Hantavirus Infection

Introduction

Hantavirus Pulmonary Syndrome is an illness caused by hantavirus. Hantaviruses, found in rodents, can cause severe illness. There are multiple strains of hantavirus including Sin Nombre, Andes and Seoul. Seoul virus, found across the world, can also cause Hemorrhagic Fever with Renal Syndrome (HFRS). Rodent control in and around the home remains the primary strategy for preventing hantavirus infection. Infection with hantavirus can progress to Hantavirus Pulmonary Syndrome (HPS), which can be fatal. People become infected through contact with hantavirus-infected rodents or their urine and droppings. In rare cases, hantavirus infection have been acquired from people sick with infection with Andes virus, which is only found in South America.

Mode of Transmission

Human infection occurs most commonly through the inhalation of infectious, aerosolized saliva or excreta. Persons visiting laboratories where infected rodents were housed have been infected after only a few minutes of exposure to animal holding areas. Transmission can occur when dried materials contaminated by rodent excreta are disturbed and inhaled, directly introduced into broken skin or conjunctivae, or possibly, when ingested in contaminated food or water. Persons have also acquired HFRS and HPS after being bitten by rodents. High risk of exposure has been associated with entering or cleaning rodent-infested structures. Only Andes virus has been documented to be transmitted between people, when an individual has come in close contact with someone who is ill due to hantavirus from the Andes virus.

Risk Factors

Hantavirus infections are associated with domestic, occupational and recreational activities that bring humans into contact with infected rodents. This occurs more often in rural settings. Adults are primarily infected by the virus. HPS cases in the United States occur throughout the year, but greater numbers are reported in spring and summer. Hantavirus infection resulting in HPS has been epidemiologically associated with the following situations:

- Increasing numbers of host rodents in human dwellings.
- Occupying or cleaning previously vacant cabins, buildings or other structures that are actively infested with rodents.
- Disturbing excreta or rodent nests around the home or workplace (e.g. during renovation, demolition or construction).
- Residing in or visiting areas where substantial increases have occurred in numbers of hantavirus infected host rodents.
- Handling equipment or machinery that has been in rodent infested storage locations.
- Disturbing excreta in rodent-infested areas while hiking or camping.
- Hand plowing or planting in contaminated soil.

Persons who frequently handle or are exposed to wild rodents or excreta contaminated materials are at higher risk for hantavirus infection than the general public. Such persons include, but are not limited to: mammalogists, pest-control workers, some farm and domestic workers, building and fire inspectors, construction and utility workers.

Documented laboratory-acquired infections have occurred in individuals working with hantaviruses. Extreme caution must be used in performing any laboratory operation that may create aerosols (centrifugation, vortex-mixing, etc.). Operations involving rats, voles, and other laboratory rodents, should be conducted with special caution because of the extreme hazard of aerosol infection, especially from infected rodent urine.
Clean up and Disinfection

It is uncertain how long the virus survives after being shed into the environment. It is critical to minimize aerosolization of dust during clean up and disinfection, therefore, droppings and other contaminated material should not be dry swept or vacuumed with a household vacuum. The U.S. Centers for Disease Control and Prevention (CDC) recommends:

1) Before starting to clean:
   a) Ventilate the space by opening doors and windows for at least 30 minutes to allow fresh air to enter the area. Use cross-ventilation whenever possible. It is important for all people to leave the area during the airing-out period.

2) To clean up any urine and droppings:
   a) Wear rubber, latex, or vinyl gloves when cleaning rodent urine and droppings.
   b) When you begin cleaning, it is important that you do not stir up dust by sweeping or vacuuming up rodent urine, droppings, or nesting materials.
   c) Spray the urine and droppings with a disinfectant or a mixture of bleach and water and let soak for 5 minutes. The recommended dilution of bleach solution is 1-part bleach to 9-parts water (10% solution). When using a commercial disinfectant, follow the manufacturer's instructions on the label for dilution and disinfection time.
   d) Use a paper towel to pick up the urine and droppings and dispose of the waste in the garbage.
   e) After the rodent urine and droppings have been removed, disinfect surfaces and items that might have been contaminated by rodents or their urine and droppings.

3) When you’re done with cleaning:
   a) Remove gloves and put in the garbage, and thoroughly wash hands with soap and water (or use a waterless alcohol-based hand rub when soap is not available, and hands are not visibly soiled; however, it is important to wash hands with soap and water as soon as a sink is available).

Refer to the CDC hantavirus website (www.cdc.gov/hantavirus) for additional details on clean up and disinfection.

Engineering Controls

As with any occupational hazard, engineering controls (e.g. eliminating the hazard) are the best. In this case utilizing environmental hygiene practices that deter rodents from colonizing the home and work environment are recommended. The CDC hantavirus website (www.cdc.gov/hantavirus) and the July 26, 2002 issue of Morbidity and Mortality Weekly Report have recommendations for eliminating rodents from structures (e.g. sealing building entry points, removing food sources, use of traps to eliminate the rodent population).

