

NATIONAL PARK SERVICE
HANTAVIRUS INFECTION
INTERIM RECOMMENDATIONS FOR RISK REDUCTION



November 1993

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1. SUMMARY

The purpose of this document is to provide information about Hantavirus and provide recommendations to protect NPS personnel who reside or visit in areas known or are suspected of having Hantavirus. It is adapted from the official publication of the U.S. Public Health Service, MMWR July 30, 1993, Vol. 42, No. RR11. If you have questions or need further information, contact your Regional Public Health Consultant.

This document contains specific recommendations for (1) reducing rodent shelter and food sources in and around the home, (2) eliminating rodents inside the home and preventing them from entering the home, (3) preventing Hantavirus infection while rodent-contaminated areas are being cleaned up, (4) protecting persons who have potential occupational contact with rodents, and (5) protecting campers and hikers.

2. INTRODUCTION

The recently recognized Hantavirus-associated disease primarily among residents of the Southwestern United States and the identification of rodent reservoirs for the virus in the affected areas warrant recommendations to minimize the risk of exposure to rodents for both employees and visitors. While information is being gathered about the virus that causes the disease, provisional recommendations are provided from knowledge about this and other related Hantaviruses. These recommendations will be periodically evaluated and modified, as more information becomes available.

The Hantavirus is naturally found in many rodents. Each Hantavirus appears to have preferential rodent hosts, but other small mammals can be infected as well. Available data strongly suggests that the deer mouse is the primary reservoir of the newly recognized Hantavirus in the Southwestern United States. Evidence of infection has also been found in piñon mice, brush mice, and western chipmunks. The deer mouse is highly adaptable and is found in many different habitats, including human residences in rural and semirural areas, but generally not in urban centers.

Rodents carrying the Hantaviruses do not exhibit any apparent illness but shed the virus in saliva, urine, and feces for many weeks. The duration and period of maximum infectivity are unknown. The demonstrated presence of infectious virus in saliva of infected rodents and the marked sensitivity of these animals to Hantaviruses following inoculation suggests that biting may be an important mode of transmission among rodents.

Human infection may occur when infective saliva or excreta are inhaled as aerosols produced directly from the animal. Persons visiting laboratories where infected rodents were housed have been infected after only a few minutes of exposure to animal holding areas. Transmission may

also occur when dried materials contaminated by rodent excreta are disturbed, directly introduced into broken skin, introduced onto the eye, or, possibly, ingested in contaminated food or water. Persons have also become infected after being bitten by rodents.

Arthropod vectors (mosquitoes, fleas, ticks etc.) are not known to have a role in the transmission of Hantaviruses. Person-to-person transmission has not been associated with any of the previously identified Hantaviruses or with the recent outbreak in the Southwest. Cats and dogs are not known to carry the Hantaviruses. However, these domestic animals may bring infected rodents into contact with humans.

Known Hantavirus infections of humans occur primarily in adults and are associated with domestic, occupational, or leisure activities that bring humans into contact with infected rodents, usually in a rural setting.

Hantaviruses are susceptible to most disinfectants (e.g., dilute hypochlorite solutions, ethyl alcohol [70%], or most general-purpose household disinfectants). How long these viruses survive after being shed in the environment is uncertain.

Do not forget about plague and relapsing fever, which occur in geographic areas where Hantavirus has been reported. Plague is transmitted to humans by rodent fleas and relapsing fever by rodent ticks. If you know or suspect either of these diseases has occurred in your park, you need to treat buildings for arthropod vectors if the buildings have evidence of rodent infestation. This is especially important when reopening seasonally used buildings. Contact your IPM coordinator for information about indoor suppression of plague and/or relapsing fever arthropod vectors.

Eradicating the rodents that carry the Hantaviruses is neither feasible nor desirable. The best currently available approach for disease control and prevention is risk reduction through environmental hygiene practices that deter rodents from colonizing the home and work environment.

3. GENERAL HOUSEHOLD PRECAUTIONS IN AFFECTED AREAS

Although studies are being conducted to identify specific behaviors that may increase the risk for Hantavirus infection in humans in the United States, rodent control in and around the home will continue to be the primary prevention strategy. CDC has issued the following recommendations for rodent-proofing urban and suburban dwellings and reducing rodent populations through habitat modification and sanitation.

A. Eliminate rodents and reduce the availability of food sources and nesting sites used by rodents inside the home.

- * Follow the recommendations in Section 4 on Eliminating Rodents inside the Home.
- * Keep food (including pet food) and water covered and stored in rodent-proof metal or thick plastic containers with tight-fitting lids.
- * Store garbage kept inside homes in rodent-proof metal or thick plastic

containers with tight-fitting lids.

- * Wash dishes and cooking utensils immediately after use and properly dispose all spilled food.

- * Dispose of trash and clutter.

- * Use spring-loaded rodent traps in the home continuously. Do not use rodenticide or live traps.

B. Prevent rodents from entering the home and other buildings. Specific measures should be adapted to local circumstances.

- * Use steel wool or cement to seal, screen, or otherwise cover all openings into the home that have a diameter greater than or equal to 1/4 inch.

