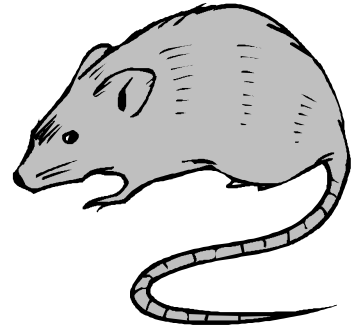


HANTAVIRUS PULMONARY SYNDROME (HPS)

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WHAT IS HPS?

Hantavirus pulmonary syndrome (HPS, commonly referred to as Hantavirus disease) is a disease transmitted by Hantavirus-infected rodents that causes flu-like symptoms in humans. Early signs of HPS include fever, chills, muscle soreness, headache, dry cough, nausea, vomiting and gastrointestinal symptoms. As HPS develops, the victim experiences an increased respiration rate caused by seepage of fluid into the lungs. The initial shortness of breath is subtle and the victim may be unaware of it, but progression is rapid and ultimately results in respiratory failure.



Hantavirus has probably been in the United States for many years, though it was not diagnosed until recently. In May 1993, an outbreak of an unexplained pulmonary illness occurred in the “Four Corners” region of the Southwestern United States shared by Arizona, New Mexico, Colorado and Utah. Several people within that region had all died after acute respiratory failure. In November 1993, scientists isolated the specific hantavirus that caused the outbreak. The new virus was called *Muerto Canyon* virus and was later changed to *Sin Nobre* virus (SNV). The new disease caused by the virus was named Hantavirus pulmonary syndrome.

HOW IS HPS TRANSMITTED?

Several species of rural-habitat rodents in the United States carry Hantaviruses that cause HPS in humans, including the deer mouse, cotton rat, rice rat and white-footed mouse. Other rodents carry strains of hantavirus that cause HPS, but they have not yet been identified. Rodents shed the virus in their urine, droppings and saliva. The virus is mainly transmitted to people when they breathe air contaminated with the virus. There are several other ways rodents may spread hantavirus to people:

- A rodent with the virus bites someone; the virus may spread to that person. This type of transmission is rare.
- A person touches something that has been contaminated with the virus, such as rodent urine, droppings or saliva, and the person then touches his or her nose or mouth.
- A person eats food contaminated by urine, droppings or saliva from an infected rodent.

Common Hantaviruses and their Rodent Hosts

Sin Nobre virus – Deer mouse
(*Peromyscus maniculatus*)

New York virus – White-footed mouse
(*Peromyscus leucopus*)

Black Creek Canal virus – Cotton rat
(*Sigmodon hispidus*)

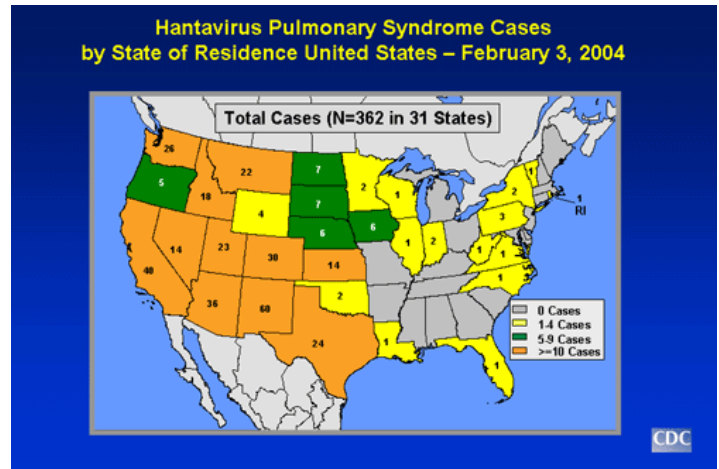
Bayou virus – Rice rat (*Oryzomys palustris*)

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

The Hantaviruses that cause HPS in the United States are not known to be transmitted by any types of animals other than certain species of rodents. Hantavirus is not spread from farm animals, such as cows, chickens or sheep, or from insects, such as mosquitoes. Dogs and cats are not known to carry Hantavirus; though they may bring infected rodents into close contact with people if they catch rodents and bring them home. Guinea pigs, hamsters, gerbils and rodents from pet stores are known to carry hantavirus.

WHERE IS HANTAVIRUS FOUND?

