meal. The term 'arbovirus' has no taxonomic significance. Arboviruses that cause human encephalitis are members of three virus families: the *Togaviridae* (genus Alphavirus), *Flaviviridae*, and *Bunyaviridae*.

All arboviral encephalitides are zoonotic, being maintained in complex life cycles involving a nonhuman primary vertebrate host and a primary arthropod vector. These cycles usually remain undetected until humans encroach on a natural focus, or the virus escapes this focus via a secondary vector or vertebrate host as the result of some ecologic change. Humans and domestic animals can develop clinical illness but usually are "dead-end" hosts because they do not produce significant viremia, and do not contribute to the transmission cycle. Many arboviruses that cause encephalitis have a variety of different vertebrate hosts and some are transmitted by more than one vector. Maintenance of the viruses in nature may be facilitated by vertical transmission (e.g., the virus is transmitted from the female through the eggs to the offspring).

Arboviral encephalitides have a global distribution, but there are four main virus agents of encephalitis in the United States: eastern equine encephalitis (EEE), western equine encephalitis (WEE), St. Louis encephalitis (SLE) and La Crosse (LAC) encephalitis, all of which are transmitted by mosquitoes. Another virus, Powassan, is a minor cause of encephalitis in the northern United States, and is transmitted by ticks. A new Powassan-like virus has recently been isolated from deer ticks. Its relatedness to Powassan virus and its ability to cause disease has not been well documented. Most cases of arboviral encephalitis occur from June through September, when arthropods are most active. In milder (i.e., warmer) parts of the country, where arthropods are active late into the year, cases can occur into the winter months.

The majority of human infections are asymptomatic or may result in a nonspecific flu-like syndrome. Onset may be insidious or sudden with fever, headache, myalgias, malaise and occasionally prostration. Infection may, however, lead to encephalitis, with a fatal outcome or permanent neurologic sequelae. Fortunately, only a small proportion of infected persons progress to frank encephalitis.

Experimental studies have shown that invasion of the central nervous system (CNS), generally follows initial virus replication in various peripheral sites and a period of viremia. Viral transfer from the blood to the CNS through the olfactory tract has been suggested. Because the arboviral encephalitides are viral diseases, antibiotics are not effective for treatment and no effective antiviral drugs have yet been discovered. Treatment is supportive, attempting to deal with problems such as swelling of the brain, loss of the automatic breathing activity of the brain and other treatable complications like bacterial pneumonia.

There are no commercially available human vaccines for these U.S. diseases. There is a Japanese encephalitis vaccine available in the U.S. A tick-borne encephalitis vaccine is available in Europe. An equine vaccine is available for EEE, WEE and

Venezuelan equine encephalitis (VEE). Arboviral encephalitis can be prevented in two major ways: personal protective measures and public health measures to reduce the population of infected mosquitoes. Personal measures include reducing time outdoors particularly in early evening hours, wearing long pants and long sleeved shirts and applying mosquito repellent to exposed skin areas. Public health measures often require spraying of insecticides to kill juvenile (larvae) and adult mosquitoes.

Selection of mosquito control methods depends on what needs to be achieved; but, in most emergency situations, the preferred method to achieve maximum results over a wide area is aerial spraying. In many states aerial spraying may be available in certain locations as a means to control nuisance mosquitoes. Such resources can be redirected to areas of virus activity. When aerial spraying is not routinely used, such services are usually contracted for a given time period.

Financing of aerial spraying costs during large outbreaks is usually provided by state emergency contingency funds. Federal funding of emergency spraying is rare and almost always requires a federal disaster declaration. Such disaster declarations usually occur when the vector-borne disease has the potential to infect large numbers of people, when a large population is at risk and when the area requiring treatment is extensive. Special large planes maintained by the United States Air Force can be called upon to deliver the insecticide(s) chosen for such emergencies. Federal disaster declarations have relied heavily on risk assessment by the CDC.

Laboratory diagnosis of human arboviral encephalitis has changed greatly over the last few years. In the past, identification of antibody relied on four tests: hemagglutination-inhibition, complement fixation, plaque reduction neutralization test, and the indirect fluorescent antibody (IFA) test. Positive identification using these immunoglobulin M (IgM) - and IgG-based assays requires a four-fold increase in titer between acute and convalescent serum samples. With the advent of solid-phase antibody-binding assays, such as enzyme-linked immunosorbent assay (ELISA), the diagnostic algorithm for identification of viral activity has changed. Rapid serologic assays such as IgM-capture ELISA (MAC-ELISA) and IgG ELISA may now be employed soon after infection. Early in infection, IgM antibody is more specific, while later in infection, IgG antibody is more reactive. Inclusion of monoclonal antibodies (MAbs) with defined virus specificities in these solid phase assays has allowed for a level of standardization that was not previously possible.

Virus isolation and identification have also been useful in defining viral agents in serum, cerebrospinal fluid and mosquito vectors. While virus isolation still depends upon growth of an unknown virus in cell culture or neonatal mice, virus identification has also been greatly facilitated by the availability of virus-specific MAbs for use in IFA assays. Similarly, MAbs with avidities sufficiently high to allow for specific binding to virus antigens in a complex protein mixture (e.g., mosquito pool suspensions) have enhanced our ability to rapidly identify virus agents *in situ*. While polymerase chain reaction (PCR) has been developed to identify a number of viral agents, such tests have not yet been validated for routine rapid identification in the clinical setting.

Mosquito-borne encephalitis offers a rare opportunity in public health to detect the risk of a disease before it occurs and to intervene to reduce that risk substantially. The surveillance required to detect risk is being increasingly refined by the potential utilization of these new technologies which allows for rapid identification of

dangerous viruses in mosquito populations. These rapid diagnostic techniques used in threat recognition can shorten public health response time and reduce the geographic spread of infected vectors and thereby the cost of containing them. The Arbovirus Diseases Branch of NCID's Division of Vector-Borne Infectious Diseases has responsibility for CDC's programs in surveillance, diagnosis, research and control of arboviral encephalitides.

La Crosse Encephalitis

La Crosse (LAC) encephalitis was discovered in La Crosse, Wisconsin in 1963. Since then, the virus has been identified in several Midwestern and Mid-Atlantic states. During an average year, about 75 cases of LAC encephalitis are reported to the CDC. Most cases of LAC encephalitis occur in children under 16 years of age. LAC virus is a Bunyavirus and is a zoonotic pathogen cycled between the daytime-biting treehole mosquito, *Aedes triseriatus*, and vertebrate amplifier hosts (chipmunks, tree squirrels) in deciduous forest habitats. The virus is maintained over the winter by transovarial transmission in mosquito eggs. If the female mosquito is infected, she may lay eggs that carry the virus, and the adults coming from those eggs may be able to transmit the virus to chipmunks and to humans.

Historically, most cases of LAC encephalitis occur in the upper Midwestern states (Minnesota, Wisconsin, Iowa, Illinois, Indiana, and Ohio). Recently, more cases are being reported from states in the mid-Atlantic (West Virginia, Virginia and North Carolina) and southeastern (Alabama and Mississippi) regions of the country. It has long been suspected that LAC encephalitis has a broader distribution and a higher incidence in the eastern United States, but is under-reported because the etiologic agent is often not specifically identified.

LAC encephalitis initially presents as a nonspecific summertime illness with fever, headache, nausea, vomiting and lethargy. Severe disease occurs most commonly in children under the age of 16 and is characterized by seizures, coma, paralysis, and a variety of neurological sequelae after recovery. Death from LAC encephalitis occurs in less than 1% of clinical cases. In many clinical settings, pediatric cases presenting with CNS involvement are routinely screened for herpes or enteroviral etiologies. Since there is no specific treatment for LAC encephalitis, physicians often do not request the tests required to specifically identify LAC virus, and the cases are reported as aseptic meningitis or viral encephalitis of unknown etiology.

Also found in the United States, Jamestown Canyon and Cache Valley viruses are related to LAC, but rarely cause encephalitis.

Eastern Equine Encephalitis

Eastern equine encephalitis (EEE) is also caused by a virus transmitted to humans and equines by the bite of an infected mosquito. EEE virus is an alphavirus that was first identified in the 1930's and currently occurs in focal locations along the eastern seaboard, the Gulf Coast and some inland Midwestern locations of the United States. While small outbreaks of human disease have occurred in the United States, equine epizootics can be a common occurrence during the summer and fall.

It takes from 4-10 days after the bite of an infected mosquito for an individual to develop symptoms of EEE. These symptoms begin with a sudden onset of fever,

general muscle pains, and a headache of increasing severity. Many individuals will progress to more severe symptoms such as seizures and coma. Approximately one-third of all people with clinical encephalitis caused by EEE will die from the disease and of those who recover, many will suffer permanent brain damage with many of those requiring permanent institutional care.

In addition to humans, EEE virus can produce severe disease in: horses, some birds such as pheasants, quail, ostriches and emus, and even puppies. Because horses are outdoors and attract hordes of biting mosquitoes, they are at high risk of contracting EEE when the virus is present in mosquitoes. Human cases are usually preceded by those in horses and exceeded in numbers by horse cases which may be used as a surveillance tool.

EEE virus occurs in natural cycles involving birds and *Culiseta melanura*, in some swampy areas nearly every year during the warm months. Where the virus resides or how it survives in the winter is unknown. It may be introduced by migratory birds in the spring or it may remain dormant in some yet undiscovered part of its life cycle. With the onset of spring, the virus reappears in the birds (native bird species do not seem to be affected by the virus) and mosquitoes of the swamp. In this usual cycle of transmission, virus does not escape from these areas because the mosquito involved prefers to feed upon birds and does not usually bite humans or other mammals.

For reasons not fully understood, the virus may escape from enzootic foci in swamp areas in birds or bridge vectors such as *Coquilletidia perturbans* and *Aedes sollicitans*. These species feed on both birds and mammals and can transmit the virus to humans, horses, and other hosts. Other mosquito species such as *Ae. vexans* and *Culex nigripalpus* can also transmit EEE virus. When health officials maintain surveillance for EEE virus activity, this movement out of the swamp can be detected, and if the level of activity is sufficiently high, can recommend and undertake measures to reduce the risk to humans.

Western Equine Encephalitis

The alphavirus western equine encephalitis (WEE) was first isolated in California in 1930 from the brain of a horse with encephalitis, and remains an important cause of encephalitis in horses and humans in North America, mainly in western parts of the USA and Canada. In the western United States, the enzootic cycle of WEE involves passerine birds, in which the infection is inapparent, and culicine mosquitoes, principally *Cx. tarsalis*, a species that is associated with irrigated agriculture and stream drainages. The virus has also been isolated from a variety of mammal species. Other important mosquito vector species include *Aedes melanimon* in California, *Ae. dorsalis* in Utah and New Mexico and *Ae. campestris* in New Mexico. WEE virus was isolated from field collected larvae of *Ae. dorsalis*, providing evidence that vertical transmission may play an important role in the maintenance cycle of an alphavirus.

Expansion of irrigated agriculture in the North Platte River Valley during the past several decades has created habitats and conditions favorable for increases in populations of granivorous birds such as the house sparrow, *Passer domesticus*, and mosquitoes such as *Cx. tarsalis*, *Aedes dorsalis* and *Aedes melanimon*. All of these species may play a role in WEE virus transmission in irrigated areas. In addition to

Cx. tarsalis, *Ae. dorsalis* and *Ae. melanimon*, WEE virus also has been isolated occasionally from some other mosquito species present in the area. Two confirmed and several suspect cases of WEE were reported from Wyoming in 1994. In 1995, two strains of WEE virus were isolated from *Culex tarsalis* and neutralizing antibody to WEE virus was demonstrated in sera from pheasants and house sparrows. During 1997, 35 strains of WEE virus were isolated from mosquitoes collected in Scotts Bluff County, Nebraska.

Human WEE cases are usually first seen in June or July. Most WEE infections are asymptomatic or present as mild, nonspecific illness. Patients with clinically apparent illness usually have a sudden onset with fever, headache, nausea, vomiting, anorexia and malaise, followed by altered mental status, weakness and signs of meningeal irritation. Children, especially those under 1 year old, are affected more severely than adults and may be left with permanent sequelae, which is seen in 5 to 30% of young patients. The mortality rate is about 3%.

St. Louis Encephalitis

In the United States, the leading cause of epidemic flaviviral encephalitis is St. Louis encephalitis (SLE) virus. SLE is the most common mosquito-transmitted human pathogen in the U.S. While periodic SLE epidemics have occurred only in the Midwest and southeast, SLE virus is distributed throughout the lower 48 states. Since 1964, there have been 4,437 confirmed cases of SLE with an average of 193 cases per year (range 4 - 1,967). However, less than 1% of SLE viral infections are clinically apparent and the vast majority of infections remain undiagnosed. Illness ranges in severity from a simple febrile headache to meningoencephalitis, with an overall case-fatality ratio of 5-15 %. The disease is generally milder in children than in adults, but in those children who do have disease, there is a high rate of encephalitis. The elderly are at highest risk for severe disease and death. During the summer season, SLE virus is maintained in a mosquito-bird-mosquito cycle, with periodic amplification by peridomestic birds and *Culex* mosquitoes. In Florida, the principal vector is *Cx. nigripalpus*, in the Midwest, *Cx. pipiens pipiens* and *Cx. p. quinquefasciatus* and in the western United States, *Cx. tarsalis* and members of the *Cx. pipiens* complex.

Powassan Encephalitis

Powassan (POW) virus is a flavivirus and currently the only well documented tick-borne transmitted arbovirus occurring in the United States and Canada. Recently a Powassan-like virus was isolated from the deer tick, *Ixodes scapularis*. Its relationship to POW and its ability to cause human disease has not been fully elucidated. POW's range in the United States is primarily in the upper tier States. In addition to isolations from man, the virus has been recovered from ticks (*Ixodes marxi*, *I. cookei* and *Dermacentor andersoni*) and from the tissues of a skunk (*Spilogale putorius*). It is a rare cause of acute viral encephalitis. POW virus was first isolated from the brain of a 5-year-old child who died in Ontario in 1958. Patients who recover may have residual neurological problems.

Venezuelan Equine Encephalitis

Like EEE and WEE viruses, Venezuelan equine encephalitis (VEE) is an alphavirus and causes encephalitis in horses and humans and is an important veterinary and public health problem in Central and South America. Occasionally, large regional epizootics

and epidemics can occur resulting in thousands of equine and human infections. Epizootic strains of VEE virus can infect and be transmitted by a large number of mosquito species. The natural reservoir host for the epizootic strains is not known. A large epizootic that began in South America in 1969 reached Texas in 1971. It was estimated that over 200,000 horses died in that outbreak, which was controlled by a massive equine vaccination program using an experimental live attenuated VEE vaccine. There were several thousand human infections. A more recent VEE epidemic occurred in the fall of 1995 in Venezuela and Colombia with an estimated 90,000 human infections. Infection of man with VEE virus is less severe than with EEE and WEE viruses, and fatalities are rare. Adults usually develop only an influenza-like illness, and overt encephalitis is usually confined to children. Effective VEE virus vaccines are available for equines.

Enzootic strains of VEE virus have a wide geographic distribution in the Americas. These viruses are maintained in cycles involving forest dwelling rodents and mosquito vectors, mainly *Culex (Melanoconion)* species. Occasional cases or small outbreaks of human disease are associated with these viruses, the most recent outbreaks were in Venezuela in 1992, Peru in 1994 and Mexico in 1995-96.

Other Arboviral Encephalitides

Many other arboviral encephalitides occur throughout the world. Most of these diseases are problems only for those individuals traveling to countries where the viruses are endemic.

Japanese Encephalitis

Japanese encephalitis (JE) virus is a flavivirus, related to SLE, and is widespread throughout Asia. Worldwide, it is the most important cause of arboviral encephalitis with over 45,000 cases reported annually. In recent years, JE virus has expanded its geographic distribution with outbreaks in the Pacific. Epidemics occur in late summer in temperate regions, but the infection is enzootic and occurs throughout the year in many tropical areas of Asia. The virus is maintained in a cycle involving culicine mosquitoes and waterbirds. The virus is transmitted to man by *Culex* mosquitoes, primarily *Cx. tritaeniorhynchus*, which breed in rice fields. Pigs are the main amplifying hosts of JE virus in peridomestic environments.

The incubation period of JE is 5 to 14 days. Onset of symptoms is usually sudden, with fever, headache and vomiting. The illness resolves in 5 to 7 days if there is no CNS involvement. The mortality in most outbreaks is less than 10%, but is higher in children and can exceed 30%. Neurologic sequelae in patients who recover are reported in up to 30% of cases. A formalin-inactivated vaccine prepared in mice is used widely in Japan, China, India, Korea, Taiwan and Thailand. This vaccine is currently available for human use in the United States, for individuals who might be traveling to endemic countries.

Tick-Borne Encephalitis

Tick-borne encephalitis (TBE) is caused by two closely related flaviviruses which are distinct biologically. The eastern subtype causes Russian spring-summer encephalitis (RSSE) and is transmitted by *Ixodes persulcatus*, whereas the western subtype is transmitted by *Ixodes ricinus* and causes Central European encephalitis (CEE). The

name CEE is somewhat misleading, since the condition can occur throughout much of Europe. Of the two subtypes, RSSE is the more severe infection, having a mortality of up to 25% in some outbreaks, whereas mortality in CEE seldom exceeds 5%.

The incubation period is 7 to 14 days. Infection usually presents as a mild, influenza-type illness or as benign, aseptic meningitis, but may result in fatal meningoencephalitis. Fever is often biphasic, and there may be severe headache and neck rigidity, with transient paralysis of the limbs, shoulders or less commonly the respiratory musculature. A few patients are left with residual paralysis. Although the great majority of TBE infections follow exposure to ticks, infection has occurred through the ingestion of infected cows' or goats' milk. An inactivated TBE vaccine is currently available in Europe and Russia.

West Nile Encephalitis

WNV is a flavivirus belonging taxonomically to the Japanese encephalitis serocomplex that includes the closely related St. Louis encephalitis (SLE) virus, Kunjin and Murray Valley encephalitis viruses, as well as others. WNV was first isolated in the West Nile Province of Uganda in 1937 (2). The first recorded epidemics occurred in Israel during 1951-1954 and in 1957. Epidemics have been reported in Europe in the Rhone delta of France in 1962 and in Romania in 1996 (3-5). The largest recorded epidemic occurred in South Africa in 1974 (6).

An outbreak of arboviral encephalitis in New York City and neighboring counties in New York state in late August and September 1999, was initially attributed to St. Louis encephalitis virus based on positive serologic findings in cerebrospinal fluid (CSF) and serum samples using a virus-specific IgM-capture enzyme-linked immunosorbent assay (ELISA). The outbreak has been subsequently confirmed as caused by West Nile virus based on the identification of virus in human, avian, and mosquito samples. A recent outbreak WN encephalitis occurred in Bucharest, Romania in 1996.

The virus that caused the New York area outbreak has been definitively identified as a strain of WNV. The genomic sequences identified to date from human brain, virus isolates from zoo birds, dead crows, and mosquito pools are identical. SLE and West Nile viruses are antigenically related, and cross reactions are observed in most serologic tests. The isolation of viruses and genomic sequences from birds, mosquitoes, and human brain tissue permitted the discovery of West Nile virus in North America and prompted more specific testing. The limitations of serologic assays emphasize the importance of isolating the virus from entomologic, clinical, or veterinary material.

Although it is not known when and how West Nile virus was introduced into North America, international travel of infected persons to New York or transport by imported infected birds may have played a role. WNV can infect a wide range of vertebrates; in humans it usually produces either asymptomatic infection or mild febrile disease, but can cause severe and fatal infection in a small percentage of patients. Within its normal geographic distribution of Africa, the Middle East, western Asia, and Europe, WNV has not been documented to cause epizootics in birds; crows and other birds with antibodies to WNV are common, suggesting that asymptomatic or mild infection usually occurs among birds in those regions. Similarly, substantial bird virulence of SLE virus has not been reported. Therefore, an epizootic producing

high mortality in crows and other bird species is unusual for either WNV or SLE virus. For both viruses, migratory birds may play an important role in the natural transmission cycles and spread. Like SLE virus, WNV is transmitted principally by *Culex* species mosquitoes, but also can be transmitted by *Aedes*, *Anopheles*, and other species. The predominance of urban *Culex pipiens* mosquitoes trapped during this outbreak suggests an important role for this species. Enhanced surveillance for early detection of virus activity in birds and mosquitoes will be crucial to guide control measures.

Murray Valley Encephalitis

Murray Valley encephalitis (MVE) is endemic in New Guinea and in parts of Australia; and is related to SLE, WN and JE viruses. Inapparent infections are common, and the small number of fatalities have mostly been in children

<http://www.cdc.gov/ncidod/dvbid/arbor/arbdet.htm>

Body Lice

Pediculosis

What are body lice?

Body lice are parasitic insects that live on the body and in the clothing or bedding of infested humans. Infestation is common, found worldwide, and affects people of all races. Body lice infestations spread rapidly under crowded conditions where hygiene is poor and there is frequent contact among people. Are body lice infestations common in the United States? Body lice are found only in homeless, transient populations who don't have access to changes of clothes or bath. Infestation is unlikely in anyone who bathes regularly.

Where are body lice found?

Body lice are found on the body and on clothing or bedding used by infested people; lice eggs are laid in the seams of clothing or on bedding. Occasionally eggs are attached to body hair.

Lice found on the hair and head are not body lice; they are head lice.

Can body lice transmit disease?

Yes. Epidemics of typhus and louse-borne relapsing fever have been caused by body lice. Though typhus is no longer widespread, epidemics still occur during times of war, civil unrest, natural disasters, in refugee camps, and prisons where people live crowded together in unsanitary conditions. Typhus still exists in places where climate, chronic poverty, and social customs prevent regular changes and laundering of clothing.

What are the signs and symptoms of body lice?

Itching and rash are common; both are your body's allergic reaction to the lice bite. Long-term body lice infestations may lead to thickening and discoloration of the skin, particularly around the waist, groin, and upper thighs. Sores on the body may be caused by scratching. These sores can sometimes become infected with bacteria or fungi.

How are body lice spread?

Body lice are spread directly through contact with a person who has body lice, or indirectly through shared clothing, beds, bed linens, or towels.

What do body lice look like?

There are three forms of body lice: the egg (sometimes called a nit), the nymph, and the adult.

Nit: Nits are body lice eggs. They are generally easy to see in the seams of clothing, particularly around the waistline and under armpits. They are about the size of the mark at the end of this arrow → Nits may also be attached to body hair. They are oval and usually yellow to white. Nits may take 30 days to hatch.

Nymph: The egg hatches into a baby louse called a nymph. It looks like an adult body louse, but is smaller. Nymphs mature into adults about 7 days after hatching. To live, the nymph must feed on blood.

