

What is hantavirus pulmonary syndrome (HPS)?

HPS is a severe respiratory illness caused by hantaviruses spread by rodents. The disease was first identified in 1993. The mortality rate for patients with HPS is between 30% and 40%.

Who is at risk for HPS?

Anyone who comes into contact with rodents that carry hantavirus is at risk of HPS. Rodent infestation in and around the home remains the primary risk of exposure. People are more at risk of being exposed to rodent infestation when opening or cleaning cabins, sheds and outbuildings that have been closed during the winter, especially in rural settings. Camping or hiking near rodent habitats also can expose people to HPS.

What are the symptoms of HPS?

Early symptoms may include fatigue; fever; muscle aches, especially in the large muscle groups such as the thighs, hips and back; headache; dizziness; chills; abdominal pain; nausea; vomiting; and diarrhea. The disease progresses into more severe and sometimes fatal respiratory symptoms within four to 10 days of the initial phase of the illness. These symptoms include coughing and shortness of breath as the lungs begin to fill with fluid.

How soon do symptoms appear?

Symptoms may develop between one to six weeks after exposure to urine, droppings or saliva of infected rodents.

How is HPS spread?

The deer mouse is a primary carrier of the virus in North Dakota. The virus is spread in rodent urine, droppings and saliva. When fresh rodent urine, droppings or nesting materials are stirred up, tiny droplets containing the virus get into the air, or become "aerosolized." People normally become infected when they breathe in air contaminated with the virus.

When and for how long is a person able to spread the disease?

The types of hantaviruses that cause HPS in the United States are not spread from person-to-person.

How is a person diagnosed?

HPS is diagnosed by testing blood and tissues in the laboratory.

What is the treatment?

There is no specific treatment for HPS. Early recognition and intensive, supportive care therapy is used to treat patients during periods of severe respiratory distress.

Does past infection make a person immune?

It is not known if a past infection will make a person immune for life.

Should children or others be excluded from child care, school, work or other activities if they have HPS?

No. Unless the staff determines the child is unwilling or unable to participate in activities or the staff determines that they cannot care for the child without compromising the health and safety of the other children in the group.

All others can attend work and other functions as long as they are well enough to do so.

Anyone who feels they were exposed to rodents or rodent infestation at work or any location should notify local public health officials.

What can be done to prevent the spread of HPS?

I. Prevention Inside and Outside the Home

Indoors

- Keep a clean home, especially the kitchen (wash dishes, remove leftover or spilled food from cooking and eating areas and floors and keep food and water covered and stored in rodent-proof containers).
- Keep pet food covered and stored in rodent-proof containers; don't leave food or water out overnight.
- Store garbage in containers with tight-fitting lids. Dispose of garbage on a frequent basis and pick up or eliminate clutter.
- Seal all entry holes ¼-inch wide or wider with patching materials such as lath screen, cement, wire screening, etc., inside and out.
- Use spring-loaded traps in the home. Place the trap perpendicular to the baseboard or wall surface, with the bait closest to the baseboard or wall. Place traps in areas where rodents might be entering the home.
- Examine traps regularly. To dispose of traps or trapped animals:
 - Wear rubber, latex, vinyl or nitrile gloves.
 - Spray the dead rodent with a disinfectant or bleach solution. (See Section IV)
 - Double-bag the rodent and dispose in a covered trash can that is emptied regularly.
 - Disinfect gloves *before taking them off* with disinfectant. Remove the disinfected gloves and wash hands with warm, soapy water for a minimum of 20 seconds.
 - If the trap will be reused, immerse and wash the trap in a disinfectant or bleach solution.
- For severe or persistent infestations, contact a pest-control professional for rodent eradication or a building contractor for rodent exclusion (rodent proofing).

Outdoors

- Elevate hay, woodpiles and garbage cans to eliminate possible nesting sites. If possible, locate them 100 feet or more from your house.
- Clear brush, grass, abandoned vehicles, tires, brick piles, etc., from around the house to eliminate a source of nesting materials.
- Store grains and animal feed in rodent-proof containers.
- Dispose of garbage in rodent-proof containers with tight-fitting lids.
- Place spring-loaded traps in outbuildings (regardless of their distance from the home) and in areas that might likely serve as rodent shelter within 100 feet around the home.