Since the Hantavirus was found in 1993, more than 360 cases of HPS have been reported in the United States. Thirty-eight percent of all reported cases have resulted in death. Cases have been reported in 31 states, including most of the Western half of the country and some Eastern states. According to the Centers for Disease Control and Prevention, Hantavirus has been found in at least 20 national parks. More than half of the confirmed cases have been reported from areas outside the Four Corners area. Cases of HPS stemming from related Hantaviruses have also been documented in Argentina, Brazil, Canada, Chile, Paraguay and Uruguay, making HPS a pan-hemispheric disease.



About 70 percent of victims who contract HPS reside in rural areas, where known species of Hantavirus-carrying species of rodents live. Of persons ill with HPS, 62 percent are male and 38 percent are female. One explanation for this trend is that males are more likely to work in occupations or perform activities that put them in closer proximity to rodent habitats.

WHO'S AT RISK?

Anyone who comes into contact with rodents that carry hantavirus is at risk of developing HPS, regardless of good health. Hantavirus is spread when virus-containing particles from rodent urine, droppings or saliva are stirred into the air and are breathed into the lungs. Thus, any activity that puts you in contact with these particles is risky. The chance of being exposed to hantavirus is greatest when people work, play or live in closed spaces where rodents are actively living. Based on documented cases of HPS, victims with potential occupational exposures include grain farmers, livestock specialists, field biologists, and agricultural, mill, construction, utility and feedlot workers.

Caution is warranted when opening and cleaning previously unused buildings (especially in rural areas), and when performing housecleaning activities where rodents take shelter. Others at risk include construction, utility and pest control workers who work in crawl spaces, under houses or in vacant buildings that may have a rodent population. Campers and hikers may also be exposed when they use infested trail shelters or camp in other rodent habitats. However, travel to and within all areas where hantavirus infection has been reported is not considered a risk factor for infection with HPS. The possibility of exposure to Hantavirus for campers, hikers and tourists is very small and is reduced further if steps are taken to reduce rodent contact.

Hantavirus infection has been associated with the following situations:

- Increasing numbers of host rodents in human dwellings
- Occupying or cleaning previously vacant cabins or other dwellings that are actively infested with rodents
- Cleaning barns and other outbuildings
- Disturbing excreta or rodent nests around the home or workplace
- Residing in or visiting areas where substantial increases have occurred in numbers of host rodents or numbers of hantavirus-infected host rodents
- Handling mice without gloves

- Keeping captive wild rodents as pets or research subjects
- Handling equipment or machinery that has been in storage
- Disturbing excreta in rodent-infested areas while hiking or camping
- Sleeping on the ground
- Hand plowing or planting

IS THERE A VACCINE?

No specific treatment, cure or vaccine is currently available to prevent Hantavirus infection. However, early detection and symptomatic treatment of hantavirus infection is beneficial to victims. The earlier the victim is brought to intensive care, the better. In intensive care, patients are given oxygen therapy to help them through the period of severe respiratory distress. If a victim is experiencing full distress, it is less likely the treatment will be effective.

HOW CAN I PROTECT AGAINST HPS?

In order to protect yourself, family members and workers from contracting the Hantavirus that causes HPS, precautions should be taken to: 1) Eliminate rodents, and their habitats and food sources inside and outside your home; 2) Limit occupational and recreational exposure to rodents; and 3) Clean up rodent-contaminated areas and dead rodents.

Rodent control in and around the home is the primary strategy in preventing hantavirus infection. The interior and exterior of the home should be carefully inspected at least twice per year for any openings where rodents can enter the home and for conditions that support rodent activity.