Adult: The adult body louse is about the size of a sesame seed, has 6 legs, and is tan to greyish-white. Females lay eggs. To live, adult lice need to feed on blood. If the louse falls off a person, it dies within 10 days.

How is a body lice infestation diagnosed?

By looking closely in the seams of clothing and on the body for eggs and for crawling lice. Diagnosis should be made by a health care provider if you are unsure about infestation. How are body lice treated? Lice infestations are generally treated by giving the infested person a clean change of clothes, a shower, and by laundering all worn clothing, bed linens, and towels. When laundering items, use the hot cycle (130°F) of the washing machine. Set the dryer to the hot cycle to dry items. Additionally, a 1% permethrin or pyrethrin lice shampoo, (also called pediculicide peh-DICK-you-luh-side), may be applied to the body. Medication should be applied exactly as directed on the bottle or by your physician.

This fact sheet is for information only and is not meant to be used for self-diagnosis or as a substitute for consultation with a health care provider. If you have any questions about the disease described above or think that you may have a parasitic infection, consult a health care provider.

Section 1.02 http://www.cdc.gov/ncidod/dpd/parasites/lice/factsht_body_lice.htm

Head Lice Infestation

(Pediculosis)

What are head lice?

Also called *Pediculus humanus capitis* (peh-DICK-you-lus HUE-man-us CAP-ih-TUS), head lice are parasitic insects found on the heads of people. Having head lice is very common; as many as 6-12 million people worldwide get head lice each year.

Who is at risk for getting head lice?

Anyone who comes in close contact with someone who already has head lice contaminated clothing, and other belongings. Preschool and elementary-age children, 3-10, and their families are infested most often. Girls get head lice more often than boys, women more than men. In the United States, African-Americans rarely get head lice.

What do head lice look like?

There are three forms of lice: the nit, the nymph, and the adult.

Nit: Nits are head lice eggs. They are hard to see and are often confused for dandruff or hair spray droplets. Nits are found firmly attached to the hair shaft. They are oval and usually yellow to white. Nits take about 1 week to hatch.

Nymph: The nit hatches into a baby louse called a nymph. It looks like an adult head louse, but is smaller. Nymphs mature into adults about 7 days after hatching. To live, the nymph must feed on blood.

Adult: The adult louse is about the size of a sesame seed, has six legs, and is tan to greyish-white. In persons with dark hair, the adult louse will look darker. Females lay nits; they are usually larger than males. Adult lice can live up to 30 days on a person's head. To live, adult lice need to feed on blood. If the louse falls off a person, it dies within 2 days.

Where are head lice most commonly found?

On the scalp behind the ears and near the neckline at the back of the neck. Head lice hold on to hair with hook-like claws found at the end of each of their six legs. Head lice are rarely found on the body, eyelashes, or eyebrows.

What are the signs and symptoms of head lice infestation?

- Tickling feeling of something moving in the hair.
- Itching, caused by the an allergic reaction to the bites.
- Irritability.
- Sores on the head caused by scratching. These sores can sometimes become infected.

How did my child get head lice?

- By contact with an already infested person. Contact is common during play at school and at home (slumber parties, sports activities, at camp, on a playground).
- By wearing infested clothing, such as hats, scarves, coats, sports uniforms, or hair ribbons.
- By using infested combs, brushes, or towels.
- By lying on a bed, couch, pillow, carpet, or stuffed animal that has recently been in contact with an infested person.

How is head lice infestation diagnosed?

By looking closely through the hair and scalp for nits, nymphs, or adults. Finding a nymph or adult may be difficult; there are usually few of them and they can move quickly from searching fingers. If crawling lice are not seen, finding nits within a 1/4 inch of the scalp confirms that a person is infested and should be treated. If you only find nits more than 1/4 inch from the scalp, the infestation is probably an old one and does not need to be treated. If you are not sure if a person has head lice, the diagnosis should be made by a health care provider, school nurse, or a professional from the local health department or agricultural extension service.

This fact sheet is for information only and is not meant to be used for self-diagnosis or as a substitute for consultation with a health care provider. If you have any questions about the disease described above or think that you may have a parasitic infection, consult a health care provider.

http://www.cdc.gov/ncidod/dpd/parasites/headlice/factsht_head_lice.htm

Lyme Disease

Q. How do people get Lyme disease?

A. By the bite of ticks infected with Lyme disease bacteria. (Deer tick)

Q. What is the basic transmission cycle?

A. Immature ticks become infected by feeding on small rodents, such as the white-footed mouse, and other mammals that are infected with the bacterium *Borrelia burgdorferi*. In later stages, these ticks then transmit the Lyme disease bacterium to humans and other mammals during the feeding process. Lyme disease bacteria are maintained in the blood systems and tissues of small rodents.

Q. Could you get Lyme disease from another person?

A. No, Lyme disease bacteria are NOT transmitted from person-to-person. For example, you cannot get infected from touching or kissing a person who has Lyme disease, or from a health care worker who has treated someone with the disease, or by sexual contact.

Q. What are the signs and symptoms of Lyme disease?

A. Within days to weeks following a tick bite, 80% of patients will have a red, slowly expanding "bull's-eye" rash (called erythema migrans), accompanied by general tiredness, fever, headache, stiff neck, muscle aches, and joint pain. If untreated, weeks to months later some patients may develop arthritis, including intermittent episodes of swelling and pain in the large joints; neurologic abnormalities, such as aseptic meningitis, facial palsy, motor and sensory nerve inflammation (radiculoneuritis) and inflammation of the brain (encephalitis); and, rarely, cardiac problems, such as atrioventricular block, acute inflammation of the tissues surrounding the heart (myopericarditis) or enlarged heart (cardiomegaly).

Q. What is the incubation period for Lyme disease?

A. For the red "bull's-eye" rash (erythema migrans), usually 7 to 14 days following tick exposure. Some patients present with later manifestations without having had early signs of disease.

Q. What is the mortality rate of Lyme disease?

A. Lyme disease is rarely, if ever, fatal.

Q. Can a person be reinfected with Lyme disease?

A. Yes. Having had Lyme disease doesn't protect against reinfection. Some persons have had Lyme disease more than once after re-exposure to infective tick bites. This stresses the need for continued tick bite prevention activities such as wearing appropriate clothing when in tick-infested areas, daily tick checks, and quick removal of attached ticks.

Q. How is Lyme disease treated?

A. According to treatment experts, antibiotic treatment for 3-4 weeks with doxycycline or amoxicillin is generally effective in early disease. Cefuroxime axetil or erythromycin can be used for persons allergic to penicillin or who cannot take tetracyclines. Later disease, particularly with objective neurologic manifestations, may require treatment with intravenous ceftriaxone or penicillin for 4 weeks or more, depending on disease severity. In later disease, treatment failures may occur and

retreatment may be necessary. (The Medical Letter, Vol. 42(Issue 1077), May 1, 2000)

Q. Is the disease seasonal in its occurrence?

A. Yes, Lyme disease is most common during the late spring and summer months in the U.S. (May through August) when nymphal ticks are most active and human populations are frequently outdoors and most exposed.

Q. Where is Lyme disease most common?

A. Generally, most Lyme disease is endemic in the northeastern and upper midwest states.

Q. Who is at risk for getting Lyme disease?

A. Persons in endemic areas who frequent sites where infected ticks are common, such as grassy or wooded locations favored by white-tailed deer in the northeastern and upper midwest states, and along the northern Pacific coast of California.

Q. Is there a vaccine against Lyme disease?

A. As of February 25, 2002 the manufacturer announced that the LYMErix™ Lyme disease vaccine will no longer be commercially available.

Q. Does the Lyme disease vaccine cause arthritis? Are individuals with certain HLA-DR4 genetic subtypes more susceptible to getting arthritis from the vaccine?

A. An association between naturally acquired treatment-resistant Lyme disease arthritis, certain HLA-DR4 genetic subtypes, and high levels of antibody to OspA of naturally acquired *Borrelia burgdorferi* has been described in the medical literature. Because of the relationship between OspA antibodies and treatment-resistant arthritis from naturally acquired infection, CDC's Advisory Committee on Immunization Practices (ACIP) has stated that the vaccine should not be given to persons with treatment-resistant Lyme arthritis. However, at this writing there is no scientific evidence that the currently licensed Lyme disease vaccine increases the recipient's risk of arthritis. To the contrary, there is good evidence that the risk of arthritis in vaccine recipients is not significantly different from the risk in individuals who have received placebo without OspA. ACIP has not recommended screening of HLA type prior to vaccination. In the absence of evidence that the vaccine causes arthritis, screening for HLA-DR4 subtypes before vaccination would not seem to be a beneficial use of health resources.

<http://www.cdc.gov/ncidod/dvbid/lyme/ga.htm>

Plague

What is plague?

Plague is a disease caused by *Yersinia pestis* (*Y. pestis*), a bacterium found in rodents and their fleas in many areas around the world.

Why are we concerned about pneumonic plague as a bioweapon?

Yersinia pestis used in an aerosol attack could cause cases of the pneumonic form of plague. One to six days after becoming infected with the bacteria, people would develop pneumonic plague. Once people have the disease, the bacteria can spread to others who have close contact with them. Because of the delay between being exposed to the bacteria and becoming sick, people could travel over a large area before becoming contagious and possibly infecting others. Controlling the disease would then be more difficult. A bioweapon carrying *Y. pestis* is possible because the bacterium occurs in nature and could be isolated and grown in quantity in a laboratory. Even so, manufacturing an effective weapon using *Y. pestis* would require advanced knowledge and technology.

Is pneumonic plague different from bubonic plague?

Yes. Both are caused by *Yersinia pestis*, but they are transmitted differently and their symptoms differ. Pneumonic plague can be transmitted from person to person; bubonic plague cannot. Pneumonic plague affects the lungs and is transmitted when a person breathes in *Y. pestis* particles in the air. Bubonic plague is transmitted through the bite of an infected flea or exposure to infected material through a break in the skin. Symptoms include swollen, tender lymph glands called buboes. Buboes are not present in pneumonic plague. If bubonic plague is not treated, however, the bacteria can spread through the bloodstream and infect the lungs, causing a secondary case of pneumonic plague.

What are the signs and symptoms of pneumonic plague?

Patients usually have fever, weakness, and rapidly developing pneumonia with shortness of breath, chest pain, cough, and sometimes bloody or watery sputum. Nausea, vomiting, and abdominal pain may also occur. Without early treatment, pneumonic plague usually leads to respiratory failure, shock, and rapid death.

How do people become infected with pneumonic plague?

Pneumonic plague occurs when *Yersinia pestis* infects the lungs. Transmission can take place if someone breathes in *Y. pestis* particles, which could happen in an aerosol release during a bioterrorism attack. Pneumonic plague is also transmitted by breathing in *Y. pestis* suspended in respiratory droplets from a person (or animal) with pneumonic plague. Respiratory droplets are spread most readily by coughing or sneezing. Becoming infected in this way usually requires direct and close (within 6 feet) contact with the ill person or animal. Pneumonic plague may also occur if a person with bubonic or septicemic plague is untreated and the bacteria spread to the lungs.

Does plague occur naturally?

Yes. The World Health Organization reports 1,000 to 3,000 cases of plague worldwide every year. An average of 5 to 15 cases occur each year in the western United States. These cases are usually scattered and occur in rural to semi-rural areas. Most cases are of the bubonic form of the disease. Naturally occurring pneumonic plague is uncommon, although small outbreaks do occur. Both types of plague are readily controlled by standard public health response measures.

Can a person exposed to pneumonic plague avoid becoming sick?

Yes. People who have had close contact with an infected person can greatly reduce the chance of becoming sick if they begin treatment within 7 days of their exposure. Treatment consists of taking antibiotics for at least 7 days.

How quickly would someone get sick if exposed to plague bacteria through the air?

Someone exposed to *Yersinia pestis* through the air—either from an intentional aerosol release or from close and direct exposure to someone with plague pneumonia—would become ill within 1 to 6 days.

Can pneumonic plague be treated?

Yes. To prevent a high risk of death, antibiotics should be given within 24 hours of the first symptoms. Several types of antibiotics are effective for curing the disease and for preventing it. Available oral medications are a tetracycline (such as doxycycline) or a fluoroquinolone (such as ciprofloxacin). For injection or intravenous use, streptomycin or gentamicin antibiotics are used. Early in the response to a bioterrorism attack, these drugs would be tested to determine which is most effective against the particular weapon that was used.

Would enough medication be available in the event of a bioterrorism attack involving pneumonic plague?

National and state public health officials have large supplies of drugs needed in the event of a bioterrorism attack. These supplies can be sent anywhere in the United States within 12 hours.

What should someone do if they suspect they or others have been exposed to plague?

Get immediate medical attention: To prevent illness, a person who has been exposed to pneumonic plague must receive antibiotic treatment without delay. If an exposed person becomes ill, antibiotics must be administered within 24 hours of their first symptoms to reduce the risk of death. Notify authorities: Immediately notify local or state health departments so they can begin to investigate and control the problem right away. If bioterrorism is suspected, the health departments will notify the CDC, FBI, and other appropriate authorities.

How can someone reduce the risk of getting pneumonic plague from another person or giving it to someone else?

People having direct and close contact with someone with pneumonic plague should wear tightly fitting disposable surgical masks. Patients with the disease should be isolated and medically supervised for at least the first 48 hours of antibiotic treatment. People who have been exposed to a contagious person can be protected from developing plague by receiving prompt antibiotic treatment.

How is plague diagnosed?

The first step is evaluation by a health worker. If the health worker suspects pneumonic plague, samples of the patient's blood, sputum, or lymph node aspirate are sent to a laboratory for testing. Once the laboratory receives the sample, preliminary results can be ready in less than two hours. Confirmation will take longer, usually 24 to 48 hours.

How long can plague bacteria exist in the environment?

Yersinia pestis is easily destroyed by sunlight and drying. Even so, when released into air, the bacterium will survive for up to one hour, depending on conditions.

Is a vaccine available to prevent pneumonic plague?

Currently, no plague vaccine is available in the United States. Research is in progress, but we are not likely to have vaccines for several years or more.

<http://www.bt.cdc.gov/agent/plague/faq.asp>

Viral Hemorrhagic Fevers

What are viral hemorrhagic fevers?

Viral hemorrhagic fevers (VHFs) refer to a group of illnesses that are caused by several distinct families of viruses. In general, the term "viral hemorrhagic fever" is used to describe a severe multisystem syndrome (multisystem in that multiple organ systems in the body are affected). Characteristically, the overall vascular system is damaged, and the body's ability to regulate itself is impaired. These symptoms are often accompanied by hemorrhage (bleeding); however, the bleeding is itself rarely life-threatening. While some types of hemorrhagic fever viruses can cause relatively mild illnesses, many of these viruses cause severe, life-threatening disease.

The Special Pathogens Branch (SPB) primarily works with hemorrhagic fever viruses that are classified as biosafety level four (BSL-4) pathogens. A list of these viruses appears in the SPB disease information index. The Division of Vector-Borne Infectious Diseases, also in the National Center for Infectious Diseases, works with the non-BSL-4 viruses that cause two other hemorrhagic fevers, dengue hemorrhagic fever and yellow fever.

How are hemorrhagic fever viruses grouped?

VHFs are caused by viruses of four distinct families: arenaviruses, filoviruses, bunyaviruses, and flaviviruses. Each of these families share a number of features:

- They are all RNA viruses, and all are covered, or enveloped, in a fatty (lipid) coating.
- Their survival is dependent on an animal or insect host, called the natural reservoir.
- The viruses are geographically restricted to the areas where their host species live.
- Humans are not the natural reservoir for any of these viruses. Humans are infected when they come into contact with infected hosts. However, with some viruses, after the accidental transmission from the host, humans can transmit the virus to one another.
- Human cases or outbreaks of hemorrhagic fevers caused by these viruses occur sporadically and irregularly. The occurrence of outbreaks cannot be easily predicted.
- With a few noteworthy exceptions, there is no cure or established drug treatment for VHFs.

In rare cases, other viral and bacterial infections can cause a hemorrhagic fever; scrub typhus is a good example.

What carries viruses that cause viral hemorrhagic fevers?

Viruses associated with most VHFs are zoonotic. This means that these viruses naturally reside in an animal reservoir host or arthropod vector. They are totally dependent on their hosts for replication and overall survival. For the most part, rodents and arthropods are the main reservoirs for viruses causing VHFs. The multimammate rat, cotton rat, deer mouse, house mouse, and other field rodents

are examples of reservoir hosts. Arthropod ticks and mosquitoes serve as vectors for some of the illnesses. However, the hosts of some viruses remain unknown -- Ebola and Marburg viruses are well-known examples.

Where are cases of viral hemorrhagic fever found?

Taken together, the viruses that cause VHFs are distributed over much of the globe. However, because each virus is associated with one or more particular host species, the virus and the disease it causes are usually seen only where the host species live(s). Some hosts, such as the rodent species carrying several of the New World arenaviruses, live in geographically restricted areas. Therefore, the risk of getting VHFs caused by these viruses is restricted to those areas. Other hosts range over continents, such as the rodents that carry viruses which cause various forms of hantavirus pulmonary syndrome (HPS) in North and South America, or the different set of rodents that carry viruses which cause hemorrhagic fever with renal syndrome (HFRS) in Europe and Asia. A few hosts are distributed nearly worldwide, such as the common rat. It can carry Seoul virus, a cause of HFRS; therefore, humans can get HFRS anywhere where the common rat is found.

While people usually become infected only in areas where the host lives, occasionally people become infected by a host that has been exported from its native habitat. For example, the first outbreaks of Marburg hemorrhagic fever, in Marburg and Frankfurt, Germany, and in Yugoslavia, occurred when laboratory workers handled imported monkeys infected with Marburg virus. Occasionally, a person becomes infected in an area where the virus occurs naturally and then travels elsewhere. If the virus is a type that can be transmitted further by person-to-person contact, the traveler could infect other people. For instance, in 1996, a medical professional treating patients with Ebola hemorrhagic fever (Ebola HF) in Gabon unknowingly became infected. When he later traveled to South Africa and was treated for Ebola HF in a hospital, the virus was transmitted to a nurse. She became ill and died. Because more and more people travel each year, outbreaks of these diseases are becoming an increasing threat in places where they rarely, if ever, have been seen before.

How are hemorrhagic fever viruses transmitted?

Viruses causing hemorrhagic fever are initially transmitted to humans when the activities of infected reservoir hosts or vectors and humans overlap. The viruses carried in rodent reservoirs are transmitted when humans have contact with urine, fecal matter, saliva, or other body excretions from infected rodents. The viruses associated with arthropod vectors are spread most often when the vector mosquito or tick bites a human, or when a human crushes a tick. However, some of these vectors may spread virus to animals, livestock, for example. Humans then become infected when they care for or slaughter the animals.

Some viruses that cause hemorrhagic fever can spread from one person to another, once an initial person has become infected. Ebola, Marburg, Lassa and Crimean-Congo hemorrhagic fever viruses are examples. This type of secondary transmission of the virus can occur directly, through close contact with infected people or their body fluids. It can also occur indirectly, through contact with objects contaminated with infected body fluids. For example, contaminated syringes and needles have

played an important role in spreading infection in outbreaks of Ebola hemorrhagic fever and Lassa fever.

What are the symptoms of viral hemorrhagic fever illnesses?

Specific signs and symptoms vary by the type of VHF, but initial signs and symptoms often include marked fever, fatigue, dizziness, muscle aches, loss of strength, and exhaustion. Patients with severe cases of VHF often show signs of bleeding under the skin, in internal organs, or from body orifices like the mouth, eyes, or ears. However, although they may bleed from many sites around the body, patients rarely die because of blood loss. Severely ill patient cases may also show shock, nervous system malfunction, coma, delirium, and seizures. Some types of VHF are associated with renal (kidney) failure.

How are patients with viral hemorrhagic fever treated?

Patients receive supportive therapy, but generally speaking, there is no other treatment or established cure for VHFs. Ribavirin, an anti-viral drug, has been effective in treating some individuals with Lassa fever or HFRS. Treatment with convalescent-phase plasma has been used with success in some patients with Argentine hemorrhagic fever.

How can cases of viral hemorrhagic fever be prevented and controlled?

With the exception of yellow fever and Argentine hemorrhagic fever, for which vaccines have been developed, no vaccines exist that can protect against these diseases. Therefore, prevention efforts must concentrate on avoiding contact with host species. If prevention methods fail and a case of VHF does occur, efforts should focus on preventing further transmission from person to person, if the virus can be transmitted in this way. Because many of the hosts that carry hemorrhagic fever viruses are rodents, disease prevention efforts include

- controlling rodent populations;
- discouraging rodents from entering or living in homes or workplaces;
- encouraging safe cleanup of rodent nests and droppings.

For hemorrhagic fever viruses spread by arthropod vectors, prevention efforts often focus on community-wide insect and arthropod control. In addition, people are encouraged to use insect repellent, proper clothing, bednets, window screens, and other insect barriers to avoid being bitten.

For those hemorrhagic fever viruses that can be transmitted from one person to another, avoiding close physical contact with infected people and their body fluids is the most important way of controlling the spread of disease. Barrier nursing or infection control techniques include isolating infected individuals and wearing protective clothing. Other infection control recommendations include proper use, disinfection, and disposal of instruments and equipment used in treating or caring for patients with VHF, such as needles and thermometers.

In conjunction with the World Health Organization, CDC has developed practical, hospital-based guidelines, titled Infection Control for Viral Haemorrhagic Fevers In

the African Health Care Setting. The manual can help health-care facilities recognize cases and prevent further hospital-based disease transmission using locally available materials and few financial resources.

What needs to be done to address the threat of viral hemorrhagic fevers?

Scientists and researchers are challenged with developing containment, treatment, and vaccine strategies for these diseases. Another goal is to develop immunologic and molecular tools for more rapid disease diagnosis, and to study how the viruses are transmitted and exactly how the disease affects the body (pathogenesis). A third goal is to understand the ecology of these viruses and their hosts in order to offer preventive public health advice for avoiding infection

<http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/vhf.htm>

Pandemic Flu / Avian Flu

<http://www.pandemicflu.gov/general/index.html>

Seasonal flu, avian flu, and pandemic flu are not the same.

Topics on this Page

- [What's Happening Now?](#)
- [Avian Influenza Viruses](#)
- [Avian Influenza in Birds](#)
- [Human Infection with Avian Influenza Viruses](#)
- [Vaccination and Treatment for H5N1 Virus in Humans](#)
- [What would be the Impact of a Pandemic?](#)
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(i) What's Happening Now?

A pandemic is a global disease outbreak. A flu pandemic occurs when a new influenza virus emerges for which people have little or no immunity, and for which there is no vaccine. The disease spreads easily person-to-person, causes serious illness, and can sweep across the country and around the world in very short time.

