

**SAN DIEGO STATE UNIVERSITY  
ENVIRONMENTAL HEALTH & SAFETY**

**HANTAVIRUS PULMONARY SYNDROME  
DISEASE TRANSMISSION, SYMPTOMS OF INFECTIONS, AND GUIDANCE ON  
PREVENTION MEASURES**

**Background**

Hantavirus pulmonary syndrome is a disease caused by the Sin Nombre Virus. The virus causes hemorrhagic fever with renal syndrome in some carriers of the virus. Hantavirus does not affect the health of the rodent host in most cases, but the hosts may develop chronic infections and continuously shed the virus in urine, feces and saliva. Humans are seen as the end host for the virus. Humans are not known to act as a carrier or vector for the virus.

**Rodent Reservoirs of Virus**

All Hantavirus that cause hantavirus pulmonary syndrome are carried by New World rats and mice. Most New World rats and mice are located in more suburban and rural areas. Some examples are deer mice and white-footed mice. Hantavirus can also use voles and lemmings as hosts, yet these strains have not yet caused Hantavirus pulmonary syndrome in humans.

**Transmission to Humans**

Human infection with Hantavirus occurs through inhalation of infectious materials such as rodent saliva or excreta. The infectious materials enter the body through inhalation, introduction into broken skin, or ingested in contaminated food or water. It is also possible to become infected with the Hantavirus by rodent bites. Currently there are no known cases of the Hantavirus being transmitted by human to human contact in the United States.

**Signs and Symptoms**

The onset of symptoms comes after an incubation period ranging from a few days to six weeks. Early symptoms include fatigue, fever, muscle aches, nausea, vomiting, and abdominal pain. Late symptoms can take up to 10 days to manifest after the early symptoms. The symptoms are coughing and shortness of breath. The illness progresses rapidly to severe respiratory failure and shock.

**Treatments**

There is no cure for Hantavirus pulmonary syndrome, but treatments include respiratory intensive care management and oxygen therapy.

**Precautions to Limit Exposure to Rodents**

- When removing rodents from traps or handling live rodents with the potential for aerosolization of saliva or excreta, wear either a half-face, tight-seal, negative-pressure respirator or a (positive pressure) PAPR (powered air-purifying respirator), equipped with N-100 or P-100 filters (formerly designated high-efficiency particulate air filters [HEPA]). Negative-pressure respirators are not protective if facial hair interferes with the face-piece to face seal because a proper fit cannot be assured. Contact EHS at x42865 or x46965 to be trained and fitted with the appropriate respirator. Given the predictable

nature of HPS risk in certain professions or environmental situations, provisions should be made in advance for respiratory protection. Respirators might cause stress to persons with respiratory or cardiac conditions; these persons should be medically cleared before using such a respirator. Users with potentially impaired respiratory function also should be aware of the risks associated with the use of negative-pressure respirators.

- 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.
- Mammalogists, wildlife biologists, or public health personnel who handle wild rodents for research or management purposes should refer to published safety guidelines (<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5109a1.htm>, Mills JN, Yates TL, Childs JE, et al. Guidelines for working with rodents potentially infected with hantavirus. *J Mammology* 1995;76:716—22, and Mills JN, Childs JE, Ksiazek TG, Peters CJ, Velleca WM. Methods for trapping and sampling small mammals for virologic testing. Atlanta GA: US Department of Health and Human Services, Public Health Service, CDC, 1995). Precautions are also available on CDC's website, All About Hantaviruses (<http://www.cdc.gov/ncidod/dvrd/spb/mnpages/rodentmanual.htm>).
- Individuals who develop a febrile or respiratory illness within 45 days of the last potential exposure should immediately seek medical attention (Student Health Services for SDSU students or Sharp Rees Stealy for SDSU employees) and inform the attending physician of the potential occupational risk of hantavirus infection. The physician should contact local public health authorities promptly if hantavirus-associated illness is suspected. A blood sample should be obtained and forwarded to the state health department for hantavirus antibody testing.

### **Precautions for Cleanup of Rodent-Contaminated Areas and Dead Rodents**

Areas with evidence of rodent activity (e.g., dead rodents and rodent excreta) should be thoroughly cleaned to reduce the likelihood of exposure to hantavirus-infected materials. Cleanup procedures must be performed in a manner that limits the potential for dirt or dust from contaminated surfaces to become airborne. Recommendations are listed in this report for cleaning up 1) rodent urine and droppings, and surfaces potentially contaminated by rodents and 2) dead rodents and rodent nests.

#### Cleanup of Rodent Urine and Droppings and Contaminated Surfaces

- During cleaning, wear rubber, latex, vinyl, or nitrile gloves.
- Spray rodent urine and droppings with a disinfectant or chlorine solution until thoroughly soaked. (See Cleanup of Dead Rodents and Rodent Nests.)
- To avoid generating potentially infectious aerosols, do not vacuum or sweep rodent urine, droppings, or contaminated surfaces until they have been disinfected.
- Use a paper towel moistened with disinfectant to pick up the urine and droppings. Place the paper towel in the garbage.
- After the rodent droppings and urine have been removed, disinfect items that might have been contaminated by rodents or their urine and droppings with a cloth moistened with disinfectant. Disinfect gloves before removing them with disinfectant or soap and water. After removing the clean gloves, thoroughly wash bare hands with soap and warm water.

### Cleanup of Dead Rodents and Rodent Nests

- Wear rubber, latex, vinyl, or nitrile gloves.
- In the western United States, use insect repellent (containing DEET) on clothing, shoes, and hands to reduce the risk of fleabites that might transmit plague.
- Spray dead rodents and rodent nests with a disinfectant or a chlorine solution, soaking them thoroughly.
- Place the dead rodent or nest in a plastic bag or remove the dead rodent from the trap and place it in a plastic bag. When cleanup is complete (or when the bag is full), seal the bag, place it into a second plastic bag, and seal the second bag. Dispose of the material in the double bag by 1) burying it in a 2- to 3-foot-deep hole or 2) burning it or 3) discarding it in a covered trash can that is regularly emptied. Contact the local or state health department concerning other appropriate disposal methods.
- Clean up the surrounding area as described in Cleanup of Rodent Urine and Droppings and Contaminated Surfaces.

### Disinfecting Solutions

Two types of disinfecting solutions are recommended to clean up rodent materials.

1. General-Purpose Household Disinfectant --- Prepare according to the label, if not prediluted. Almost any agent commercially available in the United States is sufficient as long as the label states that it is a disinfectant. Effective agents include those based on phenols, quaternary ammonium compounds, and hypochlorite.

2. Hypochlorite Solution --- A chlorine solution, freshly prepared by mixing 1½ cups of household bleach in 1 gallon of water (or a 1:10 solution) can be used in place of a commercial disinfectant. When using chlorine solution, avoid spilling the mixture on clothing or other items that might be damaged by bleach. Wear rubber, latex, vinyl, or nitrile gloves when preparing and using chlorine solutions. Chlorine solutions should be prepared fresh daily.

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**ACKNOWLEDGEMENT FORM**

I acknowledge that I have read the Hantavirus Pulmonary Syndrome Disease Transmission, Symptoms of Infection, and Guidance on Prevention Measures and will adhere to CDC's recommendations for risk reduction when handling rodents or handling traps containing rodents.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Print Name: \_\_\_\_\_

Dept: \_\_\_\_\_

Red ID Number: \_\_\_\_\_