II. Common Signs of Rodent Infestation

- Look for droppings near places where food is stored, such as in cupboards and drawers or in bins.
- Storage rooms with boxes, bags and old furniture make ideal nesting sites for rodents.
- Worksites such as warehouses and restaurants can be common sites of rodent infestations.
- Common rodent nest materials include shredded paper, bunches of dry grass or small twigs, fabric and furniture stuffing.
- Look for food boxes, containers or food itself that appears to be nibbled. Check for droppings nearby.
- Look for evidence of gnawed wood, paper board, cloth sacks and other materials.
- Check for a musky odor in closed-up rooms.

III. Cleanup of Rodents, Rodent Urine and Droppings, Rodent Nests and Contaminated Surfaces

- Wear rubber, latex, vinyl or nitrile gloves.
- **Do not** vacuum or sweep rodent urine, droppings, contaminated surfaces or nesting material. This action may stir up and aerosolize the viral particles.
- Thoroughly wet contaminated area with a detergent or bleach solution; let soak for five minutes or according to manufacturer's directions.

- Once everything is wet, remove contaminated materials with disposable paper towels. Then mop or sponge the area with a disinfectant.
 - Mop floors with a disinfectant or bleach solution.
 - Disinfect countertops, cabinets, drawers and other durable surfaces with a disinfectant or chlorine solution.
 - Spray dirt floors with a disinfectant or chlorine solution.
 - Disinfect carpets, rugs and upholstered furniture with a disinfectant or with a commercial-grade steam cleaner or shampoo.
 - Launder potentially contaminated bedding and clothing with hot water and detergent. Use gloves when handling contaminated laundry. Machine-dry laundry on a high setting.
- Spray any dead rodents with a disinfectant or bleach solution, then double-bag with all cleaning materials and dispose in a covered trash can that is emptied regularly.
- Before removing rubber gloves, clean them with disinfectant or soap and water. After removing the clean gloves, thoroughly wash hands with soap and warm water.
- If cleaning in a home where HPS has been identified or in building with heavy rodent infestation, additional personal protective gear should be worn, including coveralls (disposable, if possible), rubber boots or disposable shoe covers, rubber gloves, protective goggles and an appropriate respiratory protection device with high-efficiency particulate air (HEPA) filter. Always decontaminate personal protective gear at the end of each day.
- For severe or persistent infestations, contact a pest-control professional for rodent eradication or a building contractor for rodent exclusion (rodent proofing).

IV. Disinfecting Solutions

Most general-purpose household disinfectants and household detergents are effective. Prepare according to the label directions. A bleach solution freshly prepared by mixing **1½ cups of household bleach in one gallon of water (10 percent bleach)** may be used in place of a commercial disinfectant.

V. Cleaning Sheds and Other Outbuildings

Before cleaning closed sheds and other outbuildings, ventilate the building by opening doors and windows for at least 30 minutes. Use cross ventilation if possible. Leave the area during the airing-out period. This airing helps to remove infectious primary aerosols that might be created when hantavirus-infected rodents urinate. For severe or persistent infestations, contact a pest-control professional for rodent eradication or a building contractor for rodent exclusion (rodent proofing).

Additional Information

Additional information is available by calling the North Dakota Department of Health at 800.472.2180.

This disease is a reportable condition. As mandated by North Dakota law, any incidence of this disease shall be reported to the North Dakota Department of Health.

Resources:

1. American Academy of Pediatrics. [Children in Out-Of-Home Child Care]. In: Kimberlin DW, Brady MT, Jackson MA, Long SS, eds. *Red Book: 2018 Report of the Committee on Infectious Diseases*. 31st ed. Itasca, IL: American Academy of Pediatrics; 2018:[pages 122-136].
2. American Academy of Pediatrics. [Hantavirus Pulmonary Syndrome]. In: Kimberlin DW, Brady MT, Jackson MA, Long SS, eds. *Red Book: 2018 Report of the Committee on Infectious Diseases*. 31st ed. Itasca, IL: American Academy of Pediatrics; 2018:[pages 375-378].
3. Heymann, D. L. (2015). *Control of Communicable Diseases Manual, 20th Edition*. Hantaviral Diseases. American Public Health Association. 2015: 245-249.
4. Centers for Disease Control and Prevention. (2013). Hantavirus. www.cdc.gov/hantavirus/index.html.