It is difficult to predict when the next influenza pandemic will occur or how severe it will be. Wherever and whenever a pandemic starts, everyone around the world is at risk. Countries might, through measures such as border closures and travel restrictions, delay arrival of the virus, but cannot stop it.

Health professionals are concerned that the continued spread of a highly pathogenic avian H5N1 virus across eastern Asia and other countries represents a significant threat to human health. The H5N1 virus has raised concerns about a potential human pandemic because:

- It is especially virulent
- It is being spread by migratory birds
- It can be transmitted from birds to mammals and in some limited circumstances to humans, and
- Like other influenza viruses, it continues to evolve.

Since 2003, a growing number of human H5N1 cases have been reported in Asia, Europe, and Africa. More than half of the people infected with the H5N1 virus have died. Most of these cases are all believed to have been caused by exposure to infected poultry. There has been no sustained human-to-human transmission of the disease, but the concern is that H5N1 will evolve into a virus capable of human-to-human transmission.

(ii) Avian Influenza Viruses

Avian (bird) flu is caused by influenza A viruses that occur naturally among birds. There are different subtypes of these viruses because of changes in certain proteins (hemagglutinin [HA] and neuraminidase [NA]) on the surface of the influenza A virus and the way the proteins combine.

Each combination represents a different subtype. All known subtypes of influenza A viruses can be found in birds. The avian flu currently of concern is the H5N1 subtype.

(iii) Avian Influenza in Birds

Wild birds worldwide carry avian influenza viruses in their intestines, but usually do not get sick from them. Avian influenza is very contagious among birds and can make some domesticated birds, including chickens, ducks, and turkeys, very sick and kill them.

Infected birds shed influenza virus in their saliva, nasal secretions, and feces. Domesticated birds may become infected with avian influenza virus through direct contact with infected waterfowl or other infected poultry, or through contact with surfaces (such as dirt or cages) or materials (such as water or feed) that have been contaminated with the virus.

Avian influenza infection in domestic poultry causes two main forms of disease that are distinguished by low and high extremes of virulence. The "low pathogenic" form may go undetected and usually causes only mild symptoms (such as ruffled feathers and a drop in egg production). However, the highly pathogenic form spreads more rapidly through flocks of poultry. This form may cause disease that affects multiple internal organs and has a mortality rate that can reach 90-100%, often within 48 hours. It is the highly pathogenic form of H5N1 that concerns scientists..

(iv) Human Infection with Avian Influenza Viruses

"Human influenza virus" usually refers to those subtypes that spread widely among humans. There are only four known A subtypes of influenza viruses (H1N1, H1N2, H3N2, and H7N2) currently circulating among humans. It is likely that some genetic parts of current human influenza A viruses originally came from birds. Influenza A viruses are constantly changing, and other strains might adapt over time to infect and spread among humans.

The risk from avian influenza is generally low to most people, because the viruses do not usually infect humans. H5N1 is one of the few avian influenza viruses to have crossed the species barrier to infect humans, and it is the most deadly of those that have crossed the barrier.

Most cases of H5N1 influenza infection in humans have resulted from contact with infected poultry (e.g., domesticated chicken, ducks, and turkeys) or surfaces contaminated with secretion/excretions from infected birds.

So far, the spread of H5N1 virus from person to person has been limited and has not continued beyond one person. Nonetheless, because all influenza viruses have the ability to change, scientists are concerned that H5N1 virus one day could be able to infect humans and spread easily from one person to another.

In the current outbreaks in Asia, Europe, and Africa, more than half of those infected with the H5N1 virus have died. Most cases have occurred in previously healthy children and young adults. However, it is possible that the only cases currently being reported are those in the most severely ill people, and that the full range of illness caused by the H5N1 virus has not yet been defined.

Symptoms of avian influenza in humans have ranged from typical human influenza-like symptoms (e.g., fever, cough, sore throat, and muscle aches) to eye infections, pneumonia, severe respiratory diseases (such as acute respiratory distress), and other severe and life-threatening complications. The symptoms of avian influenza may depend on which virus caused the infection.

Because these viruses do not commonly infect humans, there is little or no immune protection against them in the human population. If H5N1 virus were to gain the capacity to spread easily from person to person, a pandemic (worldwide outbreak of disease) could begin. No one can predict when a pandemic might occur. However, experts from around the world are watching the H5N1 situation very closely and are preparing for the possibility that the virus may begin to spread more easily and widely from person to person.

For the most current information about avian influenza and cumulative case numbers, see the world map on this site's home page.

For more information about human infection, see <http://www.cdc.gov/flu/avian/gen-info/avian-flu-humans.htm>

(v) Vaccination and Treatment for H5N1 Virus in Humans

There currently is no commercially available vaccine to protect humans against H5N1 virus that is being seen in Asia, Europe, and Africa. A vaccine specific to the virus strain causing the pandemic cannot be produced until a new pandemic influenza virus emerges and is identified.

The U.S. Department of Health and Human Services (HHS), through its National Institute of Allergy and Infectious Diseases (NIAID), is addressing the problem in a number of ways. These include:

- the development of pre-pandemic vaccines based on current lethal strains of H5N1 (The Food and Drug Administration has approved a vaccine based

on an early strain of the H5N1 virus that is not commercially available, but is being added to the Strategic National Stockpile.)

- collaboration with industry to increase the Nation's vaccine production capacity
- seeking ways to expand or extend the existing supply
- doing research in the development of new types of influenza vaccines.

Studies done in laboratories suggest that some of the prescription medicines approved in the United States for human influenza viruses should work in treating avian influenza infection in humans. However, influenza viruses can become resistant to these drugs, so these medications may not always work. Additional studies are needed to demonstrate the effectiveness of these medicines.

The H5N1 virus that has caused human illness and death in Asia is resistant to amantadine and rimantadine, two antiviral medications commonly used for influenza. Two other antiviral medications, oseltamavir and zanamavir, would probably work to treat influenza caused by H5N1 virus, but additional studies still need to be done to demonstrate their effectiveness.

For more information about H5N1 drug and vaccine development, see <http://www.pandemicflu.gov/vaccine/index.html>

(vi) What would be the Impact of a Pandemic?

A pandemic may come and go in waves, each of which can last for six to eight weeks.

An especially severe influenza pandemic could lead to high levels of illness, death, social disruption, and economic loss. Everyday life would be disrupted because so many people in so many places become seriously ill at the same time. Impacts can range from school and business closings to the interruption of basic services such as public transportation and food delivery.

A substantial percentage of the world's population will require some form of medical care. Health care facilities can be overwhelmed, creating a shortage of hospital staff, beds, ventilators and other supplies. Surge capacity at non-traditional sites such as schools may need to be created to cope with demand.

The need for vaccine is likely to outstrip supply and the supply of antiviral drugs is also likely to be inadequate early in a pandemic. Difficult decisions will need to be made regarding who gets antiviral drugs and vaccines.

Death rates are determined by four factors: the number of people who become infected, the virulence of the virus, the underlying characteristics and vulnerability of affected populations and the availability and effectiveness of preventive measures.

(vii) How are We Preparing?

The United States has been working closely with other countries and the World Health Organization (WHO) to strengthen systems to detect outbreaks of influenza that might cause a pandemic. See [Global Activities](#).

The effects of a pandemic can be lessened if preparations are made ahead of time. Planning and preparation information and checklists are being prepared for various sectors of society, including information for individuals and families. See [Planning & Response Activities](#).

HHS and other federal agencies are providing funding, advice, and other support to your state to assist with pandemic planning and preparation. Information on state/federal planning and cooperation, including links to state pandemic plans, is available on this site. See [State & Local Planning](#).

The federal government will provide up-to-date information and guidance to the public through the public media and this web site should an influenza pandemic unfold.

Factsheets

- [What is an Influenza Pandemic?](#)
Read what an influenza pandemic is and learn about its characteristics and challenges.
- [How Does Seasonal Flu Differ From Pandemic Flu?](#)
Pandemic flu should not be confused with seasonal flu. Learn the differences.
- [Avian Influenza \(Bird Flu\)](#)
Read this short fact sheet about bird flu.
- [Low-Pathogenicity H5N1 vs. High-Pathogenicity H5N1](#) (U.S. Department of Agriculture)
Find information on the differences between low-pathogenicity and high-pathogenicity H5N1.

Frequent Questions (FAQs)

- [Frequent Questions \(FAQs\)](#)
Find answers to questions about both avian and pandemic influenza, including vaccines and antivirals.

History of Pandemics

- **Timelines**

- [H5N1 Timeline \(PDF - 164 KB\)](#) (WHO)

View the above WHO timeline to see the progression and major activity of H5N1 in both animals and humans since 1996.

- [Timeline of Human Flu Pandemics](#) (National Institute of Allergy and Infectious Diseases)

See a chronology of significant dates in pandemic influenza history.

- **1918-1919 Influenza Epidemic**

- [The Great Pandemic: The United States in 1918-1919](#)
Learn about the 1918 pandemic, along with the Nation's health and medical system and how they were affected. Meet some people who fought the 1918 Influenza in the United States.
- [Pandemic Influenza Storybook](#)
Personal recollections of prior influenza pandemics, told by survivors, families, and friends.
- [The Deadly Virus: The Influenza Epidemic of 1918](#) (National Archives and Records Administration)

View archival documents and photos from the era of the Great Pandemic of 1918.

- [The Great Pandemic of 1918: State by State](#)
Read stories and anecdotes of the impact of the Great Pandemic in individual states.
- [Experts Say Further Review of 1918 Pandemic Studies Key to Influenza Preparedness](#) (National Institute of Allergy and Infectious Diseases)
Read why researchers are looking to the 1918 influenza pandemic to help further preparedness efforts today.
- [Pandemic Influenza--Past, Present, Future: Communicating Today Based on the Lessons from the 1918-1919 Influenza Pandemic](#)

([PDF - 1.72 MB](#))

These workshop proceedings provide a historical retrospective review of the impact of the 1918–1919 influenza pandemic. A panel of experts discuss how the 1918–1919 pandemic affected daily life in the United States, and what lessons can be learned and applied to planning today.

- [The American Experience, Influenza 1918](#) (Public Broadcasting Service)

Read the history of "the worst epidemic the U.S. has ever known"

- **Other Influenza Pandemics**

- [Pandemics and Pandemic Threats since 1900](#)
Learn about the three pandemics and several "pandemic threats" that have occurred.
- [Pandemic Influenza Storybook](#)
Personal recollections of prior influenza pandemics, told by survivors, families, and friends.
- [Influenza Pandemics of the 20th Century](#) (Centers for Disease Control and Prevention)

Pandemics with changes in hemagglutinin subtypes arise from genetic reassortment with animal influenza A viruses.

- [Swine Influenza A Outbreak, Fort Dix, New Jersey, 1976](#) (Centers for Disease Control and Prevention)

Find out how the Swine Influenza A Outbreak affected the health of the Fort Dix soldiers in 1976.

- [The Swine Flu Episode and the Fog of Epidemics](#) (Centers for Disease Control and Prevention)

Read about the lessons learned from previous epidemics.

Pandemic Flu / Avian Flu for Travelers

<http://www.cdc.gov/print.do?url=http%3A//wwwn.cdc.gov/travel/contentAvianFluQA.aspx>

This fact sheet provides general information about avian influenza (bird flu) and information about one type of bird flu, called avian influenza A (H5N1) which is causing infections in birds and humans.

- [What is bird flu \(avian influenza\)?](#)
- [Do avian influenza viruses infect humans?](#)
- [What are the symptoms of avian influenza in humans?](#)
- [Where is avian influenza occurring?](#)
- [Does CDC recommend travel restrictions to areas with known H5N1 outbreaks?](#)
- [Is there a risk of infection for people who travel to areas affected by avian influenza?](#)
- [What can I do to protect myself from avian influenza before and during travel?](#)
- [Can I get avian influenza from eating or preparing poultry or eggs?](#)
- [What should I do if I become sick when traveling abroad in an avian influenza-affected area?](#)
- [Should I see a doctor after I return from an area with avian influenza?](#)
- [What is pandemic flu?](#)
- [How will I know if the situation with avian influenza changes?](#)
- [Is there a risk in handling feather products that come from countries experiencing outbreaks of avian influenza A \(H5N1\)?](#)

(b) What is bird flu (avian influenza)?

Bird flu —avian influenza—is an infection caused by avian (bird) influenza (flu) viruses, such as influenza A (H5N1) subtype . Influenza A infection occurs mainly in wild birds worldwide, which carry the viruses in their intestines, but usually do not get sick from them. However, avian influenza is very contagious among birds and can make some domesticated birds, including chickens, ducks, and turkeys, very sick and kill them.

(c) Do avian influenza viruses infect humans?

Avian influenza viruses do not usually infect humans, but more than 200 confirmed cases of human infection with H5N1 viruses have occurred since 1997. Because of concerns about the potential for more widespread infection in the human population, public health authorities closely monitor outbreaks of human illness associated with avian influenza. The World Health Organization (WHO) maintains [situation updates](#) and [cumulative reports of human cases](#) of avian influenza A (H5N1).

(d) What are the symptoms of avian influenza in humans?

Symptoms of avian influenza in humans have ranged from typical human influenza-like symptoms (fever, cough, sore throat, and muscle aches) to eye infections, pneumonia, severe respiratory diseases (such as acute respiratory distress

syndrome), and other severe and life-threatening complications. The symptoms of avian influenza may depend on which specific virus subtype and strain caused the infection.

(e) Where is avian influenza occurring?

The avian influenza A (H5N1) epizootic (animal outbreak) is occurring in [parts of Asia, Europe, the Near East, and Africa](#). Human cases have been reported in some countries. Currently, H5N1 avian influenza has not been reported in the United States. See [update on avian influenza in animals](#) from the World Organization for Animal Health website. See the WHO website for the [cumulative reports of human cases](#) of avian influenza A (H5N1) and situation updates.

(f) Does CDC recommend travel restrictions to areas with known H5N1 outbreaks?

The Centers for Disease Control and Prevention (CDC) does not recommend any travel restrictions to affected countries at this time. However, CDC advises that travelers to countries with known outbreaks of H5N1 influenza avoid poultry farms, contact with animals in live food markets, and any surfaces that appear to be contaminated with feces from poultry or other animals. For more information, see [Human Infection with Avian Influenza A \(H5N1\) Virus Advice for travelers](#).

(g) Is there a risk of infection for people who travel to areas affected by avian influenza?

The risk from avian influenza is generally low to most people, because the viruses do not usually infect humans. During an outbreak of avian influenza among poultry, there is a possible risk to people who have contact with infected birds or surfaces that have been contaminated with secretions or excretions from infected birds. In addition, rare instances of probable human-to-human transmission associated with H5N1 viruses have occurred, most recently in a family cluster in Indonesia.

(h) What can I do to protect myself from avian influenza before and during travel?

(i) Before Travel

Prevention of illness during travel always begins with preparation before travel:

- Before you travel, be sure you are up to date with all your routine vaccinations (i.e., tetanus/diphtheria, polio, measles/mumps/rubella, and seasonal influenza vaccine if it is available), and see your doctor or health-care provider to get any additional vaccinations, medications, or information you may need.
- Assemble a [travel health kit](#) containing basic first aid and medical supplies.
- Visit CDC's Travelers' Health website at <http://www.cdc.gov/travel> to educate yourself and others who may be traveling with you about any disease risks and CDC health recommendations for international travel in the areas you plan to visit.

- Learn what medical services your health insurance will cover overseas, as well as any policy exclusions.
- Identify health-care resources in the country(ies) you will be visiting and resources for emergency medical evacuation, especially if your travel will be long-term or if you have an underlying medical condition.
- For informational purposes, [Travel Health Online](#) and the [International Society of Travel Medicine](#) (ISTM) provide lists of travel medicine health-care providers from around the world.
- A list of travel insurance and medical evacuation companies is available at the [U.S. Department of State](#) website. For more information, see [Seeking Health Care Abroad](#) in *Health Information for International Travel* .

(ii) During Travel

- During travel, avoid places where live birds, such as chickens, are raised or kept.
- Wash your hands often with soap and water to prevent disease transmission. If soap and water are not available, use an alcohol-based hand gel (containing at least 60% alcohol).
- Cover your mouth and nose with a tissue when you cough or sneeze, and encourage others to do the same.

For more information, see [Human Infection with Avian Influenza A \(H5N1\) Virus Advice for travelers](#).

(i) Can I get avian influenza from eating or preparing poultry or eggs?

You cannot get avian influenza from properly handled and cooked poultry and eggs.

Most cases of avian influenza infection in humans have resulted from direct or close contact with infected poultry or surfaces contaminated with secretions and excretions from infected birds. Even if poultry and eggs were to be contaminated with the virus, proper cooking would kill it.

(j) What should I do if I become sick when traveling abroad in an avian influenza-affected area?

- If you become sick with symptoms such as a fever accompanied by a cough, sore throat, or difficulty breathing, or if you develop any illness that requires prompt medical attention, a U.S. consular officer can assist you in locating medical services and informing your family or friends. See the [U.S. Department of State](#).
- Wear a mask if you are sick.
- Before you visit the doctor or clinic, inform your health-care provider of any possible exposures to avian influenza.
- Do not travel if you are sick except to seek local medical care.

See [Seeking Health Care Abroad](#) in *Health Information for International Travel* for more information about what to do if you become ill while abroad.

(k) Should I see a doctor after I return from an area with avian influenza?

After returning from an area affected by avian influenza, you should

- Pay close attention to your health for 10 days to check for symptoms of fever along with a cough, sore throat, or breathing problems.
- If you develop these symptoms, see a health-care provider. Before your visit, tell your doctor about your recent trip.
- Wear a mask if you are sick to prevent spreading infection to others.

(l) What is pandemic flu?

Pandemic flu is a contagious human flu that causes a global outbreak, or pandemic, of serious illness. Because there is little natural immunity, the disease can spread easily from person to person. Currently, there is no pandemic flu.

The public health threat of a pandemic arising from novel influenza subtypes such as influenza A (H5N1) virus will be greatly increased if the virus gains the ability to spread easily from one human to another.

(m) How will I know if the situation with avian influenza changes?

- Because the situation is evolving, stay abreast of any new developments by checking the [official U.S. government website for pandemic flu](#). The CDC [Travelers' Health website](#), [CDC Avian Influenza website](#), and the [WHO website](#) are also regularly updated.
- If you are abroad, the [U.S. Department of State website](#) provides information including travel warnings, emergencies, crisis awareness and preparedness, consular information, and special services. In addition, pay attention to any alerts or restrictions from local health authorities.

(n) Is there a risk in handling feather products that come from countries experiencing outbreaks of avian influenza A (H5N1)?

The U.S. government has determined that there is a risk to handling feather products from countries experiencing outbreaks of H5N1 influenza.

There is currently a ban on the importation of birds and bird products from H5N1-affected countries in Africa, Asia, and Europe. The [regulation](#) states that no person may import or attempt to import any birds (Class Aves), whether dead or alive, or any products derived from birds (including hatching eggs), from the specified countries (see [Embargo of Birds from Specified Countries](#)). This prohibition does not apply to any person who imports or attempts to import products derived from birds if, as determined by federal officials, such products have been properly processed to render them noninfectious so that they pose no risk of transmitting or carrying H5N1 and which comply with the U.S. Department of Agriculture (USDA) requirements. Therefore, feathers from these countries are banned unless they have been processed to render them noninfectious. Additional information about the import ban is available on the USDA website.

(o) For more information about avian influenza and travel, see:

[Human Infection with Avian Influenza A \(H5N1\) Virus
Advice for travelers](#)

[Interim Guidance about Avian Influenza A \(H5N1\) for U.S. Citizens Living Abroad](#)

**(p) For more information about pandemic influenza and avian influenza,
see**

[The CDC Avian Influenza website](#)

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Avoid Contact with Wild Animals

Basically, you and your pets need to avoid contact with rodents and other wild animals because they can carry some very deadly diseases. For example:

- Rodents can transmit hantavirus and plague.
- Ticks can transmit Rocky Mountain Spotted Fever and Lyme disease.
- Mammals such as raccoons, skunks, and foxes can transmit rabies. In fact, bats cause most of the human rabies cases in this country.

When are most wild animals active?

Most wild animals come out at night and are afraid of people. So, if you see a wild animal during the day, you should avoid having contact with it and notify animal control authorities because it may have rabies.

How can you discourage animals from nesting in your house?

- Keep your home clean.
- At night when insects, rodents and other animals search for food, keep tight-fitting lids on food containers and on the garbage containers.
- Discard any excess food and take up pet water bowls when not in use.

How can you discourage animals from entering your house?

The closer wild animals live to your house, the more likely they are to find a way inside.

- Eliminate any possible nesting sites and items that provide a water source.
- Seal entrances on the inside and the outside of your home because a mouse can squeeze through an opening as small as a dime.
- One pair of mice can produce over 15,000 offspring a year. You can keep rodent populations low by continually setting traps inside and outside your home.
- Keep baits and traps out of reach of children and pets.
- Natural predators also help control rodent populations in the wild.

What should you do if you find a dead animal?

- If you find a dead animal, spray it and any nesting materials with disinfectant before moving it. This reduces the risk of exposure to deadly viruses.
- Use protective measures when moving the carcass and dispose of the animal according to local regulations.
- Remember to wash your hands afterwards.
- If your home is infested with rodents, contact animal control authorities.

What precautions should you take against ticks and mosquitoes?

In wooded areas and high grass, take extra precautions against ticks and mosquitoes.

- It helps to wear light-colored clothing that covers as much exposed skin as possible.
- Use an insect repellent containing DEET.
- Carefully check yourself and your family for ticks. Use tweezers to remove them.

What should you do if you are bitten or scratched by a wild animal?

- Apply first aid treatment as quickly as possible, and
- Immediately notify your health care provider.

Wild animals can carry fatal diseases and we have to keep them out of our homes. But we also need to take certain precautions with those endearing pets that we enjoy close at hand.

<http://www.cdc.gov/ncidod/op/animals.htm>

Brucellosis

(Brucella melitensis, abortus, suis, and canis)

Frequently Asked Questions

- What is brucellosis?
- How common is brucellosis?
- Where is brucellosis usually found?
- How is brucellosis transmitted to humans, and who is likely to become infected?
- Can brucellosis be spread from person and person?
- Is there a way to prevent infection?
- My dog has been diagnosed with brucellosis. Is that a risk for me?
- How is brucellosis diagnosed?
- Is there a treatment for brucellosis?
- I am a veterinarian and I recently accidentally jabbed myself with the animal vaccine (RB-51 or B-19, or REV-1) while I was vaccinating cows (or sheep, goats). What do I need to do?

What is brucellosis?