- * Place metal roof flashing as a rodent barrier around wooden, earthen, or adobe foundations up to a height of 12 inches and buried in the soil to a depth of 6 inches.

C. Reduce rodent shelter and food sources within 100 feet of the home and other buildings.

- * Use raised cement foundations in new construction of sheds, barns, outbuildings, or woodpiles.

- * When possible, place woodpiles 100 feet or more from the house, and elevate wood at least 12 inches off the ground.

- * Store grains and animal feed in rodent-proof containers.

- * Near buildings, remove food sources that might attract rodents, or store food and water in rodent-proof containers.

- * Store hay on pallets, and use traps continuously to keep hay free of rodents.

- * Do not leave pet food in feeding dishes overnight as rodents are most active at night.

- * Dispose of garbage and trash in rodent-proof containers that are elevated at least 12 inches off the ground.

- * Haul away trash, abandoned vehicles, discarded tires, and other items that may serve as rodent nesting sites.

- * Cut grass, brush, and trim dense shrubbery within 100 feet of the home.

- * Place spring-loaded rodent traps at likely spots for rodent shelter within 100 feet around the home, and use continuously.

Note: Follow the recommendations specified in Section 6 below [Cleanup of Rodent-Contaminated Areas] if rodent nests are encountered while these measures are being carried out.

4. ELIMINATING RODENTS INSIDE THE HOME AND OTHER BUILDINGS AND REDUCING RODENT ACCESS TO THESE STRUCTURES

Rodent infestation can be determined by direct observation of animals, from the presence of feces in closets or cabinets or on floors, and from evidence that rodents have been gnawing at food. If rodent infestation is detected inside the home or outbuildings, rodent abatement measures should be undertaken.

- * If the area is heavily infested, see Section 5 below for special precautions to protect workers.
- * Before rodent elimination work is begun in heavy infestation areas, ventilate closed buildings or areas inside buildings by opening doors and windows for at least 30 minutes. Use an exhaust fan or cross ventilation if possible. Leave the area until the airing out period is finished. This airing should remove any aerosolized virus inside the closed-in structure.
- * Seal, screen, or otherwise cover all openings into the home that have a diameter of a 1/4 inch or greater because rodents can enter through holes as small as a quarter inch. Pay special attention to openings where pipes and wires enter the home. It is best to plug holes with sheet metal or metal screening material.
- * Trap rodents using spring loaded traps. Traps should be placed on a newspaper, along suspected paths like baseboards or near the corner of a room. Place the trap perpendicular to the wall, with the baited end closest to the wall. Do not use live traps.
- * Rodenticide should only be considered in special circumstances including rapid knockdown of heavy rodent infestations and elimination of rodents in areas known to have Hantavirus. Approval from the IPM coordinator is required before using rodenticide.
- * Spray dead rodents and the newspaper with a household disinfectant and wait ten (10) minutes. [A disinfectant bleach solution prepared by mixing 3 tablespoons or capfuls of household bleach in 1 gallon of water may be used in place of a household disinfectant.] Remove dead rodents from the traps. Wear rubber or plastic gloves while handling rodents. Place the carcasses in a plastic bag containing a sufficient amount of disinfectant to thoroughly wet the carcasses. Seal the bag then place it in a second plastic bag and seal. Dispose of the bagged material by burying it in a 2 to 3-foot hole. If burying is not possible, contact your local or state health department about other appropriate disposal methods.
- * Before removing the gloves, wash gloved hands in a disinfectant and

then in soap and water. Thoroughly wash hands with soap and water after removing the gloves. Do not reuse plastic or vinyl gloves. They should be disposed in the plastic bags containing the rodent carcasses, nests, and/or feces.

* Leave several baited spring-loaded traps inside the house at all times as a further precaution against rodent re-infestation. Examine the traps regularly. Disinfect traps no longer in use by washing in a disinfectant solution. Disinfect and wash gloves as described above, and wash hands thoroughly with soap and water before beginning other activities.

5. CLEANUP OF RODENT-CONTAMINATED AREAS

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 aerosolization of dirt or dust from all potentially contaminated surfaces and household goods.

* Persons involved in the cleanup should wear rubber or plastic gloves.

* Spray dead rodents, rodent nests, excreta, or foods or other items that have been tainted by rodents with a general-purpose household disinfectant such as the household bleach solution described in Section 4. Soak the material thoroughly, and place in a plastic bag. When cleanup is complete (or when the bag is full), seal the bag, then place it into a second plastic bag and seal. Dispose of the bagged materials by burying in a 2-3 foot deep hole. If burying is not possible, contact your local or state health department about other appropriate disposal methods.

* After the above items have been removed, mop floors with a solution of water, detergent, and disinfectant. A second mopping or spraying of floors with a general-purpose household disinfectant is optional. Spray dirt floors with a disinfectant solution. Carpets can be effectively disinfected with household disinfectants or by commercial-grade steam cleaning or shampooing. Some disinfectants including household bleach will damage carpets and other fabrics. Therefore, check the disinfectant label for usage precautions before applying disinfectants to these materials. To avoid generating potentially infectious aerosols, do not vacuum or sweep dry surfaces before mopping or shampooing.