Personal Protective Equipment (PPE)

In some cases, such as construction or utilities work, engineering controls as described above may not be practical or sufficiently reduce the hazard. PPE may also be necessary during clean up and decontamination. Proper PPE for workers should include respiratory protection, eye protection, gloves and coveralls as described below and/or as outlined by the CDC. When use of respirators is required, the Occupational Safety and Health Administration (OSHA) requires the employer to implement a respiratory protection program per 29 CFR 1910.134. (www.osha.gov). All PPE must be used in accordance with the manufacturer’s user instructions. Refer to the user instructions for proper use procedures, limitations, warnings and cautions.

- In the United States, respirators used should be tested and certified by the National Institute for Occupational Safety and Health (NIOSH). Suggested respirators include:
  - Half face piece, negative pressure respirator with N100 or P100 filters. Dust proof goggles should also be worn to protect the eyes from contaminated dust
  - Full face piece, negative pressure respirator with N100 or P100 filters.
  - Powered Air Purifying Respirator (PAPR) with high efficiency (HE) filters.
• **In Canada.** the Canadian Centre for Occupational Health and Safety (CCOHS) also recommends NIOSH approved respirators, including:
  – Disposable half face piece N95 respirators, for general clean-up activities of not heavy accumulations of droppings.
  – Powered air-purifying (PAPR) or air purifying respirators with P100 filters, for cleaning of areas with heavy accumulations of rodent droppings. [3M PAPRs are only available with P100 type NIOSH approved filters]

• **Outside of the Americas, or whenever NIOSH approved respirators are unavailable.** consider that standard test procedures and published research shows that CE approved class P2 (EN143:2000) filters and FFP2 (EN149: 2001) respirators have comparable filter performance to type 95 NIOSH approved products when exposed to airborne aerosols. This statement also applies to P3 filters and FFP3, which have comparable filter performance to type 100 NIOSH approved products.

• **The following PPE is also recommended by CCOHS for use as outlined in the product’s user instruction:**
  – Gloves (rubber, vinyl or nitrile), eye protection, and face protection when handling rodents, traps containing rodents, or excreta contaminated materials. Carefully remove gloves when done and thoroughly wash hands with soap and water. A waterless, alcohol-based hand sanitizer can be used if wash water is not available.
  – Disposable coveralls, rubber boots or disposable shoe covers.

Personal protective gear should be decontaminated or disposed upon removal, completion of activities or at the end of each day the equipment is in use, whichever occurs first., to further reduce risk of fomite transmission.

### Waste Disposal

All potentially infective waste material (including respirator filters and protective clothing) from clean-up operations should be double bagged in appropriate plastic bags. The bagged material should then be labeled as infectious (if it is to be transported) and disposed of in accordance with local requirements for infectious waste.

### Conclusion

OSHA does not currently have any specific regulations regarding hantavirus. For the latest information on hantavirus and the CDC’s recommendations for diagnosis, treatment and prevention, refer to the CDC’s hantavirus website (www.cdc.gov/hantavirus). This Technical Data Bulletin does not contain the CDC’s recommendations in their entirety, nor does it constitute an endorsement by PSD to use 3M respirators for this purpose. The impact and utility of these recommendations will be assessed as they are implemented and will be continually reviewed by the CDC and the involved state and local health agencies as additional data related to the disease is gathered. The reader is advised to be alert to supplements or modifications to these recommendations in the future.

For further information on respirators, eye protection and disposable coveralls for use against hantavirus, contact 3M Technical Service at 1-800-243-4630 or visit our website at www.3M.com/PPESafety. For information on disinfectants visit: http://solutions.3m.com/wps/portal/3M/en_US/Commercial/Care/Solutions- for/Infection-Control/

⚠️ **WARNING**

Respirators are designed to reduce the wearer’s exposure to airborne hazards. Biological agents, such as viruses, are particles and can be filtered by particulate filters with the same efficiency as non-biological particles having the same physical characteristics (e.g. size, shape). Unlike many industrial particles, there are no exposure limits established for biological agents. Therefore, while respirators will help reduce exposure to hantaviruses, there is no guarantee that the user will not contract HPS. Respirators may help reduce exposures to airborne contaminants, but they don’t eliminate the risk of exposure, infection, illness or death.
References

- Centers for Disease Control and Prevention—Hantavirus website [www.cdc.gov/hantavirus](http://www.cdc.gov/hantavirus)


- Canadian Centre for Occupational Health and Safety—Hantavirus website [https://www.ccohs.ca/oshanswers/diseases/hantavir.html](https://www.ccohs.ca/oshanswers/diseases/hantavir.html).