Brucellosis is an infectious disease caused by the bacteria of the genus *Brucella*. These bacteria are primarily passed among animals, and they cause disease in many different vertebrates. Various *Brucella* species affect sheep, goats, cattle, deer, elk, pigs, dogs, and several other animals. Humans become infected by coming in contact with animals or animal products that are contaminated with these bacteria. In humans brucellosis can cause a range of symptoms that are similar to the flu and may include fever, sweats, headaches, back pains, and physical weakness. Severe infections of the central nervous systems or lining of the heart may occur. Brucellosis can also cause long-lasting or chronic symptoms that include recurrent fevers, joint pain, and fatigue.

How common is brucellosis?

Brucellosis is not very common in the United States, where 100 to 200 cases occur each year. But brucellosis can be very common in countries where animal disease control programs have not reduced the amount of disease among animals.

Where is brucellosis usually found?

Although brucellosis can be found worldwide, it is more common in countries that do not have good standardized and effective public health and domestic animal health programs. Areas currently listed as high risk are the Mediterranean Basin (Portugal, Spain, Southern France, Italy, Greece, Turkey, North Africa), South and Central America, Eastern Europe, Asia, Africa, the Caribbean, and the Middle East. Unpasteurized cheeses, sometimes called "village cheeses," from these areas may represent a particular risk for tourists.

How is brucellosis transmitted to humans, and who is likely to become infected?

Humans are generally infected in one of three ways: eating or drinking something that is contaminated with *Brucella*, breathing in the organism (inhalation), or having the bacteria enter the body through skin wounds. The most common way to be infected is by eating or drinking contaminated milk products. When sheep, goats, cows, or camels are infected, their milk is contaminated with the bacteria. If the milk is not pasteurized, these bacteria can be transmitted to persons who drink the milk or eat cheeses made it. Inhalation of *Brucella* organisms is not a common route of infection, but it can be a significant hazard for people in certain occupations, such as those working in laboratories where the organism is cultured. Inhalation is often responsible for a significant percentage of cases in abattoir employees. Contamination of skin wounds may be a problem for persons working in slaughterhouses or meat packing plants or for veterinarians. Hunters may be infected through skin wounds or by accidentally ingesting the bacteria after cleaning deer, elk, moose, or wild pigs that they have killed.

Can brucellosis be spread from person to person?

Direct person-to-person spread of brucellosis is extremely rare. Mothers who are breast-feeding may transmit the infection to their infants. Sexual transmission has also been reported. For both sexual and breast-feeding transmission, if the infant or person at risk is treated for brucellosis, their risk of becoming infected will probably be eliminated within 3 days. Although uncommon, transmission may also occur via contaminated tissue transplantation.

Is there a way to prevent infection?

Yes. Do not consume unpasteurized milk, cheese, or ice cream while traveling. If you are not sure that the dairy product is pasteurized, don't eat it. Hunters and animal herdsman should use rubber gloves when handling viscera of animals. There is no vaccine available for humans.

My dog has been diagnosed with brucellosis. Is that a risk for me?

B. canis is the species of *Brucella* species that can infect dogs. This species has occasionally been transmitted to humans, but the vast majority of dog infections do not result in human illness. Although veterinarians exposed to blood of infected animals are at risk, pet owners are not considered to be at risk for infection. This is partly because it is unlikely that they will come in contact with blood, semen, or placenta of the dog. The bacteria may be cleared from the animal within a few days of treatment; however re-infection is common and some animal body fluids may be infectious for weeks. Immunocompromised persons (cancer patients, HIV-infected individuals, or transplantation patients) should not handle dogs known to be infected with *B. canis*.

How is brucellosis diagnosed?

Brucellosis is diagnosed in a laboratory by finding *Brucella* organisms in samples of blood or bone marrow. Also, blood tests can be done to detect antibodies against the bacteria. If this method is used, two blood samples should be collected 2 weeks apart.

Is there a treatment for brucellosis?

Yes, but treatment can be difficult. Doctors can prescribe effective antibiotics. Usually, doxycycline and rifampin are used in combination for 6 weeks to prevent reoccurring infection. Depending on the timing of treatment and severity of illness, recovery may take a few weeks to several months. Mortality is low (<2%), and is usually associated with endocarditis.

I am a veterinarian, and I recently accidentally jabbed myself with the animal vaccine (RB-51 or B-19, or REV-1) while I was vaccinating cows (or sheep, goats). What do I need to do?

These are live vaccines, and B-19 is known to cause disease in humans. Although we know less about the other vaccines, the recommendations are the same. You should see a health care provider. A baseline blood sample should be collected for testing for antibodies. We recommend that you take antibiotics (doxycycline and rifampin for B-19 and REV-1, or doxycycline alone for RB-51) for 3 weeks. At the end of that time you should be rechecked and a second blood sample should be collected. (The sample can also be collected at 2 weeks.) The same recommendations hold true for spraying vaccine in the eyes (6 weeks of treatment in this case) or spraying onto open wounds on the skin.

http://www.cdc.gov/ncidod/dbmd/diseaseinfo/brucellosis_g.htm

Cat Scratch Disease

(*Bartonella henselae* Infection)

What is cat scratch disease?

Cat scratch disease (CSD) is a bacterial disease caused by *Bartonella henselae*. Most people with CSD have been bitten or scratched by a cat and developed a mild infection at the point of injury. Lymph nodes, especially those around the head, neck, and upper limbs, become swollen. Additionally, a person with CSD may experience fever, headache, fatigue, and a poor appetite. Rare complications of *B. henselae* infection are bacillary angiomatosis and Parinaud's oculolabial syndrome.

Can my cat transmit *Bartonella henselae* to me?

Sometimes, yes, cats can spread *B. henselae* to people. Most people get CSD from cat bites and scratches. Kittens are more likely to be infected and to pass the bacterium to people. About 40% of cats carry *B. henselae* at some time in their lives. Cats that carry *B. henselae* do not show any signs of illness; therefore, you cannot tell which cats can spread the disease to you. People with immunocompromised conditions, such as those undergoing immunosuppressive treatments for cancer, organ transplant patients, and people with HIV/AIDS, are more likely than others to have complications of CSD. Although *B. henselae* has been found in fleas, so far there is no evidence that a bite from an infected flea can give you CSD.

How can I reduce my risk of getting cat scratch disease from my cat?

- Avoid "rough play" with cats, especially kittens. This includes any activity that may lead to cat scratches and bites.
- Wash cat bites and scratches immediately and thoroughly with running water and soap.
- Do not allow cats to lick open wounds that you may have.
- Control fleas.
- If you develop an infection (with pus and pronounced swelling) where you were scratched or bitten by a cat or develop symptoms, including fever, headache, swollen lymph nodes, and fatigue, contact your physician.

<http://www.cdc.gov/healthypets/diseases/catscratch.htm>

Psittacosis

Clinical Features

In humans, fever, chills, headache, muscle aches, and a dry cough. Pneumonia is often evident on chest x-ray.

Etiologic Agent

Chlamydia psittaci, a bacterium

Incidence

Since 1996, fewer than 50 confirmed cases were reported in the United States each year. Many more cases may occur that are not correctly diagnosed or reported.

Sequelae

Endocarditis, hepatitis, and neurologic complications may occasionally occur. Severe pneumonia requiring intensive-care support may also occur. Fatal cases have been reported.

Transmission

Infection is acquired by inhaling dried secretions from infected birds. The incubation period is 6 to 19 days. Although all birds are susceptible, pet birds (parrots, parakeets, macaws, and cockatiels) and poultry (turkeys and ducks) are most frequently involved in transmission to humans.

Risk Groups

Bird owners, pet shop employees, and veterinarians. Outbreaks of psittacosis in poultry processing plants have been reported.

Surveillance

Psittacosis is a reportable condition in most states.

Trends

Annual incidence varies considerably because of periodic outbreaks. A decline in reported cases since 1988 may be the result of improved diagnostic tests that distinguish *C.psittaci* from more common *C. pneumoniae* infections.

Challenges

Diagnosis of psittacosis can be difficult. Antibiotic treatment may prevent an antibody response, thus limiting diagnosis by serologic methods. Infected birds are often asymptomatic. Tracebacks of infected birds to distributors and breeders often is not possible because of limited regulation of the pet bird industry.

Opportunities

Characterize new and rapid diagnostic tests for human and avian psittacosis, and determine value of screening flocks for avian psittacosis to prevent human infection.

http://www.cdc.gov/ncidod/dbmd/diseaseinfo/psittacosis_t.htm

Q fever

- Overview of the disease
- Signs and Symptoms in Humans
- Diagnosis
- Treatment
- Prevention
- Significance for Bioterrorism

Overview

Q fever is a zoonotic disease caused by *Coxiella burnetii*, a species of bacteria that is distributed globally. In 1999, Q fever became a notifiable disease in the United States but reporting is not required in many other countries. Because the disease is underreported, scientists cannot reliably assess how many cases of Q fever have actually occurred worldwide. Many human infections are inapparent.

Cattle, sheep, and goats are the primary reservoirs of *C. burnetii*. Infection has been noted in a wide variety of other animals, including other breeds of livestock and in domesticated pets. *Coxiella burnetii* does not usually cause clinical disease in these animals, although abortion in goats and sheep has been linked to *C. burnetii* infection. Organisms are excreted in milk, urine, and feces of infected animals. Most importantly, during birthing the organisms are shed in high numbers within the amniotic fluids and the placenta. The organisms are resistant to heat, drying, and many common disinfectants. These features enable the bacteria to survive for long periods in the environment. Infection of humans usually occurs by inhalation of these organisms from air that contains airborne barnyard dust contaminated by dried placental material, birth fluids, and excreta of infected herd animals. Humans are often very susceptible to the disease, and very few organisms may be required to cause infection.

Ingestion of contaminated milk, followed by regurgitation and inspiration of the contaminated food, is a less common mode of transmission. Other modes of transmission to humans, including tick bites and human to human transmission, are rare.

Signs and Symptoms in Humans

Only about one-half of all people infected with *C. burnetii* show signs of clinical illness. Most acute cases of Q fever begin with sudden onset of one or more of the following: high fevers (up to 104-105° F), severe headache, general malaise, myalgia, confusion, sore throat, chills, sweats, non-productive cough, nausea, vomiting, diarrhea, abdominal pain, and chest pain. Fever usually lasts for 1 to 2 weeks. Weight loss can occur and persist for some time. Thirty to fifty percent of patients with a symptomatic infection will develop pneumonia. Additionally, a majority of patients have abnormal results on liver function tests and some will develop hepatitis. In general, most patients will recover to good health within several months without any treatment. Only 1%-2% of people with acute Q fever die of the disease.

Chronic Q fever, characterized by infection that persists for more than 6 months is uncommon but is a much more serious disease. Patients who have had acute Q fever may develop the chronic form as soon as 1 year or as long as 20 years after initial infection. A serious complication of chronic Q fever is endocarditis, generally involving the aortic heart valves, less commonly the mitral valve. Most patients who develop chronic Q fever have pre-existing valvular heart disease or have a history of vascular graft. Transplant recipients, patients with cancer, and those with chronic kidney disease are also at risk of developing chronic Q fever. As many as 65% of persons with chronic Q fever may die of the disease.

The incubation period for Q fever varies depending on the number of organisms that initially infect the patient. Infection with greater numbers of organisms will result in shorter incubation periods. Most patients become ill within 2-3 weeks after exposure. Those who recover fully from infection may possess lifelong immunity against re-infection.

Diagnosis

Because the signs and symptoms of Q fever are not specific to this disease, it is difficult to make an accurate diagnosis without appropriate laboratory testing. Results from some types of routine laboratory tests in the appropriate clinical and epidemiologic settings may suggest a diagnosis of Q fever. For example, a platelet count may be suggestive because persons with Q fever may show a transient thrombocytopenia. Confirming a diagnosis of Q fever requires serologic testing to detect the presence of antibodies to *Coxiella burnetii* antigens. In most laboratories, the indirect immunofluorescence assay (IFA) is the most dependable and widely used method. *Coxiella burnetii* may also be identified in infected tissues by using immunohistochemical staining and DNA detection methods.

Coxiella burnetii exists in two antigenic phases called phase I and phase II. This antigenic difference is important in diagnosis. In acute cases of Q fever, the antibody level to phase II is usually higher than that to phase I, often by several orders of magnitude, and generally is first detected during the second week of illness. In chronic Q fever, the reverse situation is true. Antibodies to phase I antigens of *C. burnetii* generally require longer to appear and indicate continued exposure to the bacteria. Thus, high levels of antibody to phase I in later specimens in combination with constant or falling levels of phase II antibodies and other signs of inflammatory disease suggest chronic Q fever. Antibodies to phase I and II antigens have been known to persist for months or years after initial infection.

Recent studies have shown that greater accuracy in the diagnosis of Q fever can be achieved by looking at specific levels of classes of antibodies other than IgG, namely IgA and IgM. Combined detection of IgM and IgA in addition to IgG improves the specificity of the assays and provides better accuracy in diagnosis. IgM levels are helpful in the determination of a recent infection. In acute Q fever, patients will have IgG antibodies to phase II and IgM antibodies to phases I and II. Increased IgG and IgA antibodies to phase I are often indicative of Q fever endocarditis.

Treatment

Doxycycline is the treatment of choice for acute Q fever. Antibiotic treatment is most effective when initiated within the first 3 days of illness. A dose of 100 mg of

doxycycline taken orally twice daily for 15-21 days is a frequently prescribed therapy. Quinolone antibiotics have demonstrated good in vitro activity against *C. burnetii* and may be considered by the physician. Therapy should be started again if the disease relapses.

Chronic Q fever endocarditis is much more difficult to treat effectively and often requires the use of multiple drugs. Two different treatment protocols have been evaluated: 1) doxycycline in combination with quinolones for at least 4 years and 2) doxycycline in combination with hydroxychloroquine for 1.5 to 3 years. The second therapy leads to fewer relapses, but requires routine eye exams to detect accumulation of chloroquine. Surgery to remove damaged valves may be required for some cases of *C. burnetii* endocarditis.

Prevention

In the United States, Q fever outbreaks have resulted mainly from occupational exposure involving veterinarians, meat processing plant workers, sheep and dairy workers, livestock farmers, and researchers at facilities housing sheep. Prevention and control efforts should be directed primarily toward these groups and environments.

The following measures should be used in the prevention and control of Q fever:

- Educate the public on sources of infection.
- Appropriately dispose of placenta, birth products, fetal membranes, and aborted fetuses at facilities housing sheep and goats.
- Restrict access to barns and laboratories used in housing potentially infected animals.
- Use only pasteurized milk and milk products.
- Use appropriate procedures for bagging, autoclaving, and washing of laboratory clothing.
- Vaccinate (where possible) individuals engaged in research with pregnant sheep or live *C. burnetii*.
- Quarantine imported animals.
- Ensure that holding facilities for sheep should be located away from populated areas. Animals should be routinely tested for antibodies to *C. burnetii*, and measures should be implemented to prevent airflow to other occupied areas.
- Counsel persons at highest risk for developing chronic Q fever, especially persons with pre-existing cardiac valvular disease or individuals with vascular grafts.

A vaccine for Q fever has been developed and has successfully protected humans in occupational settings in Australia. However, this vaccine is not commercially available in the United States. Persons wishing to be vaccinated should first have a skin test to determine a history of previous exposure. Individuals who have previously been exposed to *C. burnetii* should not receive the vaccine because severe reactions, localized to the area of the injected vaccine, may occur. A vaccine for use in animals has also been developed, but it is not available in the United States.

Significance for Bioterrorism

Coxiella burnetii is a highly infectious agent that is rather resistant to heat and drying. It can become airborne and inhaled by humans. A single *C. burnetii* organism may cause disease in a susceptible person. This agent could be developed for use in biological warfare and is considered a potential terrorist threat.

<http://www.cdc.gov/ncidod/dvrd/qfever/index.htm>

Rabies

Pets

- How can I protect my pet from rabies?
- Why does my pet need the rabies vaccine?
- What happens if a neighborhood cat bites me?
- What happens if my pet (cat, dog, ferret) is bitten by a wild animal?
- I am moving to a rabies-free country and want to take my pets with me. Where can I get more information?

Human rabies

- How do people get rabies?
- Can I get rabies in any way other than an animal bite?
- How soon after an exposure should I seek medical attention?
- What medical attention do I need if I am exposed to rabies?
- Will the rabies vaccine make me sick?
- What if I cannot get rabies vaccine on the day I am supposed to get my next dose?
- Can rabies be transmitted from one person to another?

Wild animals

- What animals get rabies?
- How can I find out what animals have rabies in my area?
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Bats and rabies

- Do bats get rabies?
- What should I do if I come in contact with a bat?
- What should I do if I find a bat in my home?
- How can I tell if a bat has rabies?

Travel

- Should I be concerned about rabies when I travel outside the United States?
- Should I receive rabies preexposure prophylaxis before traveling to other countries?
- If I get preexposure vaccination before I travel, am I protected if I am bitten?
- I am moving to a rabies-free country and want to take my pets with me. Where can I get more information?

Pets

How can I protect my pet from rabies?

There are several things you can do to protect your pet from rabies. First, visit your veterinarian with your pet on a regular basis and keep rabies vaccinations up-to-date for all cats, ferrets, and dogs. Second, maintain control of your pets by keeping cats

and ferrets indoors and keeping dogs under direct supervision. Third, spay or neuter your pets to help reduce the number of unwanted pets that may not be properly cared for or vaccinated regularly. Lastly, call animal control to remove all stray animals from your neighborhood since these animals may be unvaccinated or ill.

Why does my pet need the rabies vaccine?

Although the majority of rabies cases occur in wildlife, most humans are given rabies vaccine as a result of exposure to domestic animals. This explains the tremendous cost of rabies prevention in domestic animals in the United States. While wildlife are more likely to be rabid than are domestic animals in the United States, the amount of human contact with domestic animals greatly exceeds the amount of contact with wildlife. Your pets and other domestic animals can be infected when they are bitten by rabid wild animals. When "spillover" rabies occurs in domestic animals, the risk to humans is increased. Pets are therefore vaccinated by your veterinarian to prevent them from acquiring the disease from wildlife, and thereby transmitting it to humans

What happens if a neighborhood cat bites me?

You should seek medical evaluation for any animal bite. However, rabies is uncommon in dogs, cats, and ferrets in the United States. Very few bites by these animals carry a risk of rabies. If the cat (or dog or ferret) appeared healthy at the time you were bitten, it can be confined by its owner for 10 days and observed. No anti-rabies prophylaxis is needed. No person in the United States has ever contracted rabies from a dog, cat or ferret held in quarantine for 10 days.

If a dog, cat, or ferret appeared ill at the time it bit you or becomes ill during the 10 day quarantine, it should be evaluated by a veterinarian for signs of rabies and you should seek medical advice about the need for anti-rabies prophylaxis.

The quarantine period is a precaution against the remote possibility that an animal may appear healthy, but actually be sick with rabies. To understand this statement, you have to understand a few things about the pathogenesis of rabies (the way the rabies virus affects the animal it infects). From numerous studies conducted on rabid dogs, cats, and ferrets, we know that rabies virus inoculated into a muscle travels from the site of the inoculation to the brain by moving within nerves. The animal does not appear ill during this time, which is called the incubation period and which may last for weeks to months. A bite by the animal during the incubation period does not carry a risk of rabies because the virus is not in saliva. Only late in the disease, after the virus has reached the brain and multiplied there to cause an encephalitis (or inflammation of the brain), does the virus move from the brain to the salivary glands and saliva. Also at this time, after the virus has multiplied in the brain, almost all animals begin to show the first signs of rabies. Most of these signs are obvious to even an untrained observer, but within a short period of time, usually within 3 to 5 days, the virus has caused enough damage to the brain that the animal begins to show unmistakable signs of rabies. As an added precaution, the quarantine period is lengthened to 10 days.

What happens if my pet (cat, dog, ferret) is bitten by a wild animal?

Any animal bitten or scratched by either a wild, carnivorous mammal or a bat that is not available for testing should be regarded as having been exposed to rabies.

Unvaccinated dogs, cats, and ferrets exposed to a rabid animal should be euthanized immediately. If the owner is unwilling to have this done, the animal should be placed in strict isolation for 6 months and vaccinated 1 month before being released. Animals with expired vaccinations need to be evaluated on a case-by-case basis. Dogs and cats that are currently vaccinated are kept under observation for 45 days.

I am moving to a rabies-free country and want to take my pets with me. Where can I get more information?

The details of regulation about importing pets into rabies-free countries vary by country. Check with the embassy of your destination country.

Human Rabies

How do people get rabies?

People usually get rabies from the bite of a rabid animal. It is also possible, but quite rare, that people may get rabies if infectious material from a rabid animal, such as saliva, gets directly into their eyes, nose, mouth, or a wound.

Can I get rabies in any way other than an animal bite?

Non-bite exposures to rabies are very rare. Scratches, abrasions, open wounds, or mucous membranes contaminated with saliva or other potentially infectious material (such as brain tissue) from a rabid animal constitute non-bite exposures. Occasionally reports of non-bite exposure are such that postexposure prophylaxis is given.

Inhalation of aerosolized rabies virus is also a potential non-bite route of exposure, but other than laboratory workers, most people are unlikely to encounter an aerosol of rabies virus.

Other contact, such as petting a rabid animal or contact with the blood, urine or feces (e.g., guano) of a rabid animal, does not constitute an exposure and is not an indication for prophylaxis.

How soon after an exposure should I seek medical attention?

Medical assistance should be obtained as soon as possible after an exposure. There have been no vaccine failures in the United States (i.e., someone developed rabies) when postexposure prophylaxis (PEP) was given promptly and appropriately after an exposure.

What medical attention do I need if I am exposed to rabies?

One of the most effective methods to decrease the chances for infection involves thorough washing of the wound with soap and water. Specific medical attention for someone exposed to rabies is called postexposure prophylaxis or PEP. In the United States, postexposure prophylaxis consists of a regimen of one dose of immune globulin and five doses of rabies vaccine over a 28-day period. Rabies immune globulin and the first dose of rabies vaccine should be given by your health care

provider as soon as possible after exposure. Additional doses of rabies vaccine should be given on days 3, 7, 14, and 28 after the first vaccination. Current vaccines are relatively painless and are given in your arm, like a flu or tetanus vaccine.

Will the rabies vaccine make me sick?

Adverse reactions to rabies vaccine and immune globulin are not common. Newer vaccines in use today cause fewer adverse reactions than previously available vaccines. Mild, local reactions to the rabies vaccine, such as pain, redness, swelling, or itching at the injection site, have been reported. Rarely, symptoms such as headache, nausea, abdominal pain, muscle aches, and dizziness have been reported. Local pain and low-grade fever may follow injection of rabies immune globulin.

What if I cannot get rabies vaccine on the day I am supposed to get my next dose?

Consult with your doctor or state or local public health officials for recommended times if there is going to be a change in the recommended schedule of shots. Rabies prevention is a serious matter and changes should not be made in the schedule of doses.