* Disinfect counter tops, cabinets, drawers, and other durable surfaces by washing them with a solution of detergent, water, and disinfectant, followed by an optional wiping-down with a general-purpose household disinfectant.

* In heavily infested homes, rugs and upholstered furniture should be steam cleaned or shampooed. If rodents have nested inside furniture and the nests are not accessible for decontamination, the furniture should be removed and burned.

* Launder potentially contaminated bedding and clothing with hot water and detergent. Use rubber or plastic gloves when handling the dirty laundry; then wash and disinfect gloves as described in the section on Eliminating Rodents Inside the Home. Machine-dry laundry on a high setting or hang it to air-dry in the sun.

6. SPECIAL PRECAUTIONS FOR HOMES OF PERSONS WITH CONFIRMED HANTAVIRUS INFECTION OR BUILDINGS WITH HEAVY RODENT INFESTATIONS

Special precautions are indicated in the affected areas for cleaning homes or buildings with heavy rodent infestations. Persons conducting these activities should contact their Regional Public Health Consultant for guidance. These precautions may also apply to vacant dwellings that have attracted numbers of rodents while unoccupied and to dwellings and other structures that have been occupied by persons with confirmed Hantavirus infection.

- * Workers should be informed about the symptoms of the disease and be given detailed guidance on prevention measures.
- * Workers who develop a fever or 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. The physician should contact local health authorities promptly if Hantavirus-associated illness is suspected.
- * Workers should wear a half-face air-purifying respirator or Powered Air Purifying Respirator (PAPR) equipped with High Efficiency Particulate Air (HEPA) filters when removing rodent nests, rodents from traps and cleaning up infested areas. Respirators are not considered protective if facial hair interferes with the face seal, since proper fit cannot be assured. Respirator use practices should be in accord with a comprehensive user program and should be supervised by a knowledgeable person.
- * Workers should wear rubber or plastic gloves when handling rodents, traps containing rodents, nests, or cleaning up infested areas. Gloves should be washed and disinfected before removing them, as described in Section 4 above.
- * All traps in which a rodent was captured should be disinfected with a household disinfectant solution.
- * Dispose of dead rodents as described in Section 4 above on Eliminating Rodents inside the Home.

7. PRECAUTIONS FOR OCCUPATIONAL GROUPS WHO HAVE POTENTIAL RODENT CONTACT

Insufficient information is available at this time to develop general recommendations regarding risks or precautions for persons in the affected areas who work in occupations with unpredictable

or incidental contact with rodents or their habitations. Examples of such occupations include telephone installers, maintenance workers, plumbers, electricians, and certain construction workers. Workers in these jobs may have to enter various buildings, crawl spaces, or other sites that may be rodent infested. NPS maintenance workers who work in and/ or under attics should follow the precautionary measures provided in Section 6.

8. PRECAUTIONS FOR CAMPERS AND HIKERS IN THE AFFECTED AREAS

There is no evidence to suggest that travel into the Hantavirus affected areas should be restricted. Most tourist activities pose little or no risk that travelers will be exposed to rodents or their excreta. However, persons engaged in outdoor activities such as camping or hiking should take precautions to reduce the likelihood of their exposure to potentially infectious materials.

- * Avoid coming into contact with rodents and rodent burrows or disturbing dens (such as pack rat nests).
- * Do not use cabins or other enclosed shelters that are rodent infested until they have been appropriately cleaned and disinfected.
- * Do not pitch tents or place sleeping bags in areas in proximity to rodent feces or burrows or near possible rodent shelters (e.g., garbage dumps or woodpiles).
- * If possible, do not sleep on the floor or bare ground. Use a cot with the sleeping surface at least 12 inches above the ground or floor. Use tents with floors.
- * Keep food in rodent-proof containers.
- * Promptly bury (or-preferably-burn followed by burying, when in accordance with local requirements), or discard all garbage and trash in covered trash containers.
- * Use only bottled water or water that has been disinfected by filtration, boiling, chlorination, or iodination for drinking, cooking, washing dishes, and brushing teeth.
- * Clean up spilled food and dispose of properly. Do not leave pet food in feeding dishes.

9. MANAGING SEASONALLY-USED CABINS AND OTHER BUILDINGS

The best protection from Hantavirus in seasonally used buildings is to prevent rodent access. This is accomplished by using the rodent proofing recommendations provided in Section 3,B. Unfortunately rodent-proofing is not always possible. Therefore, precautions need to be taken when closing buildings at the end of the season and reopening them at the beginning of the new season.

When closing buildings, give them a thorough cleaning and remove all food items and food

residues. Inspect buildings for rodent access. Eliminate these access points, if possible, following the recommendations provided in Section 3,B. Eliminate external food sources and nesting sites using the recommendations provided in Section 3,C.

When reopening buildings, first look for evidence of rodent infestation. Evidence includes direct observation of animals, presence of animal feces and/or nests, and openings into buildings that did not exist when the buildings were in use. If indication of rodent infestation exists, follow the precautionary measures provided in Section 4.