



## Managing Rodents to Prevent Hantavirus Infection

Hantaviruses are viruses that can cause a rare but deadly respiratory disease in people called hantavirus pulmonary syndrome (HPS). Certain rodent species can carry hantaviruses. In North America, the deer mouse, white-footed mouse, rice rat and cotton rat are capable of transmitting the virus, if they are infective. HPS is most often contracted by inhaling viral particles contained in urine, feces and saliva. While HPS is a rare disease, hantaviruses are found in all regions of the United States, except for Alaska and Hawaii.



**Not all rodents carry hantaviruses, but rodents are the natural reservoirs of hantaviruses:** From left to right: Photo of a White-footed mouse (*Peromyscus leucopus*); map of the natural range of the white-footed mouse; photo of a deer mouse (*Peromyscus maniculatus*); map of the natural range of the deer mouse. Photos courtesy of the Centers for Disease Control and Prevention.

### Preventing Rodent Access and Monitoring Activity

It is impossible to tell if a particular rodent is infected with hantavirus without microscopic examination and testing of urine, feces or blood. However, rodents that live in and around human environments are more likely to carry the viruses.<sup>1</sup>

The best way to prevent HPS is to exclude rodents from your home, office, cabin or other structure and avoid contact with rodents and their waste. Conduct an inspection both inside and outside to look for access points and signs of rodent activity. Mice can crawl through  $\frac{1}{4}$  inch (width of pencil) openings and rats  $\frac{1}{2}$  inch. Fill all gaps in walls, floors, ceilings, and around doors, windows, pipes, vents and other places using copper wool, hardware cloth or other heavy duty fine-mesh metal screen. Install sweeps under doors. Monitor activity using snap traps set against walls to evaluate exclusion efficacy. Exclusion measures need to be monitored and repaired on a routine basis—establish a schedule for regular monitoring and inspections. Additional monitoring using snap traps will be necessary for effective long-term management.



Copper wool  
NPS photo

If you have signs of mice or rats indoors, follow the methods described below for cleaning up urine and feces. Educate building occupants to recognize and report rodent activity signs and to keep all food and snacks secured in rodent-proof glass, metal or heavy-duty plastic containers with tight-sealing lids. Do not leave pet food out. Keep garbage in thick plastic or metal containers with tight-fitting rodent proof lids and remove garbage nightly.

### Trapping Rodents

Snap traps are proven to be the safest and most effective method to trap and remove indoor rodents, and for this reason are recommended by NPS Office of Public Health and public health authorities<sup>2-4</sup>. Snap traps kill humanely and quickly, reducing the amount of viral particles released by the animal and they allow easy, rapid removal of the carcass. Quick removal helps prevent secondary pests, such as dermestid beetles and blow flies, minimize the opportunity for scavenging wildlife, and reduce odor. Exposure to rodent waste increases the risk of infection to humans. Use of proper PPE is essential to reduce that risk. Snap traps should be placed against walls in a perpendicular orientation using a small amount of peanut butter as bait. If you have pets, it is best to place the traps in places where they are not likely to reach them, such as inside cabinets or in a box with a small

opening that rodents can enter. Monitor the traps daily and record activity on a monitoring form with date, location and trap observation. Dispose of trapped rodents in accordance with state regulations using below procedures. Caution should be used emptying traps, because it must be assumed that rodent bodily fluids will be present. See NPS Commensal Rodents Training Manual for more information.

If a non-lethal trapping outcome is needed in an outdoor setting, such as for research purposes, special precautions need to be taken to protect the individual handling the rodent and traps, including additional personal protection equipment and trap disinfection. These additional recommendations from the Centers for Disease Control and Prevention can be accessed at <http://www.jstor.org/stable/1382742?seq=2> and from the American Society for Mammologists at <http://www.mammalsociety.org/uploads/Kelt%20et%20al%202010.pdf>.

<sup>1</sup>Reviewed in Mills J. 2005. *Infectious Diseases from Nature*; 45-57 <sup>2</sup>Corrigan RM. 1998. Proceedings of the Eighteenth Vertebrate Pest Conference; <sup>3</sup>Shumake SA. 1995. National Wildlife Research Center Repellents Conference.

<sup>4</sup>Centers for Disease Control and Prevention: [http://www.cdc.gov/rodents/prevent\\_infestations/trap\\_up.html](http://www.cdc.gov/rodents/prevent_infestations/trap_up.html).



## Cleaning Up Rodent Urine and Droppings

*Do not vacuum rodent contaminated areas or sweep with a broom. Sweeping and vacuuming aerosolizes particles, which may include virus, posing an increased inhalation risk.*

Signs of rodent activity include urine, feces, nest materials, gnaw marks, rub marks, live or dead rodents, dermestid beetles or blow flies that feed on carcasses, and odor of decaying animals. If a room (office, shed, building, attic, crawl space) has been closed off for the winter and few or no signs of rodents are present, open the windows, leave the area, and let the room air out for 30 minutes before cleaning. If abundant rodent evidence is found, you will need to contact your safety officer for medical clearance and respirator fit testing to ensure the respirator forms a seal on the face. A National Institute of Occupational Safety and Health (NIOSH) approved N 100 or P 100, high efficiency particulate air filter or equivalent is required. Wearing rubber or plastic gloves, spray all urine and droppings with disinfectant or bleach solution (see below), ensuring they are well wetted. If nest materials are present, spray them as well, leave to soak for 10 minutes, then dispose of them in a sealed plastic bag. Using a wet paper towel, sponge, or mop, thoroughly clean the floor and other surfaces. If desired, you may use paper towels and disposable floor pads that can be thrown out. When finished, wash gloved hands with soap and water or bleach solution before removing them. Then wash your hands in warm soapy water.



N-100 respirator  
NPS Photo



Rodent nest, left, and rodent droppings, right. NPS Photo

## Resources

National Park Service Rodent Management and Hantavirus Prevention guidance documents: <http://www1.nrintra.nps.gov/brmd/ipm/rodent.cfm>

Centers for Disease Control map of hantavirus carriers and habitat range: <http://www.cdc.gov/hantavirus/rodents/>

Centers for Disease Control guidance for trapping and managing rodents: [http://www.cdc.gov/rodents/prevent\\_infestations/trap\\_up.html](http://www.cdc.gov/rodents/prevent_infestations/trap_up.html)

## Proper Disposal of Dead Rodents

Wear rubber or plastic gloves and have your disinfectant or freshly made bleach solution ready (see below). From a standing distance spray the dead mouse or rat and the area surrounding the trap with the bleach solution or disinfectant and let it soak for 10 minutes. Using a small plastic bag, put one hand inside the bag like a glove, pick up the trap with the covered hand and invert the bag over the rodent. Tie the bag off, place in another bag and dispose of in the trash. Wash gloves, remove them, and wash hands with warm soapy water.



Spray with disinfectant  
NPS Photo

## Preparing Bleach Solution

Diluted bleach will lose its effectiveness over time; therefore, it is very important to make a fresh bleach solution on the day it will be used. To make a gallon of 1:10 (1 part bleach to 9 parts water) solution, use a clean plastic gallon jug and fill it up about two-thirds full with water. Then add 1½ cups (12oz) bleach and more water to fill the jug. Pour into a clean spray bottle, handheld sprayer or backpack sprayer. If using a small kitchen spray bottle, mix 1 oz (2 Tbsp) bleach with 9 oz water (1 cp+2 Tbsp). You may also use a general household disinfectant (it must say “disinfectant” on the label). CAUTION: Be sure to clearly label all containers to avoid accidental poisoning or injury.

## More Information

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