Can rabies be transmitted from one person to another?

The only documented cases of rabies caused by human-to-human transmission occurred among 8 recipients of transplanted corneas. Investigations revealed each of the donors had died of an illness compatible with or proven to be rabies. The 8 cases occurred in 5 countries: Thailand (2 cases), India (2 cases), Iran (2 cases), the United States (1 case), and France (1 case). Stringent guidelines for acceptance of donor corneas have reduced this risk.

In addition to transmission from corneal transplants, bite and non-bite exposures inflicted by infected humans could theoretically transmit rabies, but no such cases have been documented. Casual contact, such as touching a person with rabies or contact with non-infectious fluid or tissue (urine, blood, feces) does not constitute an exposure and does not require postexposure prophylaxis. In addition, contact with someone who is receiving rabies vaccination does not constitute rabies exposure and does not require postexposure prophylaxis.

Wild Animals

What animals get rabies?

Any mammal can get rabies. The most common wild reservoirs of rabies are raccoons, skunks, bats, foxes, and coyotes. Domestic mammals can also get rabies. Cats, cattle, and dogs are the most frequently reported rabid domestic animals in the United States.

How can I find out what animals have rabies in my area?

Each state collects specific information about rabies, and is the best source for information on rabies in your area. In addition, the CDC publishes rabies surveillance data every year for the United States. The report, entitled Rabies Surveillance in the United States, contains information about the number of cases of rabies reported to CDC during the year, the animals reported rabid, maps showing where cases were reported for wild and domestic animals, and distribution maps showing outbreaks of rabies associated with specific animals. A summary of the report can be found in the Epidemiology section of this web site.

What is the risk of rabies from squirrels, mice, rats, and other rodents?

Small rodents (such as squirrels, rats, mice, hamsters, guinea pigs, gerbils, and chipmunks,) and lagomorphs (such as rabbits and hares) are almost never found to be infected with rabies and have not been known to cause rabies among humans in the United States. Bites by these animals are usually not considered a risk of rabies unless the animal was sick or behaving in any unusual manner and rabies is widespread in your area. However, from 1985 through 1994, woodchucks accounted for 86% of the 368 cases of rabies among rodents reported to CDC. Woodchucks or groundhogs (*Marmota monax*) are the only rodents that may be frequently submitted to state health department because of a suspicion of rabies. In all cases involving rodents, the state or local health department should be consulted before a decision is made to initiate postexposure prophylaxis (PEP).

Bats and Rabies

Do bats get rabies?

Yes. Bats are mammals and are susceptible to rabies, but most do not have the disease. You cannot tell if a bat has rabies just by looking at it; rabies can be confirmed only by having the animal tested in a laboratory. To minimize the risk for rabies, it is best never to handle any bat.

What should I do if I come in contact with a bat?

If you are bitten by a bat -- or if infectious material (such as saliva) from a bat gets into your eyes, nose, mouth, or a wound -- wash the affected area thoroughly and get medical attention immediately. Whenever possible, the bat should be captured and sent to a laboratory for rabies testing.

People usually know when they have been bitten by a bat. However, because bats have small teeth which may leave marks that are not easily seen, there are situations in which you should seek medical advice even in the absence of an obvious bite wound. For example, if you awaken and find a bat in your room, see a bat in the room of an unattended child, or see a bat near a mentally impaired or intoxicated person, seek medical advice and have the bat tested.

People cannot get rabies just from seeing a bat in an attic, in a cave, or at a distance. In addition, people cannot get rabies from having contact with bat guano

(feces), blood, or urine, or from touching a bat on its fur (even though bats should never be handled!).

What should I do if I find a bat in my home?

If you see a bat in your home and you are sure no human or pet exposure has occurred, confine the bat to a room by closing all doors and windows leading out of the room except those to the outside. The bat will probably leave soon. If not, it can be caught, as described below, and released outdoors away from people and pets.

However, if there is any question of exposure, leave the bat alone and call animal control or a wildlife conservation agency for assistance. If professional assistance is unavailable, use precautions to capture the bat safely, as described below.

What you will need:

- leather work gloves (put them on)
- small box or coffee can
- piece of cardboard
- tape

When the bat lands, approach it slowly and place a box or coffee can over it. Slide the cardboard under the container to trap the bat inside. Tape the cardboard to the container securely. Contact your health department or animal control authority to make arrangements for rabies testing.

How can I tell if a bat has rabies?

Rabies can be confirmed only in a laboratory. However, any bat that is active by day, is found in a place where bats are not usually seen (for example in rooms in your home or on the lawn), or is unable to fly, is far more likely than others to be rabid. Such bats are often the most easily approached. Therefore, it is best never to handle any bat.

Travel

Should I be concerned about rabies when I travel outside the United States?

Yes. Rabies and the rabies-like viruses can occur in animals anywhere in the world. In most countries, the risk of rabies in an encounter with an animal and the precautions necessary to prevent rabies are the same as they are in the United States. When traveling, it is always prudent to avoid approaching any wild or domestic animal.

The developing countries in Africa, Asia, and Latin America have additional problems in that dog rabies is common there and preventive treatment for human rabies may be difficult to obtain. The importance of rabid dogs in these countries, where tens of thousands of people die of the disease each year, cannot be overstated. Unlike programs in developed countries, dog rabies vaccination programs in developing countries have not always been successful. Rates of postexposure prophylaxis in some developing countries are about 10 times higher than in the United States, and

rates of human rabies are sometimes 100 times higher. Before traveling abroad, consult a health care provider, travel clinic, or health department about your risk of exposure to rabies and how to handle an exposure should it arise.

Should I receive rabies preexposure vaccination before traveling to other countries?

In most countries, the risk of rabies and the precautions for preventing rabies are the same as they are in the United States. However, in some developing countries in Africa, Asia, and Latin America, dog rabies may be common and preventive treatment for rabies may be difficult to obtain. If you are traveling to a rabies-endemic country, you should consult your health care provider about the possibility of receiving preexposure vaccination against rabies. Preexposure vaccination is suggested if:

1. Your planned activity will bring you into contact with wild or domestic animals (for example, biologists, veterinarians, or agriculture specialists working with animals).
2. You will be visiting remote areas where medical care is difficult to obtain or may be delayed (for example, hiking through remote villages where dogs are common).
3. Your stay is longer than 1 month in an area where dog rabies is common (the longer you stay, the greater the chance of an encounter with an animal).

If I get preexposure vaccination before I travel, am I protected if I am bitten?

No. Preexposure prophylaxis is given for several reasons. First, although preexposure vaccination does not eliminate the need for additional therapy after a rabies exposure, it simplifies therapy by eliminating the need for human rabies immune globulin (HRIG) and decreasing the number of doses needed – a point of particular importance for persons at high risk of being exposed to rabies in areas where immunizing products may not be readily available. Second, it may protect persons whose postexposure therapy might be delayed. Finally, it may provide partial protection to persons with inapparent exposures to rabies.

<http://www.cdc.gov/ncidod/dvrd/rabies/Ques&Ans/q&a.htm>

Ringworm and Animals

What is ringworm?

Ringworm is a skin and scalp disease caused by several different kinds of fungi. Ringworm on the scalp usually makes a bald patch of scaly skin. People with ringworm on other parts of their skin can have a ring-shaped rash that is reddish and may be itchy. The rash can be dry and scaly or wet and crusty.

Can animals transmit ringworm to me?

Yes, many different kinds of animals can transmit ringworm to people. Ringworm is transmitted from direct contact with an infected animal's skin or hair. Dogs and cats, especially kittens or puppies, can have ringworm that can be passed to people. Cows, goats, pigs, and horses can pass ringworm to people too. People can also get ringworm from other people and their personal items.

How can I find out more about ringworm?

Learn more about ringworm from CDC's Web page describing how to prevent ringworm in childcare settings.

<http://www.cdc.gov/healthypets/diseases/ringworm.htm>

Tularemia

What is tularemia?

Tularemia is an infectious disease caused by a hardy bacterium, *Francisella tularensis*, found in animals (especially rodents, rabbits, and hares).

How do people become infected with the tularemia bacteria?

Typically, persons become infected through the bites of arthropods (most commonly, ticks and deerflies) that have fed on an infected animal, by handling infected animal carcasses, by eating or drinking contaminated food or water, or by inhaling infected aerosols. **Does tularemia occur naturally in the United States?**

Yes. It is a widespread disease of animals. Approximately 200 cases of tularemia in humans are reported annually in the United States, mostly in persons living in the south-central and western states. Nearly all cases occur in rural areas and are associated with the bites of infective ticks and biting flies or with the handling of infected rodents, rabbits, or hares. Occasional cases result from inhaling infectious aerosols and from laboratory accidents.

Why are we concerned about tularemia as a bio-weapon?

Francisella tularensis is highly infectious: a small number of bacteria (10-50 organisms) can cause disease. If *F. tularensis* were used as a bio-weapon, the bacteria would likely be made airborne for exposure by inhalation. Persons who inhale an infectious aerosol would generally experience severe respiratory illness, including life-threatening pneumonia and systemic infection, if they were not treated. The bacteria that cause tularemia occur widely in nature and could be isolated and grown in quantity in a laboratory, although manufacturing an effective aerosol weapon would require considerable sophistication.

Can someone become infected with the tularemia bacteria from another person?

No. People have not been known to transmit the infection to others, so infected persons do not need to be isolated.

How quickly would someone become sick if they were exposed to the tularemia bacteria?

The incubation period for tularemia is typically 3 to 5 days, with a range of 1 to 14 days.

What are the signs and symptoms of tularemia?

Depending on the route of exposure, the tularemia bacteria may cause skin ulcers, swollen and painful lymph glands, inflamed eyes, sore throat, oral ulcers, or pneumonia. If the bacteria were inhaled, symptoms would include the abrupt onset of fever, chills, headache, muscle aches, joint pain, dry cough, and progressive weakness. Persons with pneumonia can develop chest pain, difficulty breathing,

bloody sputum, and respiratory failure. 40% or more of persons with the lung and systemic forms of the disease may die if they are not treated with appropriate antibiotics.

What should someone do if they suspect they or others have been exposed to the tularemia bacteria?

Seek prompt medical attention. If a person has been exposed to *Francisella tularensis*, treatment with tetracycline antibiotics for 14 days after exposure may be recommended.

Local and state health departments should be immediately notified so an investigation and control activities can begin quickly. If the exposure is thought to be due to criminal activity (bioterrorism), local and state health departments will notify CDC, the FBI, and other appropriate authorities.

How is tularemia diagnosed?

When tularemia is clinically suspected, the healthcare worker will collect specimens, such as blood or sputum, from the patient for testing in a diagnostic or reference laboratory. Laboratory test results for tularemia may be presumptive or confirmatory.

Presumptive (preliminary) identification may take less than 2 hours, but confirmatory testing will take longer, usually 24 to 48 hours.

Can tularemia be effectively treated with antibiotics?

Yes. After potential exposure or diagnosis, early treatment is recommended with an antibiotic from the tetracycline (such as doxycycline) or fluoroquinolone (such as ciprofloxacin) class, which are taken orally, or the antibiotics streptomycin or gentamicin, which are given intramuscularly or intravenously. Sensitivity testing of the tularemia bacterium can be done in the early stages of a response to determine which antibiotics would be most effective.

How long can *Francisella tularensis* exist in the environment?

Francisella tularensis can remain alive for weeks in water and soil.

Is there a vaccine available for tularemia?

In the past, a vaccine for tularemia has been used to protect laboratory workers, but it is currently under review by the Food and Drug Administration. <http://www.bt.cdc.gov/agent/tularemia/faq.asp>

Healthy Pets – Healthy People

<http://www.cdc.gov/healthypets/>

Pets provide many benefits to humans. They comfort us and they give us companionship. However, some animals can also pass diseases to people. These diseases are called zoonoses.

Although animals can carry germs, it is important to know that you are more likely to get some of these germs from contaminated food or water than from your pet or another animal you encounter. CDC has created this Web site to provide you with information about the health-related risks of owning and caring for animals. We encourage you to follow the links located throughout this Web site for general information about companion and wild animals and the diseases they can carry.

Many groups encourage people to enjoy the benefits of common household pets. By following CDC's simple tips on the Healthy Pets, Healthy People Web site, you can enjoy your pets while protecting yourself against diseases they carry.

Because wild animals can carry diseases that are dangerous to people, CDC discourages direct contact with wildlife. You should never adopt wild animals as pets or bring them home. Teach children never to handle unfamiliar animals, wild or domestic, even if the animals appears to be friendly.

What's Inside?

[Browse by Animal](#)

Can my pet make me or other people sick? Learn what diseases your pet and other animals can carry. Tips on how to keep yourself, your family, and your pets healthy are included.

[Browse by Disease](#)

What diseases can animals carry? Learn about diseases that animals can pass to people.

Prevention Tools

[Advice for People at Extra Risk](#)

Some people are more likely than others to get diseases from animals. If you have young children, are pregnant, have HIV/AIDS, have received an organ transplant, or are being treated for cancer, these recommendations will help you avoid getting sick from animals.

[For Health Professionals](#)

Attention health professionals! Physicians, nurses, community health care workers, veterinarians, and veterinary technicians can easily educate people about prevention of pet-related diseases by using CDC's ready-to-print Pet-scriptions.

[Resources](#)

Find additional resources, including articles, selected local organizations, information

hotlines, brochures, posters, and links to other Web sites, on how to have healthy pets and and remain free of pet-related diseases.

Contact Us

Send us questions or comments about our Healthy Pets, Healthy

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Multi-drug-Resistant Organisms in Non-Hospital Healthcare Settings

Frequently Asked Questions

What are "non-hospital healthcare settings"?

They refer to residential settings (e.g., long-term care and skilled nursing homes), home care, hemodialysis centers, and physicians' offices. What are multi-drug-resistant organisms? They are bacteria and other microorganisms that have developed resistance to antimicrobial drugs. Common examples of these organisms include:

- **MRSA** - methicillin/oxacillin-resistant *Staphylococcus aureus*
- **VRE** - vancomycin-resistant enterococci
- **ESBLs** - extended-spectrum beta-lactamases (which are resistant to cephalosporins and monobactams)
- **PRSP** - penicillin-resistant *Streptococcus pneumoniae*

Which multi-drug-resistant organisms are most commonly seen in non-hospital settings?

MRSA and VRE are the most commonly encountered multi-drug-resistant organisms in patients residing in non-hospital healthcare facilities, such as nursing homes and other long-term care facilities. PRSP are more common in patients seeking care in outpatient settings such as physicians' offices and clinics, especially in pediatric settings.

What is the difference between colonization and infection?

COLONIZATION means that the organism is present in or on the body but is not causing illness.

INFECTION means that the organism is present and is causing illness.

What conditions increase the risk of acquiring these organisms?

There are several risk factors for both colonization and infection:

- severity of illness
- previous exposure to antimicrobial agents
- underlying diseases or conditions, particularly:
 - chronic renal disease
 - insulin-dependent diabetes mellitus
 - peripheral vascular disease
 - dermatitis or skin lesions
- invasive procedures, such as:
 - dialysis
 - presence of invasive devices
 - urinary catheterization
- repeated contact with the healthcare system
- previous colonization of by a multi-drug-resistant organism
- advanced age

Should patients colonized or infected with these organisms be admitted to non-hospital healthcare facilities?

Non-hospital healthcare facilities can safely care for and manage these patients by following appropriate infection control practices. In addition, non-hospital healthcare facilities should be aware that persons with MRSA, VRE, and other infections may be protected by the Americans with Disabilities Act or other applicable state or local laws or regulations.

What can be done to prevent or control transmission of these pathogens in my facility?

CDC's recommendations for preventing transmission of MRSA / VRE in hospitals consist of [standard precautions](#), which **should be used for all patient care**. In addition, CDC recommends **contact precautions** when the facility (based on national or local regulations) deems the multi-drug-resistant microorganism to be of special clinical and epidemiologic significance.

The components of contact precautions may be adapted for use in non-hospital healthcare facilities, especially if the patient has draining wounds or difficulty controlling body fluids.

In addition to standard and contact precautions, the following procedures also may be considered for non-hospital healthcare facilities:

- **Patient placement** - Place the patient in a private room, if possible. When a private room is not available, place the patient in a room with a patient who is colonized or infected with the same organism, but does not have any other infection (cohorting). Another option is to place an infected patient with a patient who does not have risk factors for infection.
- **Patient placement in dialysis facilities** - Dialyze the patient at a station with as few adjacent stations as possible (e.g., at the end or corner of the unit).
- **Group activities** - It is extremely important to maintain the patients' ability to socialize and have access to rehabilitation opportunities. Infected or colonized patients should be permitted to participate in group meals and activities if draining wounds are covered, bodily fluids are contained, and the patients observe good hygienic practices.

The following are recommended for prevention of VRE / MRSA in hospitals and may be adapted for use in non-hospital healthcare facilities:

- Obtain stool cultures or rectal swab cultures of roommates of patients newly found to be infected or colonized with VRE, and nasal swabs for MRSA.
- Adopt a policy for deciding when patients can be removed from isolation, e.g., VRE-negative results on at least three consecutive occasions, one or more weeks apart.
- Consult health departments regarding discharge requirements for patients with MRSA or VRE.

Are there any recommendations for pre-admission screening in non-hospital settings?

CDC does not have recommendations for pre-admission screening. However, the following options may be considered:

- Do NOT perform screening
- Screen high-risk patients on admission
(Some evidence from a multicenter study suggests that screening before transfer leads to increased isolation and decreased transmission of VRE).

How should clusters or outbreaks of infections be handled?

Consult with state or local health departments or an experienced infection control professional for reporting requirements and management of MRSA or VRE outbreaks.

If a patient in a facility is colonized or infected with MRSA or VRE, what do their visitors/family members need to know?

In general, healthy people are at low risk of getting infected with MRSA or VRE. Therefore, casual contact - such as kissing, hugging, and touching - is acceptable. Visitors should wash their hands before leaving an infected person's room. Also, disposable gloves should be worn if contact with body fluids is expected. (If excessive contact with body fluids is expected, gowns should also be worn.) It is also acceptable for infants and children to have casual contact with these patients.

What precautions should family caregivers take for infected persons in their homes?

Outside of healthcare settings, there is little risk of transmitting organisms to persons at risk of disease from MRSA / VRE, therefore, healthy people are at low risk of getting infected. In the home, the following precautions should be followed:

- Caregivers should wash their hands with soap and water after physical contact with the infected or colonized person and before leaving the home.
- Towels used for drying hands after contact should be used only once.
- Disposable gloves should be worn if contact with body fluids is expected and hands should be washed after removing the gloves.
- Linens should be changed and washed if they are soiled and on a routine basis.
- The patient's environment should be cleaned routinely and when soiled with body fluids.
- Notify doctors and other healthcare personnel who provide care for the patient that the patient is colonized/infected with a multi-drug-resistant organism.

<http://www.cdc.gov/ncidod/hip/Aresist/nonhosp.htm>

CA - MRSA Community Associated

What is *Staphylococcus aureus* (staph)?

Staphylococcus aureus, often referred to simply as "staph," are bacteria commonly carried on the skin or in the nose of healthy people. Approximately 25% to 30% of the population is colonized (when bacteria are present, but not causing an infection) in the nose with staph bacteria. Sometimes, staph can cause an infection. Staph bacteria are one of the most common causes of skin infections in the United States. Most of these skin infections are minor (such as pimples and boils) and can be treated without antibiotics (also known as antimicrobials or antibacterials). However, staph bacteria also can cause serious infections (such as surgical wound infections, bloodstream infections, and pneumonia).

What is MRSA (methicillin-resistant *Staphylococcus aureus*)?

Some staph bacteria are resistant to antibiotics. MRSA is a type of staph that is resistant to antibiotics called beta-lactams. Beta-lactam antibiotics include methicillin and other more common antibiotics such as oxacillin, penicillin and amoxicillin. While 25% to 30% of the population is colonized with staph, approximately 1% is colonized with MRSA.

Who gets staph or MRSA infections?

Staph infections, including MRSA, occur most frequently among persons in hospitals and healthcare facilities (such as nursing homes and dialysis centers) who have weakened immune systems. These healthcare-associated staph infections include surgical wound infections, urinary tract infections, bloodstream infections, and pneumonia.

What is community-associated MRSA (CA-MRSA)?

Staph and MRSA can also cause illness in persons outside of hospitals and healthcare facilities. MRSA infections that are acquired by persons who **have not** been recently (within the past year) hospitalized or had a medical procedure (such as dialysis, surgery, catheters) are known as CA-MRSA infections. Staph or MRSA infections in the community are usually manifested as skin infections, such as pimples and boils, and occur in otherwise healthy people.

How common are staph and MRSA infections?

Staph bacteria are one of the most common causes of skin infection in the United States and are a common cause of pneumonia, surgical wound infections, and bloodstream infections. The majority of MRSA infections occur among patients in hospitals or other healthcare settings; however, it is becoming more common in the community setting. Data from a prospective study in 2003, suggests that 12% of clinical MRSA infections are community-associated, but this varies by geographic region and population.

What does a staph or MRSA infection look like?

Staph bacteria, including MRSA, can cause skin infections that may look like a pimple or boil and can be red, swollen, painful, or have pus or other drainage. More serious infections may cause pneumonia, bloodstream infections, or surgical wound infections.

Are certain people at increased risk for community-associated staph or MRSA infections?

CDC has investigated clusters of CA-MRSA skin infections among athletes, military recruits, children, Pacific Islanders, Alaskan Natives, Native Americans, men who have sex with men, and prisoners.

Factors that have been associated with the spread of MRSA skin infections include: close skin-to-skin contact, openings in the skin such as cuts or abrasions, contaminated items and surfaces, crowded living conditions, and poor hygiene.

How can I prevent staph or MRSA skin infections?

Practice good hygiene:

1. Keep your hands clean by washing thoroughly with soap and water or using an alcohol-based hand sanitizer.
2. Keep cuts and scrapes clean and covered with a bandage until healed.
3. Avoid contact with other people's wounds or bandages.
4. Avoid sharing personal items such as towels or razors.

Are people who are positive for the human immune deficiency virus (HIV) at increased risk for MRSA? Should they be taking special precautions?

People with weakened immune systems, which include some patients with HIV infection, may be at risk for more severe illness if they get infected with MRSA. People with HIV should follow the same prevention measures as those without HIV to prevent staph infections, including practice good hygiene, cover wounds (e.g., cuts or abrasions) with clean dry bandages, avoid sharing personal items such as towels and razors, and contact their doctor if they think they have an infection.

Can I get a staph or MRSA infection at my health club?