Precautions for Inside the Home

- Identify and seal all gaps and holes inside and outside of the home that are larger than ¼-inch diameter. Look behind, inside and underneath kitchen cabinets, around floor vents and dryer vents, around the fireplace, and around all pipes that come from outside the home.
- Keep food and water covered and stored in rodent-proof containers made of thick plastic, glass or metal that have tight-fitting lids.
- Keep pet food covered and stored in rodent-proof containers. Allow pets only enough food for each meal, then store or discard any remaining food. Do not leave excess pet food or water out overnight.
- If storing trash and food waste inside the home, do so in rodent-proof containers, and frequently clean the interior and exterior of the container with soap and water.
- Wash dishes, pans and cooking utensils immediately after use.
- Remove leftover food and clean up spilled food from cooking and eating areas.
- Do not store empty aluminum cans or other opened containers with food residues inside the home.
- Dispose of trash and garbage on a frequent basis, and pick up or eliminate clutter.
- Keep items such as boxes, clothes and blankets off the floor to prevent rodents from nesting in them.
- Repair water leaks and prevent condensation from forming on cold water pipes by insulating them. Deny rodents access to moisture (such as mop closets, boiler rooms, catch basins under potted plants and areas around aquarium tanks). Correct any conditions that support the growth of mold, mildew or other fungi in the home.
- Keep exterior doors and windows closed unless protected by tight-fitting screens.
- Use spring-loaded traps in the home. Use a small amount of chunky peanut butter as bait. Place the trap perpendicular to the baseboard or wall surface, with the end of the trap containing the bait closest to the baseboard wall. Place traps in areas where rodents might be entering the home. Spring-loaded traps can be painful or even dangerous if they close on fingers; they should be handled with caution, and careful consideration should be given to keep children and pets away from areas where traps are placed.

Precautions for Outside the Home

- Identify and seal all gaps and holes around windows and doors, between the foundations of the home and the ground, under doors without weather stripping, and around electrical, water, gas and sewer lines entering the home.
- Place woodpiles and stacks of lumber, bricks, stones or other materials at least 100 feet from the house.
- Store grains and animal feed in rodent-proof containers.
- Remove any food sources from the vicinity of buildings that might attract rodents.

- Keep pet food covered and stored in rodent-proof containers. Allow outside pets only enough food for each meal, then store or discard any remaining food from feeding dishes.
- Avoid using bird feeders near the home. If they must be placed near the home, use “squirrel-proof” feeders and clean up spilled seeds each evening.
- Dispose of garbage and trash in rodent-proof containers with tight-fitting lids.
- Remove trash, abandoned vehicles, discarded tires and other items that might serve as rodent nesting sites.
- Mow grass closely, and cut or remove brush and dense shrubbery to a distance of at least 100 feet from the home. Trim the limbs off any trees or shrubs that overhang or touch the building.
- Used raised cement foundations in new construction of sheds, barns and outbuildings.
- Place spring-loaded traps in outbuildings (regardless of their distance from the home) and in areas within 100 feet from the home that might likely serve as rodent shelters. Use these traps continuously, replacing the bait periodically.

Precautions for the Workplace

Occupations that require workers to handle or come into frequent contact with rodents are at higher risk of becoming infected with Hantavirus than the general public. Workers in potentially high-risk settings should be informed by their employers about Hantavirus transmission and the symptoms of infection, and be given detailed protection guidelines.

- Employers should provide a comprehensive medical screening and surveillance program to workers, including medical clearance for respirator use, baseline evaluation and periodic examination as indicated.
- Workers who develop a respiratory illness within 45 days of the last potential exposure should immediately seek medical attention and inform the attending physician of the potential occupational risk of Hantavirus infection.
- When removing rodents from traps or handling rodents, workers should wear a half-face, tight-seal, negative-pressure respirator or a powered air-purifying respirator equipped with N-100 or P-100 filters.
- Workers should wear rubber, latex, vinyl or nitrile gloves when handling rodents or handling traps containing rodents. Before removing the gloves, wash gloved hands in a disinfectant or chlorine solution, and then wash bare hands in soap and water.

Precautions for Rodent Cleanup

All dead rodents and rodent droppings should be thoroughly cleaned to reduce the likelihood of exposure to Hantavirus-infected materials. Clean in a manner that will not cause dirt or dust from contaminated surfaces to become airborne.

- During cleaning, wear rubber, latex, vinyl or nitrile gloves.
- Spray rodent urine and droppings with a disinfectant or chlorine solution until thoroughly soaked.
- Don't sweep or vacuum rodent urine and droppings until they have been disinfected.
- Use a paper towel to pick up the urine and droppings. Place the paper towel in a garbage bag.
- After the rodent droppings have been removed, disinfect items that might be contaminated by rodents, or their urine and droppings.
- Before cleaning closed sheds and other buildings, provide ventilation 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. In substantially dirty or dusty environments, additional protective clothing or equipment, such as coveralls and safety goggles, may be worn.

REFERENCES

Centers for Disease Control and Prevention. Hantavirus Pulmonary Syndrome – United States: Updated Recommendations for Risk Reduction. *Morbidity and Mortality Weekly Report*. July 26, 2002. Volume 51. Number RR-9.

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