In the outbreaks of MRSA, the environment has not played a significant role in the transmission of MRSA. MRSA is transmitted most frequently by direct skin-to-skin contact. You can protect yourself from infections by practicing good hygiene (e.g., keeping your hands clean by washing with soap and water or using an alcohol-based hand rub and showering after working out); covering any open skin area such as abrasions or cuts with a clean dry bandage; avoiding sharing personal items such as towels or razors; using a barrier (e.g., clothing or a towel) between your skin and shared equipment; and wiping surfaces of equipment before and after use.

What should I do if I think I have a staph or MRSA infection?

See your healthcare provider.

Are staph and MRSA infections treatable?

Yes. Most staph and MRSA infections are treatable with antibiotics. If you are given an antibiotic, take all of the doses, even if the infection is getting better, unless your doctor tells you to stop taking it. Do not share antibiotics with other people or save unfinished antibiotics to use at another time.

However, many staph skin infections may be treated by draining the abscess or boil and may not require antibiotics. Drainage of skin boils or abscesses should only be done by a healthcare provider.

If after visiting your healthcare provider the infection is not getting better after a few days, contact them again. If other people you know or live with get the same infection tell them to go to their healthcare provider.

Is it possible that my staph or MRSA skin infection will come back after it is cured?

Yes. It is possible to have a staph or MRSA skin infection come back (recur) after it is cured. To prevent this from happening, follow your healthcare provider's directions while you have the infection, and follow the prevention steps after the infection is gone.

If I have a staph, or MRSA skin infection, what can I do to prevent others from getting infected?

You can prevent spreading staph or MRSA skin infections to others by following these steps:

1. **Cover your wound.** Keep wounds that are draining or have pus covered with clean, dry bandages. Follow your healthcare provider's instructions on proper care of the wound. Pus from infected wounds can contain staph and MRSA, so keeping the infection covered will help prevent the spread to others. Bandages or tape can be discarded with the regular trash.
2. **Clean your hands.** You, your family, and others in close contact should wash their hands frequently with soap and warm water or use an alcohol-based hand sanitizer, especially after changing the bandage or touching the infected wound.
3. **Do not share personal items.** Avoid sharing personal items such as towels, washcloths, razors, clothing, or uniforms that may have had contact with the infected wound or bandage. Wash sheets, towels, and clothes that become soiled with water and laundry detergent. Drying clothes in a hot dryer, rather than air-drying, also helps kill bacteria in clothes.
4. **Talk to your doctor.** Tell any healthcare providers who treat you that you have or had a staph or MRSA skin infection.

What should I do if someone I know has a staph or MRSA infection?

If you know someone that has a staph or MRSA infection you should follow the prevention steps as outlined above.

http://www.cdc.gov/ncidod/hip/Aresist/ca_mrsa_public.htm

HA - MRSA - Methicillin Resistant *Staphylococcus aureus* **Information for Healthcare Personnel**

Methicillin-resistant *Staphylococcus aureus* (MRSA) has become a prevalent nosocomial pathogen in the United States. In hospitals, the most important reservoirs of MRSA are infected or colonized patients. Although hospital personnel can serve as reservoirs for MRSA and may harbor the organism for many months, they have been more commonly identified as a link for transmission between colonized or infected patients. The main mode of transmission of MRSA is via hands (especially health care workers' hands) which may become contaminated by contact with a) colonized or infected patients, b) colonized or infected body sites of the personnel themselves, or c) devices, items, or environmental surfaces contaminated with body fluids containing MRSA. Standard Precautions, as described in the "Guideline for Isolation Precautions in Hospitals" (Infect Control Hosp Epidemiol 1996;17:53-80), should control the spread of MRSA in most instances.

Standard Precautions include:

1) Hand washing

Wash hands after touching blood, body fluids, secretions, excretions, and contaminated items, whether or not gloves are worn. Wash hands immediately after gloves are removed, between patient contacts, and when otherwise indicated to avoid transfer of microorganisms to other patients or environments. It may be necessary to wash hands between tasks and procedures on the same patient to prevent cross-contamination of different body sites.

2) Gloving

Wear gloves (clean nonsterile gloves are adequate) when touching blood, body fluids, secretions, excretions, and contaminated items; put on clean gloves just before touching mucous membranes and nonintact skin. Remove gloves promptly after use, before touching noncontaminated items and environmental surfaces, and before going to another patient, and wash hands immediately to avoid transfer of microorganisms to other patients or environments.

3) Masking

Wear a mask and eye protection or a face shield to protect mucous membranes of the eyes, nose, and mouth during procedures and patient-care activities that are likely to generate splashes or sprays of blood, body fluids, secretions, and excretions.

4) Gowning

Wear a gown (a clean nonsterile gown is adequate) to protect skin and prevent soiling of clothes during procedures and patient-care activities that are likely to generate splashes or sprays of blood, body fluids, secretions, and excretions or cause soiling of clothing.

5) Appropriate device handling

Handle used patient-care equipment soiled with blood, body fluids, secretions, and excretions in a manner that prevents skin and mucous membrane exposures, contamination of clothing, and transfer of microorganisms to other patients and environments. Ensure that reusable equipment is not used for

the care of another patient until it has been appropriately cleaned and reprocessed and that single-use items are properly discarded.

6) Appropriate handling of laundry

Handle, transport, and process used linen soiled with blood, body fluids, secretions, and excretions in a manner that prevents skin and mucous membrane exposures, contamination of clothing, and transfer of microorganisms to other patients and environments.

If MRSA is judged by the hospital's infection control program to be of special clinical or epidemiologic significance, then Contact Precautions should be considered.

Contact Precautions consist of:

- 1) Placing a patient with MRSA in a private room. When a private room is not available, the patient may be placed in a room with a patient(s) who has active infection with MRSA, but with no other infection (cohorting).
- 2) Wearing gloves (clean nonsterile gloves are adequate) when entering the room. During the course of providing care for a patient, change gloves after having contact with infective material that may contain high concentrations of microorganisms (e.g., fecal material and wound drainage). Remove gloves before leaving the patient's room and wash hands immediately with an antimicrobial agent. After glove removal and handwashing, ensure that hands do not touch potentially contaminated environmental surfaces or items in the patient's room to avoid transfer of microorganisms to other patients and environments.
- 3) Wearing a gown when entering the room if you anticipate that your clothing will have substantial contact with the patient, environmental surfaces, or items in the patient's room, or if the patient is incontinent, or has diarrhea, an ileostomy, a colostomy, or wound drainage not contained by a dressing. Remove the gown before leaving the patient's room. After gown removal, ensure that clothing does not contact potentially contaminated environmental surfaces to avoid transfer of microorganisms to other patients and environments.
- 4) Limiting the movement and transport of the patient from the room to essential purposes only. If the patient is transported out of the room, ensure that precautions are maintained to minimize the risk of transmission of microorganisms to other patients and contamination of environmental surfaces or equipment.
- 5) Ensuring that patient-care items, bedside equipment, and frequently touched surfaces receive daily cleaning.
- 6) When possible, dedicating the use of noncritical patient-care equipment and items such as stethoscope, sphygmomanometer, bedside commode, or electronic rectal thermometer to a single patient (or cohort of patients infected or colonized with MRSA) to avoid sharing between patients. If use of common equipment or items is unavoidable, then adequately clean and disinfect them before use on another patient.

Culturing of Personnel and Management of Personnel Carriers of MRSA

Unless the objective of the hospital is to eradicate all MRSA carriage and treat all personnel who are MRSA carriers, whether or not they disseminate MRSA, it may be prudent to culture only personnel who are implicated in MRSA transmission based on epidemiologic data. MRSA-carrier personnel who are epidemiologically linked to transmission should be removed from direct patient care until treatment of the MRSA-carrier status is successful. If the hospital elects to culture all personnel to identify MRSA carriers, a) surveillance cultures need to be done frequently, and b) it is likely that personnel colonized by MRSA who are not linked to transmission and/or who may not be MRSA disseminators will be identified, subjected to treatment, and/or removed from patient contact unnecessarily. Because of the high cost attendant to repeated surveillance cultures and the potential of repeated culturing to result in serious consequences to health care workers, hospitals should weigh the advantages and the adverse effects of routinely culturing personnel before doing so.

Control of MRSA Outbreaks

When an outbreak of MRSA infection occurs, an epidemiologic assessment should be initiated to identify risk factors for MRSA acquisition in the institution; clinical isolates of MRSA should be saved and submitted for strain typing. Colonized or infected patients should be identified as quickly as possible, appropriate barrier precautions should be instituted, and hand washing by medical personnel before and after all patient contacts should be strictly adhered to.

All personnel should be reinstructed on appropriate precautions for patients colonized or infected with multi-resistant microorganisms and on the importance of hand washing and barrier precautions in preventing contact transmission.

If additional help is needed by the hospital, a consultation with the local or state health department or CDC may be necessary.

<http://www.cdc.gov/ncidod/hip/Aresist/mrsahcw.htm>

CA-MRSA Information for Clinicians

What is *Staphylococcus aureus*?

Staphylococcus aureus, often referred to simply as "staph," are bacteria commonly carried on the skin or in the nose of healthy people. Approximately 25% to 30% of the population is colonized (when bacteria are present, but not causing an infection) in the nose with staph bacteria. Sometimes, staph can cause an infection. Staph bacteria are one of the most common causes of skin infections in the United States. Most of these skin infections are minor (such as pimples and boils) and can be treated without antibiotics (also known as antimicrobials or antibacterials). However, staph bacteria also can cause serious infections (such as surgical wound infections, bloodstream infections, and pneumonia).

What is MRSA (methicillin-resistant *Staphylococcus aureus*)?

Some staph bacteria are resistant to antibiotics. MRSA is a type of staph that is resistant to antibiotics called beta-lactams. Beta-lactam antibiotics include methicillin and other more common antibiotics such as oxacillin, penicillin and amoxicillin. While 25% to 30% of the population is colonized with staph, approximately 1% is colonized with MRSA.

Who gets staph or MRSA infections?

Staph infections, including MRSA, occur most frequently among persons in hospitals and healthcare facilities (such as nursing homes and dialysis centers) who have weakened immune systems. These healthcare-associated staph infections include surgical wound infections, urinary tract infections, bloodstream infections, and pneumonia.

What is community-associated MRSA (CA-MRSA)?

Staph and MRSA can also cause illness in persons outside of hospitals and healthcare facilities. MRSA infections that are acquired by persons who **have not** been recently (within the past year) hospitalized or had a medical procedure (such as dialysis, surgery, catheters) are known as CA-MRSA infections. Staph or MRSA infections in the community are usually manifested as skin infections, such as pimples and boils, and occur in otherwise healthy people.

Are certain people at increased risk for community-associated staph or MRSA infections?

CDC has investigated clusters of CA-MRSA skin infections among athletes, military recruits, children, Pacific Islanders, Alaskan Natives, Native Americans, men who have sex with men, and prisoners.

Factors that have been associated with the spread of MRSA skin infections include close skin-to-skin contact, openings in the skin such as cuts or abrasions, contaminated items and surfaces, crowded living conditions, and poor hygiene.

What are the clinical features of CA-MRSA?

CA-MRSA most often presents as skin or soft tissue infection such as a boil or abscess. Patients frequently recall a "spider bite". The involved site is red, swollen, and painful and may have pus or other drainage. Staph infections also can cause more serious infections, such as blood stream infections or pneumonia, leading to symptoms of shortness of breath, fever, and chills.

What are the criteria for distinguishing community-associated MRSA (CA-MRSA) from healthcare-associated MRSA (HA-MRSA)?

Persons with MRSA infections that meet all of the following criteria likely have CA-MRSA infections:

- Diagnosis of MRSA was made in the outpatient setting or by a culture positive for MRSA within 48 hours after admission to the hospital.
- No medical history of MRSA infection or colonization.
- No medical history in the past year of:
 - Hospitalization
 - Admission to a nursing home, skilled nursing facility, or hospice
 - Dialysis
 - Surgery
- No permanent indwelling catheters or medical devices that pass through the skin into the body.

What is the main way that staph or MRSA is transmitted in the community?

The main mode of transmission of staph and/or MRSA is via hands which may become contaminated by contact with a) colonized or infected individuals, b) colonized or infected body sites of other persons, or c) devices, items, or environmental surfaces contaminated with body fluids containing staph or MRSA. Other factors contributing to transmission include skin-to-skin contact, crowded conditions, and poor hygiene.

How is a MRSA infection diagnosed?

In general, a culture should be obtained from the infection site and sent to the microbiology laboratory. If *S. aureus* is isolated, the organism should be tested as follows to determine which antibiotics will be effective for treating the infection.

Skin Infection: Obtain either a small biopsy of skin or drainage from the infected site. A culture of a skin lesion is especially useful in recurrent or persistent cases of skin infection, in cases of antibiotic failure, and in cases that present with advanced or aggressive infections.

Pneumonia: Obtain a sputum culture (expectorated purulent sputum, respiratory lavage, or bronchoscopy).

Bloodstream Infection: Obtain blood cultures using aseptic techniques.

Urinary Infection: Obtain urine cultures using aseptic techniques.

How are CA-MRSA infections treated?

Staph skin infections, such as boils or abscesses, may be treated by incision and drainage, depending on severity. Antibiotic treatment, if indicated, should be guided by the susceptibility profile of the organism.

How do CA-MRSA and HA-MRSA strains differ?

Recently recognized outbreaks of MRSA in community settings have been associated with strains that have some unique microbiologic and genetic properties compared with the traditional hospital-based MRSA strains, suggesting some biologic properties (e.g., virulence factors) may allow the community strains to spread more easily or cause more skin disease. Additional studies are underway to characterize and compare the biologic properties of HA-MRSA and CA-MRSA strains.

There are at least three different *S. aureus* strains in the United States that can cause CA-MRSA infections. CDC continues to work with state and local health departments to gather organisms and epidemiologic data from known cases to determine why certain groups of people get these infections.

Are MRSA infections a reportable disease?

MRSA is reportable in several states. The decision to make a particular disease reportable to public health authorities is made by each state, based on the needs of that individual state. To find out if MRSA is reportable in your state, call your state health department.

http://www.cdc.gov/ncidod/hip/ARESIST/ca_mrsa_clinician.htm



Methicillin-Resistant Staphylococcus aureus (MRSA) in Schools

http://www.cdc.gov/ncidod/dhqp/ar_mrsa_in_schools.html

October 2007

CDC, along with parents and school officials, wants to do everything possible to protect students from MRSA skin infections. These are commonly asked questions that will help parents and school officials prevent the spread of MRSA in schools.

- [What type of infection does MRSA cause?](#)
- [How is MRSA transmitted?](#)
- [In what settings do MRSA skin infections occur?](#)
- [How do I protect myself from MRSA?](#)
- [Should schools close because of a MRSA infection?](#)
- [Should the school be closed to be cleaned or disinfected when an MRSA infection occurs?](#)
- [Should the entire school community be notified of every MRSA infection?](#)
- [Should the school be notified that my child has an MRSA infection?](#)
- [Should students with MRSA skin infections be excluded from attending school?](#)
- [I have an MRSA skin infection. How do I prevent spreading it to others?](#)

What type of infections does MRSA cause?

- In the community most MRSA infections are skin infections that may appear as pustules or boils which often are red, swollen, painful, or have pus or other drainage. These skin infections commonly occur at sites of visible skin trauma, such as cuts and abrasions, and areas of the body covered by hair (e.g., back of neck, groin, buttock, armpit, beard area of men).
- Almost all MRSA skin infections can be effectively treated by drainage of pus with or without antibiotics. More serious infections, such as pneumonia, bloodstream infections, or bone infections, are very rare in healthy people who get MRSA skin infections.

How is MRSA transmitted?

- MRSA is usually transmitted by direct skin-to-skin contact or contact with shared items or surfaces that have come into contact with someone else's infection (e.g., towels, used bandages).

In what settings do MRSA skin infections occur?

- MRSA skin infections can occur anywhere.
- Some settings have factors that make it easier for MRSA to be transmitted.
 - These factors, referred to as the 5 C's, are as follows: Crowding, frequent skin-to-skin Contact, Compromised skin (i.e., cuts or abrasions), Contaminated items and surfaces, and lack of Cleanliness.

- Locations where the 5 C's are common include schools, dormitories, military barracks, households, correctional facilities, and daycare centers.

How do I protect myself from getting MRSA?

You can protect yourself by:

- practicing good hygiene (e.g., keeping your hands clean by washing with soap and water or using an alcohol-based hand sanitizer and showering immediately after participating in exercise);
- covering skin trauma such as abrasions or cuts with a clean dry bandage until healed;
- avoiding sharing personal items (e.g., towels, razors) that come into contact with your bare skin; and using a barrier (e.g., clothing or a towel) between your skin and shared equipment such as weight-training benches;
- maintaining a clean environment by establishing cleaning procedures for frequently touched surfaces and surfaces that come into direct contact with people's skin.

Should schools close because of an MRSA infection?

- The decision to close a school for any communicable disease should be made by school officials in consultation with local and/or state public health officials. However, in most cases, it is not necessary to close schools because of an MRSA infection in a student. It is important to note that MRSA transmission can be prevented by simple measures such as hand hygiene and covering infections.

Should the school be closed to be cleaned or disinfected when an MRSA infection occurs?

- Covering infections will greatly reduce the risks of surfaces becoming contaminated with MRSA. In general it is not necessary to close schools to "disinfect" them when MRSA infections occur. MRSA skin infections are transmitted primarily by skin-to-skin contact and contact with surfaces that have come into contact with someone else's infection.
- When MRSA skin infections occur, cleaning and disinfection should be performed on surfaces that are likely to contact uncovered or poorly covered infections.
- Cleaning surfaces with detergent-based cleaners or Environmental Protection Agency (EPA)-registered disinfectants is effective at removing MRSA from the environment.
 - It is important to read the instruction labels on all cleaners to make sure they are used safely and appropriately.
 - Environmental cleaners and disinfectants should not be used to treat infections.
 - The EPA provides a list of EPA-registered products effective against MRSA: <http://epa.gov/oppad001/chemregindex.htm>

Should the entire school community be notified of every MRSA infection?

- Usually, it should not be necessary to inform the entire school community about a single MRSA infection. When an MRSA infection occurs within the school population, the school nurse and school physician should determine, based on their medical judgment, whether some or all students, parents and staff should be notified. Consultation with the local public health authorities should be used to guide this decision.
- Remember that staphylococcus (staph) bacteria, including MRSA, have been and remain a common cause of skin infections.

Should the school be notified that my child has an MRSA infection?

- Consult with your school about its policy for notification of skin infections.

Should students with MRSA skin infections be excluded from attending school?

- Unless directed by a physician, students with MRSA infections should not be excluded from attending school.
- Exclusion from school and sports activities should be reserved for those with wound drainage ("pus") that cannot be covered and contained with a clean, dry bandage and for those who cannot maintain good personal hygiene.

I have an MRSA skin infection. How do I prevent spreading it to others?

- Cover your wound. Keep wounds that are draining or have pus covered with clean, dry bandages until healed. Follow your healthcare provider's instructions on proper care of the wound. Pus from infected wounds can contain staph, including MRSA, so keeping the infection covered will help prevent the spread to others. Bandages and tape can be discarded with the regular trash.
- Clean your hands frequently. You, your family, and others in close contact should wash their hands frequently with soap and water or use an alcohol-based hand sanitizer, especially after changing the bandage or touching the infected wound.
- Do not share personal items. Avoid sharing personal items, such as towels, washcloths, razors, clothing, or uniforms, that may have had contact with the infected wound or bandage. Wash sheets, towels, and clothes that become soiled with water and laundry detergent. Use a dryer to dry clothes completely.

(q) Practical Advice for Teachers

- If you observe children with open draining wounds or infections, refer the child to the school nurse.
- Enforce hand hygiene with soap and water or alcohol-based hand sanitizers (if available) before eating and after using the bathroom.

(r) Advice for School Health Personnel

- Students with skin infections may need to be referred to a licensed health care provider for diagnosis and treatment. School health personnel should notify parents/guardians when possible skin infections are detected.

- Use standard precautions (e.g., hand hygiene before and after contact, wearing gloves) when caring for nonintact skin or potential infections.
- Use barriers such as gowns, masks and eye protection if splashing of body fluids is anticipated.

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Recognition of Illness Associated with the Intentional Release of a Biologic Agent

On September 11, 2001, following the terrorist incidents in New York City and Washington, D.C., CDC recommended heightened surveillance for any unusual disease occurrence or increased numbers of illnesses that might be associated with the terrorist attacks. Subsequently, cases of anthrax in Florida and New York City have demonstrated the risks associated with intentional release of biologic agents. This report provides guidance for health-care providers and public health personnel about recognizing illnesses or patterns of illness that might be associated with intentional release of biologic agents.

Health-Care Providers

Health-care providers should be alert to illness patterns and diagnostic clues that might indicate an unusual infectious disease outbreak associated with intentional release of a biologic agent and should report any clusters or findings to their local or state health department. The covert release of a biologic agent may not have an immediate impact because of the delay between exposure and illness onset, and outbreaks associated with intentional releases might closely resemble naturally occurring outbreaks. Indications of intentional release of a biologic agent include 1) an unusual temporal or geographic clustering of illness (e.g., persons who attended the same public event or gathering) or patients presenting with clinical signs and symptoms that suggest an infectious disease outbreak (e.g., ≥ 2 patients presenting with an unexplained febrile illness associated with sepsis, pneumonia, respiratory failure, or rash or a botulism-like syndrome with flaccid muscle paralysis, especially if occurring in otherwise healthy persons); 2) an unusual age distribution for common diseases (e.g., an increase in what appears to be a chickenpox-like illness among adult patients, but which might be smallpox); and 3) a large number of cases of acute flaccid paralysis with prominent bulbar palsies, suggestive of a release of *botulinum* toxin.

CDC defines three categories of biologic agents with potential to be used as weapons, based on ease of dissemination or transmission, potential for major public health impact (e.g., high mortality), potential for public panic and social disruption, and requirements for public health preparedness. Agents of highest concern are *Bacillus anthracis* (anthrax), *Yersinia pestis* (plague), variola major (smallpox), *Clostridium botulinum* toxin (botulism), *Francisella tularensis* (tularemia), filoviruses (Ebola hemorrhagic fever, Marburg hemorrhagic fever); and arenaviruses (Lassa [Lassa fever], Junin [Argentine hemorrhagic fever], and related viruses). The following summarizes the clinical features of these agents.

Anthrax. A nonspecific prodrome (i.e., fever, dyspnea, cough, and chest discomfort) follows inhalation of infectious spores. Approximately 2--4 days after initial symptoms, sometimes after a brief period of improvement, respiratory failure and hemodynamic collapse ensue. Inhalational anthrax also might include thoracic edema and a widened mediastinum on chest radiograph. Gram-positive bacilli can grow on blood culture, usually 2--3 days after onset of illness. Cutaneous anthrax follows deposition of the organism onto the skin, occurring particularly on exposed areas of the hands, arms, or face. An area of local edema becomes a pruritic macule or papule, which enlarges and ulcerates after 1--2 days. Small, 1--3 mm vesicles may surround the ulcer. A painless, depressed, black eschar usually with surrounding

local edema subsequently develops. The syndrome also may include lymphangitis and painful lymphadenopathy.

Plague. Clinical features of pneumonic plague include fever, cough with mucopurulent sputum (gram-negative rods may be seen on gram stain), hemoptysis, and chest pain. A chest radiograph will show evidence of bronchopneumonia.

Botulism. Clinical features include symmetric cranial neuropathies (i.e., drooping eyelids, weakened jaw clench, and difficulty swallowing or speaking), blurred vision or diplopia, symmetric descending weakness in a proximal to distal pattern, and respiratory dysfunction from respiratory muscle paralysis or upper airway obstruction without sensory deficits. Inhalational botulism would have a similar clinical presentation as foodborne botulism; however, the gastrointestinal symptoms that accompany foodborne botulism may be absent.

Smallpox (variola). The acute clinical symptoms of smallpox resemble other acute viral illnesses, such as influenza, beginning with a 2--4 day nonspecific prodrome of fever and myalgias before rash onset. Several clinical features can help clinicians differentiate varicella (chickenpox) from smallpox. The rash of varicella is most prominent on the trunk and develops in successive groups of lesions over several days, resulting in lesions in various stages of development and resolution. In comparison, the vesicular/pustular rash of smallpox is typically most prominent on the face and extremities, and lesions develop at the same time.

Inhalational tularemia. Inhalation of *F. tularensis* causes an abrupt onset of an acute, nonspecific febrile illness beginning 3--5 days after exposure, with pleuropneumonitis developing in a substantial proportion of cases during subsequent days.

Hemorrhagic fever (such as would be caused by Ebola or Marburg viruses). After an incubation period of usually 5--10 days (range: 2--19 days), illness is characterized by abrupt onset of fever, myalgia, and headache. Other signs and symptoms include nausea and vomiting, abdominal pain, diarrhea, chest pain, cough, and pharyngitis. A maculopapular rash, prominent on the trunk, develops in most patients approximately 5 days after onset of illness. Bleeding manifestations, such as petechiae, ecchymoses, and hemorrhages, occur as the disease progresses.

Clinical Laboratory Personnel

Although unidentified gram-positive bacilli growing on agar may be considered as contaminants and discarded, CDC recommends that these bacilli be treated as a "finding" when they occur in a suspicious clinical setting (e.g., febrile illness in a previously healthy person). The laboratory should attempt to characterize the organism, such as motility testing, inhibition by penicillin, absence of hemolysis on sheep blood agar, and further biochemical testing or species determination.

An unusually high number of samples, particularly from the same biologic medium (e.g., blood and stool cultures), may alert laboratory personnel to an outbreak. In addition, central laboratories that receive clinical specimens from several sources should be alert to increases in demand or unusual requests for culturing (e.g., uncommon biologic specimens such as cerebrospinal fluid or pulmonary aspirates).

When collecting or handling clinical specimens, laboratory personnel should 1) use Biological Safety Level II (BSL-2) or Level III (BSL-3) facilities and practices when working with clinical samples considered potentially infectious; 2) handle all specimens in a BSL-2 laminar flow hood with protective eyewear (e.g., safety glasses or eye shields), use closed-front laboratory coats with cuffed sleeves, and stretch the gloves over the cuffed sleeves; 3) avoid any activity that places persons at risk for infectious exposure, especially activities that might create aerosols or droplet dispersal; 4) decontaminate laboratory benches after each use and dispose of supplies and equipment in proper receptacles; 5) avoid touching mucosal surfaces with their hands (gloved or ungloved), and never eat or drink in the laboratory; and 6) remove and reverse their gloves before leaving the laboratory and dispose of them in a biohazard container, and wash their hands and remove their laboratory coat.

When a laboratory is unable to identify an organism in a clinical specimen, it should be sent to a laboratory where the agent can be characterized, such as the state public health laboratory or, in some large metropolitan areas, the local health department laboratory. Any clinical specimens suspected to contain variola (smallpox) should be reported to local and state health authorities and then transported to CDC. All variola diagnostics should be conducted at CDC laboratories. Clinical laboratories should report any clusters or findings that could indicate intentional release of a biologic agent to their state and local health departments.

Infection-Control Professionals

Heightened awareness by infection-control professionals (ICPs) facilitates recognition of the release of a biologic agent. ICPs are involved with many aspects of hospital operations and several departments and with counterparts in other hospitals. As a result, ICPs may recognize changing patterns or clusters in a hospital or in a community that might otherwise go unrecognized.

ICPs should ensure that hospitals have current telephone numbers for notification of both internal (ICPs, epidemiologists, infectious diseases specialists, administrators, and public affairs officials) and external (state and local health departments, Federal Bureau of Investigation field office, and CDC Emergency Response office) contacts and that they are distributed to the appropriate personnel. ICPs should work with clinical microbiology laboratories, on- or off-site, that receive specimens for testing from their facility to ensure that cultures from suspicious cases are evaluated appropriately.

State Health Departments

State health departments should implement plans for educating and reminding health-care providers about how to recognize unusual illnesses that might indicate intentional release of a biologic agent. Strategies for responding to potential bioterrorism include 1) providing information or reminders to health-care providers and clinical laboratories about how to report events to the appropriate public health authorities; 2) implementing a 24-hour-a-day, 7-day-a-week capacity to receive and act on any positive report of events that suggest intentional release of a biologic agent; 3) investigating immediately any report of a cluster of illnesses or other event that suggests an intentional release of a biologic agent and requesting CDC's assistance when necessary; 4) implementing a plan, including accessing the

Laboratory Response Network for Bioterrorism, to collect and transport specimens and to store them appropriately before laboratory analysis; and 5) reporting immediately to CDC if the results of an investigation suggest release of a biologic agent.

Reported by: National Center for Infectious Diseases; Epidemiology Program Office; Public Health Practice Program Office; Office of the Director, CDC.

Editorial Note:

Health-care providers, clinical laboratory personnel, infection control professionals, and health departments play critical and complementary roles in recognizing and responding to illnesses caused by intentional release of biologic agents. The syndrome descriptions, epidemiologic clues, and laboratory recommendations in this report provide basic guidance that can be implemented immediately to improve recognition of these events.

After the terrorist attacks of September 11, state and local health departments initiated various activities to improve surveillance and response, ranging from enhancing communications (between state and local health departments and between public health agencies and health-care providers) to conducting special surveillance projects. These special projects have included active surveillance for changes in the number of hospital admissions, emergency department visits, and occurrence of specific syndromes. Activities in bioterrorism preparedness and emerging infections over the past few years have better positioned public health agencies to detect and respond to the intentional release of a biologic agent. Immediate review of these activities to identify the most useful and practical approaches will help refine syndrome surveillance efforts in various clinical situations.

Information about clinical diagnosis and management can be found elsewhere. Additional information about responding to bioterrorism is available from CDC at <<http://www.bt.cdc.gov>>; the U.S. Army Medical Research Institute of Infectious Diseases at <<http://www.usamriid.army.mil/education/bluebook.html>>; the Association for Infection Control Practitioners at <<http://www.apic.org>>; and the Johns Hopkins Center for Civilian Biodefense at <<http://www.hopkins-biodefense.org>>.

<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5041a2.htm>

A Radiation Emergency

What is Radiation?

- Radiation is a form of energy that is present all around us.
- Different types of radiation exist, some of which have more energy than others.

Amounts of radiation released into the environment are measured in units called curies. However, the dose of radiation that a person receives is measured in units called rem.

How Can Exposure Occur?

- People are exposed to small amounts of radiation every day, both from naturally occurring sources (such as elements in the soil or cosmic rays from the sun), and man-made sources. Man-made sources include some electronic equipment (such as microwave ovens and television sets), medical sources (such as x-rays, certain diagnostic tests, and treatments), and from nuclear weapons testing.
- The amount of radiation from natural or man-made sources to which people are exposed is usually small; a radiation emergency (such as a nuclear power plant accident or a terrorist event) could expose people to small or large doses of radiation, depending on the situation.
- Scientists estimate that the average person in the United States receives a dose of about one-third of a rem per year. About 80% of human exposure comes from natural sources and the remaining 20% comes from man-made radiation sources – mainly medical x-rays.
- Internal exposure refers to radioactive material that is taken into the body through breathing, eating, or drinking.
- External exposure refers to an exposure to a radioactive source outside of our bodies.

Contamination refers to particles of radioactive material that are deposited anywhere that they are not supposed to be, such as on an object or on a person's skin.

What Happens When People Are Exposed to Radiation?

- Radiation can affect the body in a number of ways, and the adverse health effects of exposure may not be apparent for many years.
- These adverse health effects can range from mild effects, such as skin reddening, to serious effects such as cancer and death, depending on the amount of radiation absorbed by the body (the dose), the type of radiation, the route of exposure, and the length of time a person was exposed.
- Exposure to very large doses of radiation may cause death within a few days or months.

Exposure to lower doses of radiation may lead to an increased risk of developing cancer or other adverse health effects later in life.

What Types of Terrorist Events Might Involve Radiation?

- Possible terrorist events could involve introducing radioactive material into the food or water supply, using explosives (like dynamite) to scatter radioactive materials (called a “dirty bomb”), bombing or destroying a nuclear facility, or exploding a small nuclear device.
- Although introducing radioactive material into the food or water supply most likely would cause great concern or fear, it probably would not cause much contamination or increase the danger of adverse health effects.
- Although a dirty bomb could cause serious injuries from the explosion, it most likely would not have enough radioactive material in a form that would cause serious radiation sickness among large numbers of people. However, people who were exposed to radiation scattered by the bomb could have a greater risk of developing cancer later in life, depending on their dose.
- A meltdown or explosion at a nuclear facility could cause a large amount of radioactive material to be released. People at the facility would probably be contaminated with radioactive material and possibly be injured if there was an explosion. Those people who received a large dose might develop acute radiation syndrome. People in the surrounding area could be exposed or contaminated.
- Clearly, an exploded nuclear device could result in a lot of property damage. People would be killed or injured from the blast and might be contaminated by radioactive material. Many people could have symptoms of acute radiation syndrome. After a nuclear explosion, radioactive fallout would extend over a large region far from the point of impact, potentially increasing people’s risk of developing cancer over time.

What Preparations Can I Make for a Radiation Emergency?

- Your community should have a plan in place in case of a radiation emergency. Check with community leaders to learn more about the plan and possible evacuation routes.
- Check with your child’s school, the nursing home of a family member, and your employer to see what their plans are for dealing with a radiation emergency.
- Develop your own family emergency plan so that every family member knows what to do.
- At home, put together an emergency kit that would be appropriate for any emergency. The kit should include the following items:
 - A flashlight with extra batteries
 - A portable radio with extra batteries
 - Bottled water
 - Canned and packaged food
 - A hand-operated can opener
 - A first-aid kit and essential prescription medications
 - Personal items such as paper towels, garbage bags, and toilet paper

How Can I Protect Myself During a Radiation Emergency?

- After a release of radioactive materials, local authorities will monitor the levels of radiation and determine what protective actions to take.
- The most appropriate action will depend on the situation. Tune to the local emergency response network or news station for information and instructions during any emergency.
- If a radiation emergency involves the release of large amounts of radioactive materials, you may be advised to “shelter in place,” which means to stay in your home or office; or you may be advised to move to another location.
- If you are advised to shelter in place, you should do the following:
 - Close and lock all doors and windows.
 - Turn off fans, air conditioners, and forced-air heating units that bring in fresh air from the outside. Only use units to recirculate air that is already in the building.
 - Close fireplace dampers.
 - If possible, bring pets inside.
 - Move to an inner room or basement.
 - Keep your radio tuned to the emergency response network or local news to find out what else you need to do.
- If you are advised to evacuate, follow the directions that your local officials provide. Leave the area as quickly and orderly as possible. In addition –
 - Take a flashlight, portable radio, batteries, first-aid kit, supply of sealed food and water, hand-operated can opener, essential medicines, and cash and credit cards.
 - Take pets only if you are using your own vehicle and going to a place you know will accept animals. Emergency vehicles and shelters usually will not accept animals.

Should I Take Potassium Iodide During a Radiation Emergency?

- Potassium iodide (KI) should only be taken in a radiation emergency that involves the release of radioactive iodine, such as an accident at a nuclear power plant or the explosion of a nuclear bomb. A “dirty bomb” most likely will not contain radioactive iodine.
- A person who is internally exposure to radioactive iodine may experience thyroid disease later in life. The thyroid gland will absorb radioactive iodine and may develop cancer or abnormal growths later on. KI will saturate the thyroid gland with iodine, decreasing the amount of harmful radioactive iodine that can be absorbed.
- KI only protects the thyroid gland and does not provide protection from any other radiation exposure.
- Some people are allergic to iodine and should not take KI. Check with your doctor about any concerns you have about potassium iodide.

<http://www.bt.cdc.gov/radiation/emergencyfaq.asp>

Dirty Bombs

Because of recent terrorist events, people have expressed concern about the possibility of a terrorist attack involving radioactive materials, possibly through the use of a "dirty bomb," and the harmful effects of radiation from such an event. The Centers for Disease Control and Prevention has prepared this fact sheet to help people understand what a dirty bomb is and how it may affect their health.

What is a "dirty bomb"?

A dirty bomb, or radiological dispersion device, is a bomb that combines conventional explosives, such as dynamite, with radioactive materials in the form of powder or pellets. The idea behind a dirty bomb is to blast radioactive material into the area around the explosion. This could possibly cause buildings and people to be exposed to radioactive material. The main purpose of a dirty bomb is to frighten people and make buildings or land unusable for a long period of time.

Dirty bomb versus atomic bombs in Hiroshima and Nagasaki

The atomic explosions that occurred in Hiroshima and Nagasaki were conventional nuclear weapons involving a fission reaction. A dirty bomb is designed to spread radioactive material and contaminate a small area. It does not include the fission products necessary to create a large blast like those seen in Hiroshima and Nagasaki.

What are the sources of the radioactive material?

There has been a lot of speculation about where terrorists could get radioactive material to place in a dirty bomb. The most harmful radioactive materials are found in nuclear power plants and nuclear weapons sites. However, increased security at these facilities makes obtaining materials from them more difficult.

Because of the dangerous and difficult aspects of obtaining high-level radioactive materials from a nuclear facility, there is a greater chance that the radioactive materials used in a dirty bomb would come from low-level radioactive sources. Low-level radioactive sources are found in hospitals, on construction sites, and at food irradiation plants. The sources in these areas are used to diagnose and treat illnesses, sterilize equipment, inspect welding seams, and irradiate food to kill harmful microbes.

What are the dangers of a dirty bomb?

If low-level radioactive sources were to be used, the primary danger from a dirty bomb would be the blast itself. Gauging how much radiation might be present is difficult when the source of the radiation is unknown. However, *at the levels created by most probable sources, not enough radiation would be present in a dirty bomb to cause severe illness from exposure to radiation.*

What are past uses of dirty bombs?

According to a United Nations report, Iraq tested a dirty bomb device in 1987 but found that the radiation levels were too low to cause significant damage. Thus, Iraq abandoned any further use of the device.

What should people do following an explosion?

Radiation cannot be seen, smelled, felt, or tasted by humans. Therefore, if people are present at the scene of an explosion, they will not know whether radioactive materials were involved at the time of the explosion. If people are not too severely injured by the initial blast, they should:

- Leave the immediate area on foot. Do not panic. Do not take public or private transportation such as buses, subways, or cars because if radioactive materials were involved, they may contaminate cars or the public transportation system.
- Go inside the nearest building. Staying inside will reduce people's exposure to any radioactive material that may be on dust at the scene.
- Remove their clothes as soon as possible, place them in a plastic bag, and seal it. Removing clothing will remove most of the contamination caused by external exposure to radioactive materials. Saving the contaminated clothing would allow testing for exposure without invasive sampling.
- Take a shower or wash themselves as best they can. Washing will reduce the amount of radioactive contamination on the body and will effectively reduce total exposure.
- Be on the lookout for information. Once emergency personnel can assess the scene and the damage, they will be able to tell people whether radiation was involved.

Even if people do not know whether radioactive materials were present, following these simple steps can help reduce their injury from other chemicals that might have been present in the blast.

Taking potassium iodide (KI)

Potassium iodide, also called KI, only protects a person's thyroid gland from exposure to radioactive iodine. KI will not protect a person from other radioactive materials or protect other parts of the body from exposure to radiation. It must be taken prior to exposure (for example, if people hear that a radioactive cloud is coming their way) or immediately after exposure to be effective. Since there is no way to know at the time of an incident whether radioactive iodine was used in the explosive device, taking KI would probably not be beneficial. Also, KI can be dangerous to some people. Taking KI is not recommended unless there is a risk of exposure to radioactive iodine.

What if radioactive materials were involved?

Keep televisions or radios tuned to local news networks. If a radioactive material was released, people will be told where to report for radiation monitoring and blood tests to determine whether they were exposed to the radiation as well as what steps to take to protect their health.

What are the risks of cancer from a dirty bomb?

Some cancers can be caused by exposure to radiation. Being at the site where a dirty bomb exploded does not guarantee that people were exposed to the radioactive material. Until doctors are able to check people's skin with sensitive radiation detection devices, it will not be clear whether they were exposed. Just because people are near a radioactive source for a short time or get a small amount of radioactive material on them does not mean that they will get cancer. Doctors will be able to assess risks after the exposure level has been determined.

For more information about radiation and emergency response, see the Centers for Disease Control and Prevention's website at <http://www.bt.cdc.gov>.

<http://www.cdc.gov/nceh/radiation/db.htm>

Ricin

What Is Ricin?

Ricin is a poison that can be made from the waste left over from processing castor beans. It can be in the form of a powder, a mist, or a pellet, or it can be dissolved in water or weak acid. It is a stable substance. For example, it is not affected much by extreme conditions such as very hot or very cold temperatures.

Where Is Ricin Found, and How Is It Used?

Castor beans are processed throughout the world to make castor oil. Ricin is part of the waste mash produced when castor oil is made. Amateurs can make ricin from castor beans. Ricin has some potential medical uses, such as bone marrow transplants and cancer treatment (to kill cancer cells).

How Can People Be Exposed to Ricin?

It would take a deliberate act to make ricin and use it to poison people. Accidental exposure to ricin is highly unlikely. People can breathe in ricin mist or powder and be poisoned. Ricin can also get into water or food and then be swallowed. Pellets of ricin, or ricin dissolved in a liquid, can be injected into people's bodies. Depending on the route of exposure (such as injection), as little as 500 micrograms of ricin could be enough to kill an adult. A 500-microgram dose of ricin would be about the size of the head of a pin. A much greater amount would be needed to kill people if the ricin were inhaled (breathed in) or swallowed. Ricin poisoning is not contagious. It cannot be spread from person to person through casual contact.

In 1978, Georgi Markov, a Bulgarian writer and journalist who was living in London, died after he was attacked by a man with an umbrella. The umbrella had been rigged to inject a poison ricin pellet under Markov's skin. Some reports have indicated that ricin may have been used in the Iran-Iraq war during the 1980s and that quantities of ricin were found in Al Qaeda caves in Afghanistan.

How Does Ricin Work?

Ricin works by getting inside the cells of a person's body and preventing the cells from making the proteins they need. Without the proteins, cells die, and eventually the whole body can shut down and die. Specific effects of ricin poisoning depend on whether ricin was inhaled, swallowed, or injected.

What Are the Signs and Symptoms of Ricin Exposure?

Inhalation: Within a few hours of inhaling significant amounts of ricin, the likely symptoms would be coughing, tightness in the chest, difficulty breathing, nausea, and aching muscles. Within the next few hours, the body's airways (such as lungs) would become severely inflamed (swollen and hot), excess fluid would build up in the lungs, breathing would become even more difficult, and the skin might turn blue. Excess fluid in the lungs would be diagnosed by x-ray or by listening to the chest with a stethoscope.

Ingestion: If someone swallows a significant amount of ricin, he or she would have internal bleeding of the stomach and intestines that would lead to vomiting and bloody diarrhea. Eventually, the person's liver, spleen, and kidneys might stop working, and the person could die.

Injection: Injection of a lethal amount of ricin at first would cause the muscles and lymph nodes near the injection site to die. Eventually, the liver, kidneys, and spleen would stop working, and the person would have massive bleeding from the stomach and intestines. The person would die from multiple organ failure.

Death from ricin poisoning could take place within 36 to 48 hours of exposure, whether by injection, ingestion, or inhalation. If the person lives longer than 5 days without complications, he or she will probably not die.

Showing these signs and symptoms does not necessarily mean that a person has been exposed to ricin.

How Is Ricin Poisoning Treated?

No antidote exists for ricin. Ricin poisoning is treated by giving the victim supportive medical care to minimize the effects of the poisoning. The types of supportive medical care would depend on several factors, such as the route by which the victim was poisoned (that is, by inhalation, ingestion, or injection). Care could include such measures as helping the victim breathe and giving him or her intravenous fluids and medications to treat swelling.

How Do We Know for Sure Whether People Have Been Exposed to Ricin?

If we suspect that people have inhaled ricin, a possible clue would be that a large number of people who had been close to each other suddenly developed fever, cough, and excess fluid in their lungs. These symptoms could be followed by severe breathing problems and possibly death. No widely available, reliable test exists to confirm that a person has been exposed to ricin.

What Can People Do If They Think They May Have Been Exposed to Ricin?

Unintentional ricin poisoning is highly unlikely. CDC has no reports of intentional ricin poisoning. If people think they might have been exposed to ricin, however, they should contact the regional poison control center at 1-800-222-1222.

How Can People Get More Information About Ricin?

They can contact one of the following:

Regional poison control center (1-800-222-1222)

Centers for Disease Control and Prevention Public Response Hotline (CDC) English (888) 246-2675 Español (888) 246-2857 TTY (866) 874-2646

<http://www.bt.cdc.gov/agent/ricin/index.asp>

Sarin

What is sarin?

Sarin is a human-made chemical warfare agent classified as a nerve agent. Nerve agents are the most toxic and rapidly acting of the known chemical warfare agents. They are similar to certain kinds of pesticides (insect killers) called organophosphates in terms of how they work and what kind of harmful effects they cause. However, nerve agents are much more potent than organophosphate pesticides. Sarin originally was developed in 1938 in Germany as a pesticide. Sarin is a clear, colorless, and tasteless liquid that has no odor in its pure form. However, sarin can evaporate into a vapor (gas) and spread into the environment. Sarin is also known as GB.

Where is sarin found and how it is used?

Sarin and other nerve agents may have been used in chemical warfare during the Iran-Iraq War in the 1980s. Sarin was used in two terrorist attacks in Japan in 1994 and 1995. Sarin is not found naturally in the environment.

How can people be exposed to sarin?

Following release of sarin into the air, people can be exposed through skin contact or eye contact. They can also be exposed by breathing air that contains sarin. Sarin mixes easily with water, so it could be used to poison water. Following release of sarin into water, people can be exposed by touching or drinking water that contains sarin. Following contamination of food with sarin, people can be exposed by eating the contaminated food. A person's clothing can release sarin for about 30 minutes after it has come in contact with sarin vapor, which can lead to exposure of other people. Because sarin breaks down slowly in the body, people who are repeatedly exposed to sarin may suffer more harmful health effects. Because sarin vapor is heavier than air, it will sink to low-lying areas and create a greater exposure hazard there.

How does sarin work?

The extent of poisoning caused by sarin depends on the amount of sarin to which a person was exposed, how the person was exposed, and the length of time of the exposure. Symptoms will appear within a few seconds after exposure to the vapor form of sarin and within a few minutes up to 18 hours after exposure to the liquid form. All the nerve agents cause their toxic effects by preventing the proper operation of the chemical that acts as the body's off switch for glands and muscles. Without an off switch, the glands and muscles are constantly being stimulated. They may tire and no longer be able to sustain breathing function. Sarin is the most volatile of the nerve agents, which means that it can easily and quickly evaporate from a liquid into a vapor and spread into the environment. People can be exposed to the vapor even if they do not come in contact with the liquid form of sarin. Because it evaporates so quickly, sarin presents an immediate but short-lived threat.

What are the immediate signs and symptoms of sarin exposure?

People may not know that they were exposed because sarin has no odor. People exposed to a low or moderate dose of sarin by breathing contaminated air, eating contaminated food, drinking contaminated water, or touching contaminated surfaces may experience some or all of the following symptoms within seconds to hours of exposure:

- Runny nose
- Watery eyes
- Small, pinpoint pupils
- Eye pain
- Blurred vision
- Drooling and excessive sweating
- Cough
- Chest tightness
- Rapid breathing
- Diarrhea
- Increased urination
- Confusion
- Drowsiness
- Weakness
- Headache
- Nausea, vomiting, and/or abdominal pain
- Slow or fast heart rate
- Low or high blood pressure

Even a small drop of sarin on the skin can cause sweating and muscle twitching where sarin touched the skin. Exposure to large doses of sarin by any route may result in the following harmful health effects:

- Loss of consciousness
- Convulsions
- Paralysis
- Respiratory failure possibly leading to death

Showing these signs and symptoms does not necessarily mean that a person has been exposed to sarin.

What are the long-term health effects?

Mild or moderately exposed people usually recover completely. Severely exposed people are not likely to survive. Unlike some organophosphate pesticides, nerve agents have not been associated with neurological problems lasting more than 1 to 2 weeks after the exposure.

How can people protect themselves and what should they do if they are exposed to sarin?

Recovery from sarin exposure is possible with treatment, but the antidotes available must be used quickly to be effective. Therefore, the best thing to do is avoid exposure:

- Leave the area where the sarin was released and get to fresh air. Quickly moving to an area where fresh air is available is highly effective in reducing the possibility of death from exposure to sarin vapor.
- If the sarin release was outdoors, move away from the area where the sarin was released. Go to the highest ground possible, because sarin is heavier than air and will sink to low-lying areas.
- If the sarin release was indoors, get out of the building.
- If people think they may have been exposed, they should remove their clothing, rapidly wash their entire body with soap and water, and get medical care as quickly as possible.

Removing and disposing of clothing:

Quickly take off clothing that has liquid sarin on it. Any clothing that has to be pulled over the head should be cut off the body instead of pulled over the head. If possible, seal the clothing in a plastic bag. Then seal the first plastic bag in a second plastic bag. Removing and sealing the clothing in this way will help protect people from any chemicals that might be on their clothes. If clothes were placed in plastic bags, inform either the local or state health department or emergency personnel upon their arrival. Do not handle the plastic bags. If helping other people remove their clothing, try to avoid touching any contaminated areas, and remove the clothing as quickly as possible.

Washing the body:

As quickly as possible, wash any liquid sarin from the skin with large amounts of soap and water. Washing with soap and water will help protect people from any chemicals on their bodies. Rinse the eyes with plain water for 10 to 15 minutes if they are burning or if vision is blurred. If sarin has been swallowed, do not induce vomiting or give fluids to drink. Seek medical attention immediately. Dial 911 and explain what has happened.

How is sarin exposure treated?

Treatment consists of removing sarin from the body as soon as possible and providing supportive medical care in a hospital setting. Antidotes are available for sarin. They are most useful if given as soon as possible after exposure.

How can people get more information about sarin?

People can contact one of the following:

- Regional poison control center (1-800-222-1222)
- Centers for Disease Control and Prevention
Public Response Hotline (CDC) English (888) 246-2675 Español (888) 246-2857
TTY (866) 874-2646

<http://www.bt.cdc.gov/agent/sarin/basics/facts.asp>

Smallpox

The Disease

Smallpox is a serious, contagious, and sometimes fatal infectious disease. There is no specific treatment for smallpox disease, and the only prevention is vaccination. The name *smallpox* is derived from the Latin word for “spotted” and refers to the raised bumps that appear on the face and body of an infected person.

There are two clinical forms of smallpox. Variola major is the severe and most common form of smallpox, with a more extensive rash and higher fever. There are four types of variola major smallpox: ordinary (the most frequent type, accounting for 90% or more of cases); modified (mild and occurring in previously vaccinated persons); flat; and hemorrhagic (both rare and very severe). Historically, variola major has an overall fatality rate of about 30%; however, flat and hemorrhagic smallpox usually are fatal. Variola minor is a less common presentation of smallpox, and a much less severe disease, with death rates historically of 1% or less.

Smallpox outbreaks have occurred from time to time for thousands of years, but the disease is now eradicated after a successful worldwide vaccination program. The last case of smallpox in the United States was in 1949. The last naturally occurring case in the world was in Somalia in 1977. After the disease was eliminated from the world, routine vaccination against smallpox among the general public was stopped because it was no longer necessary for prevention.

Where Smallpox Comes From

Smallpox is caused by the variola virus that emerged in human populations thousands of years ago. Except for laboratory stockpiles, the variola virus has been eliminated. However, in the aftermath of the events of September and October, 2001, there is heightened concern that the variola virus might be used as an agent of bioterrorism. For this reason, the U.S. government is taking precautions for dealing with a smallpox outbreak.

Transmission

Generally, direct and fairly prolonged face-to-face contact is required to spread smallpox from one person to another. Smallpox also can be spread through direct contact with infected bodily fluids or contaminated objects such as bedding or clothing. Rarely, smallpox has been spread by virus carried in the air in enclosed settings such as buildings, buses, and trains. Humans are the only natural hosts of variola. Smallpox is not known to be transmitted by insects or animals.

A person with smallpox is sometimes contagious with onset of fever (prodrome phase), but the person becomes most contagious with the onset of rash. At this stage the infected person is usually very sick and not able to move around in the community. The infected person is contagious until the last smallpox scab falls off.

Smallpox Disease	
Incubation Period (Duration: 7 to 17 days) Not contagious	Exposure to the virus is followed by an incubation period during which people do not have any symptoms and may feel fine. This incubation period averages about 12 to 14 days but can range from 7 to 17 days. During this time, people are not contagious.
Initial Symptoms (Prodrome) (Duration: 2 to 4 days) Sometimes contagious*	The first symptoms of smallpox include fever, malaise, head and body aches, and sometimes vomiting. The fever is usually high, in the range of 101 to 104 degrees Fahrenheit. At this time, people are usually too sick to carry on their normal activities. This is called the <i>prodrome</i> phase and may last for 2 to 4 days.
Early Rash (Duration: about 4 days) Most contagious Rash distribution:	A rash emerges first as small red spots on the tongue and in the mouth. These spots develop into sores that break open and spread large amounts of the virus into the mouth and throat. At this time, the person becomes most contagious . Around the time the sores in the mouth break down, a rash appears on the skin, starting on the face and spreading to the arms and legs and then to the hands and feet. Usually the rash spreads to all parts of the body within 24 hours. As the rash appears, the fever usually falls and the person may start to feel better. By the third day of the rash, the rash becomes raised bumps. By the fourth day, the bumps fill with a thick, opaque fluid and often have a depression in the center that looks like a bellybutton. (This is a major distinguishing characteristic of smallpox.) Fever often will rise again at this time and remain high until scabs form over the bumps.
Pustular Rash (Duration: about 5 days) Contagious	The bumps become pustules -sharply raised, usually round and firm to the touch as if there's a small round object under the skin. People often say the bumps feel like BB pellets embedded in the skin.
Pustules and Scabs (Duration: about 5 days) Contagious	The pustules begin to form a crust and then scab . By the end of the second week after the rash appears, most of the sores have scabbed over.
Resolving Scabs (Duration: about 6 days) Contagious	The scabs begin to fall off; leaving marks on the skin that eventually becomes pitted scars . Most scabs will have fallen off three weeks after the rash appears. The person is contagious to others until all of the scabs have fallen off.
Scabs resolved Not contagious	Scabs have fallen off. Person is no longer contagious.

*Smallpox may be contagious during the *prodrome* phase, but is most infectious during the first 7 to 10 days following rash onset.

<http://www.bt.cdc.gov/agent/smallpox/overview/disease-facts.asp>

Sulfur Mustard

What is sulfur mustard?

Sulfur mustard is a type of chemical warfare agent. These kinds of agents are called vesicants or blistering agents, because they cause blistering of the skin and mucous membranes on contact. Sulfur mustard is also known as “mustard gas or mustard agent,” or by the military designations H, HD, and HT. Sulfur mustard sometimes smells like garlic, onions, or mustard and sometimes has no odor. It can be a vapor (the gaseous form of a liquid), an oily-textured liquid, or a solid. Sulfur mustard can be clear to yellow or brown when it is in liquid or solid form.

Where is sulfur mustard found and how is it used?

Sulfur mustard is not found naturally in the environment. Sulfur mustard was introduced in World War I as a chemical warfare agent. Until recently, it was available for use in the treatment of a skin condition called psoriasis. Currently, it has no medical use.

How can people be exposed to sulfur mustard?

If sulfur mustard is released into the air as a vapor, people can be exposed through skin contact, eye contact, or breathing. Sulfur mustard vapor can be carried long distances by wind. If sulfur mustard is released into water, people can be exposed by drinking the contaminated water or getting it on their skin. People can be exposed by coming in contact with liquid sulfur mustard. Sulfur mustard can last from 1 to 2 days in the environment under average weather conditions and from weeks to months under very cold conditions. Sulfur mustard breaks down slowly in the body, so repeated exposure may have a cumulative effect (that is, it can build up in the body).

How does sulfur mustard work?

Adverse health effects caused by sulfur mustard depend on the amount people are exposed to, the route of exposure, and the length of time that people are exposed. Sulfur mustard is a powerful irritant and blistering agent that damages the skin, eyes, and respiratory (breathing) tract. It damages DNA, a vital component of cells in the body. Sulfur mustard vapor is heavier than air, so it will settle in low-lying areas.

What are the immediate signs and symptoms of sulfur mustard exposure?

Exposure to sulfur mustard is usually not fatal. When sulfur mustard was used during World War I, it killed fewer than 5% of the people who were exposed and got medical care. People may not know right away that they have been exposed, because sulfur mustard often has no smell or has a smell that might not cause alarm. Typically, signs and symptoms do not occur immediately. Depending on the severity of the exposure, symptoms may not occur for 2 to 24 hours. Some people are more sensitive to sulfur mustard than are other people, and may have symptoms sooner.

Sulfur mustard can have the following effects on specific parts of the body:

- *Skin*: redness and itching of the skin may occur 2 to 48 hours after exposure and change eventually to yellow blistering of the skin.
- *Eyes*: irritation, pain, swelling, and tearing may occur within 3 to 12 hours of a mild to moderate exposure. A severe exposure may cause symptoms within 1 to 2 hours and may include the symptoms of a mild or moderate exposure plus light sensitivity, severe pain, or blindness (lasting up to 10 days).
- *Respiratory tract*: runny nose, sneezing, hoarseness, bloody nose, sinus pain, shortness of breath, and cough within 12 to 24 hours of a mild exposure and within 2 to 4 hours of a severe exposure.
- *Digestive tract*: abdominal pain, diarrhea, fever, nausea, and vomiting.

Showing these signs and symptoms does not necessarily mean that a person has been exposed to sulfur mustard.

What may be the long-term health effects?

Exposure to sulfur mustard liquid is more likely to produce second- and third-degree burns and later scarring than is exposure to sulfur mustard vapor. Extensive skin burning can be fatal. Extensive breathing in of the vapors can cause chronic respiratory disease, repeated respiratory infections, or death. Extensive eye exposure can cause permanent blindness. Exposure to sulfur mustard may increase a person's risk for lung and respiratory cancer.

How can people protect themselves and what should they do if they are exposed to sulfur mustard?

Because no antidote exists for sulfur mustard exposure, the best thing to do is avoid it. Immediately leave the area where the sulfur mustard was released. Try to find higher ground, because sulfur mustard is heavier than air and will settle in low-lying areas.

If avoiding sulfur mustard exposure is not possible, rapidly remove the sulfur mustard from the body. Getting the sulfur mustard off as soon as possible after exposure is the only effective way to prevent or decrease tissue damage to the body.

Quickly remove any clothing that has liquid sulfur mustard on it. If possible, seal the clothing in a plastic bag, and then seal that bag inside a second plastic bag.

Immediately wash any exposed part of the body (eyes, skin, etc.) thoroughly with plain, clean water. Eyes need to be flushed with water for 5 to 10 minutes. Do NOT cover eyes with bandages, but do protect them with dark glasses or goggles.

If someone has ingested sulfur mustard, do NOT induce vomiting. Give the person milk to drink.

Seek medical attention right away. Dial 911 and explain what has happened.

How is sulfur mustard exposure treated?

The most important factor is removing sulfur mustard from the body. Exposure to sulfur mustard is treated by giving the victim supportive medical care to minimize the effects of the exposure. Though no antidote exists for sulfur mustard, exposure is usually not fatal.

<http://www.bt.cdc.gov/agent/sulfurmustard/basics/facts.asp>

VX

What is VX?

VX is a human-made chemical warfare agent classified as a nerve agent. Nerve agents are the most toxic and rapidly acting of the known chemical warfare agents. They are similar to pesticides (insect killers) called organophosphates in terms of how they work and what kinds of harmful effects they cause. However, nerve agents are much more potent than organophosphate pesticides. VX was originally developed in the United Kingdom in the early 1950s. VX is odorless and tasteless. VX is an oily liquid that is amber in color and very slow to evaporate. It evaporates about as slowly as motor oil.

Where is VX found and how it is used?

It is possible that VX or other nerve agents were used in chemical warfare during the Iran-Iraq War in the 1980s. VX is not found naturally in the environment.

How can people be exposed to VX?

Following release of VX into the air, people can be exposed through skin contact, eye contact, or inhalation (breathing in the VX mist). Though VX does not mix with water as easily as other nerve agents do, it could be released into water. Following release of VX into water, people can be exposed by drinking contaminated water or getting contaminated water on their skin. Following contamination of food with VX, people can be exposed by eating the contaminated food. VX is primarily a liquid exposure hazard, but if it is heated to very high temperatures, it can turn into small amounts of vapor (gas). A person's clothing can release VX for about 30 minutes after contact with VX vapor, which can lead to exposure of other people. VX breaks down slowly in the body, meaning that repeated exposures to VX and/or other nerve agents can have a cumulative effect (build up in the body). Because VX vapor is heavier than air, it will sink to low-lying areas and create a greater exposure hazard there.

How does VX work?

The extent of poisoning caused by VX depends on the amount of VX to which a person was exposed, how the person was exposed, and the length of time of the exposure. Symptoms will appear within a few seconds after exposure to the vapor form of VX, and within a few minutes to up to 18 hours after exposure to the liquid form. VX is the most potent of all nerve agents. Compared with the nerve agent sarin (also known as GB), VX is considered to be much more toxic by entry through the skin and somewhat more toxic by inhalation. It is possible that any visible VX liquid contact on the skin, unless washed off immediately, would be lethal. All the nerve agents cause their toxic effects by preventing the proper operation of the chemical that acts as the body's off switch for glands and muscles. Without an off switch, the glands and muscles are constantly being stimulated. They may tire and no longer be able to sustain breathing function.

VX is the least volatile of the nerve agents, which means that it is the slowest to evaporate from a liquid into a vapor. Therefore, VX is very persistent in the environment. Under average weather conditions, VX can last for days on objects

that it has come in contact with. Under very cold conditions, VX can last for months. Because it evaporates so slowly, VX can be a long-term threat as well as a short-term threat. Surfaces contaminated with VX should therefore be considered a long-term hazard.

What are the immediate signs and symptoms of VX exposure?

People may not know they were exposed to VX because it has no odor. People exposed to a low or moderate dose of VX by inhalation, ingestion (swallowing), or skin absorption may experience some or all of the following symptoms within seconds to hours of exposure:

- Runny nose
- Watery eyes
- Small, pinpoint pupils
- Eye pain
- Blurred vision
- Drooling and excessive sweating
- Cough
- Chest tightness
- Rapid breathing
- Diarrhea
- Increased urination
- Confusion
- Drowsiness
- Weakness
- Headache
- Nausea, vomiting, and/or abdominal pain
- Slow or fast heart rate
- Abnormally low or high blood pressure

Even a tiny drop of nerve agent on the skin can cause sweating and muscle twitching where the agent touched the skin. Exposure to a large dose of VX by any route may result in these additional health effects:

- Loss of consciousness
- Convulsions
- Paralysis
- Respiratory failure possibly leading to death

Showing these signs and symptoms does not necessarily mean that a person has been exposed to VX.

What are the long-term health effects?

Mild or moderately exposed people usually recover completely. Severely exposed people are not likely to survive. Unlike some organophosphate pesticides, nerve agents have not been associated with neurological problems lasting more than 1 to 2 weeks after the exposure.

How can people protect themselves and what should they do if they are exposed to VX?

Recovery from VX exposure is possible with treatment, but the antidotes available must be used quickly to be effective. Therefore, the best thing to do is avoid exposure:

- Leave the area where the VX was released and get to fresh air. Quickly moving to an area where fresh air is available is highly effective in reducing the possibility of death from exposure to VX vapor.
- If the VX release was outdoors, move away from the area where the VX was released. Go to the highest ground possible, because VX is heavier than air and will sink to low-lying areas.
- If the VX release was indoors, get out of the building. If people think they may have been exposed, they should remove their clothing, rapidly wash their entire body with soap and water, and get medical care as quickly as possible.

Removing and disposing of clothing:

Quickly take off clothing that has liquid VX on it.

- Any clothing that has to be pulled over the head should be cut off the body instead of pulled over the head.
- If possible, seal the clothing in a plastic bag. Then seal the first plastic bag in a second plastic bag. Removing and sealing the clothing in this way will help protect people from any chemicals that might be on their clothes.
- If clothes were placed in plastic bags, inform either the local or state health department or emergency personnel upon their arrival. Do not handle the plastic bags.
- If helping other people remove their clothing, try to avoid touching any contaminated areas, and remove the clothing as quickly as possible.

Washing the body:

As quickly as possible, wash any liquid VX from the skin with large amounts of soap and water. Washing with soap and water will help protect people from any chemicals on their bodies. Rinse the eyes with plain water for 10 to 15 minutes if they are burning or if vision is blurred.

If VX has been ingested (swallowed), do not induce vomiting or give fluids to drink.

Seek medical attention right away. Dial 911 and explain what has happened.

How is VX exposure treated?

Treatment consists of removing VX from the body as soon as possible and providing supportive medical care in a hospital setting. Antidotes are available for VX. They are most useful if given as soon as possible after exposure.

<http://www.bt.cdc.gov/agent/vx/index.asp>

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Santa Clara County Public Health Department	
Public Health Administration	
General Information (Referral Line)	408-423-0700
Administration	408-423-0701
TDD Line	408-423-0789
Health Officer	408-423-0707
Emergency Medical Services	
Emergency Medical Services Agency (EMS)	408-885-4250
Health Planning and Evaluation Division	
Epidemiology & Data Management	408-423-0736
Immunization Registry Information System (IRIS)	408-793-2030
Partnership for the Public's Health (PPH)	408-423-0716
PHD - Support Advisory Committee (PHD-SAC)	408-423-0701
Strategic Planning and Evaluation (Community & Departmental)	408-423-0701
Vital Records (Birth and Death Certificates)	408-885-2010
Health Promotion Division	
Adolescent Family Life Program/Cal Learn (AFLP)	408-792-5070
Adolescent Pregnancy Prevention Network (APPN)	408-885-4156
Adolescent Pregnancy Prevention Program (APPP)	408-792-5070
Black Infant Health (BIH)	408-792-5055
California Children Services (CCS)	408-793-6200
Child Health and Disability Prevention Program (CHDP)	408-494-7800
Comprehensive Perinatal Services Program (CPSP)	408-792-5055
Immunization Program and Clinics (IZ)	408-792-5200
Maternal and Child Health Referral Line	800-310-2332
Maternal, Child and Adolescent Health (MCAH)	408-792-5055
Sickle Cell Counseling	408-792-5101
Women, Infant and Children (WIC)	408-792-5101
Health Protection Division	
AIDS Testing at the Crane Center	408-885-7000
Childhood Lead Poisoning Prevention Program (CLPPP)	408-494-7820
Communicable Disease Prevention	408-885-4214

Santa Clara County Public Health Department	
and Control	
HIV/AIDS Prevention & Control Program (HAP)	408-494-7870
Public Health Laboratory	408-885-4272
Public Health Pharmacy	408-792-5169
Tobacco Prevention and Education Program (TPEP)	408-494-7830
Traffic Safe Communities Network (TSCN)	408-494-7850
Tuberculosis (TB) Prevention and Control Program	408-793-6762
Violence Prevention Program (VPP)	408-494-7840
Regional Public Health Offices	
North County (Region 1)	408-992-4900
East Valley (Region 2)	408-926-7920
Downtown (Region 3)	408-792-5020
West Valley (Region 4)	408-874-5000
Narvaez (Region 5)	408-299-4305
South County (Region 6)	408-683-4697

County of Santa Clara
Employee Services Agency
Occupational Safety and Environmental Compliance
2310 North First Street
San Jose, California, 95131
408-441-4280

Centers for Disease Control and Prevention (CDC).
1600 Clifton Rd.
Atlanta, GA 30333
U.S.A
(404) 639-3311

Public Inquiries
(404) 639-3534
(800) 311-3435

<http://www.cdc.gov/health/diseases.htm>

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