



Rodent Control and Protection from Hantavirus

Guide L-209

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INTRODUCTION

Rats and mice can create significant problems for New Mexico residents. They live in and around homes, farms and commercial establishments, and on agricultural lands. The house mouse (fig. 1), roof rat (fig. 2), and Norway rat (fig. 3) are the common commensal rodents found throughout New Mexico. The term “commensal” means “living with or in close association to humans.” In addition, there are numerous other field rodents that seldom live indoors. One field rodent, the deer mouse (fig. 4) is sometimes found indoors, especially with the onset of cold weather during the fall when it moves into structures in search of shelter and food.

The house mouse (*Mus musculus*) (fig. 1) generally has a grayish brown top and a light cream colored underside. The body is 2 to 3 1/2 inches long and weighs between 5/8 and 1 ounce. The

house mouse has relatively large ears for its size, and the tail is between 3 and 4 inches long.

The roof rat (*Rattus rattus*) (fig. 2) often is called the black rat. Its color varies from black to brownish gray, and the underside varies from gray to white. The body is 6 1/2 to 8 inches long and weighs between 6 and 12 ounces. The roof rat has large ears and a pointed nose. The eyes are large and prominent. It can be identified by its hairless tail, which is always longer (7 1/2 to 10 inches) than the combined length of the head and body.

The Norway rat (*Rattus norvegicus*) (fig. 3) is sometimes referred to as the brown rat or common rat. It usually is grayish brown, but color may vary from a pure gray to reddish brown or completely black. The underside is gray to yellow-white. The body is 6 to 8 inches long and weighs between

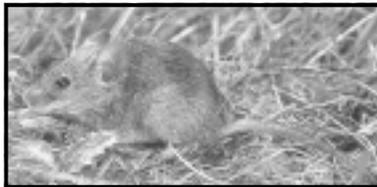


Figure 1. The house mouse.



Figure 3. The Norway rat.

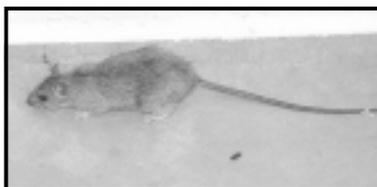


Figure 2. The roof rat.



Figure 4. Adult deer mice

12 and 16 ounces. The face features a blunt nose and small ears and eyes. The tail is scaly and always shorter than the combined length of the head and body.

Adult deer mice (*Peromyscus maniculatus*) (fig. 4) generally are tan or brown with a white underbelly and throat. Young deer mice are gray with white underbellies. The deer mouse ranges from 6 to 8 inches in total length, including the tail, which is about one-half of its total length. The ears are large, rounded and mostly hairless. The eyes are large and bulging. A distinguishing characteristic is the bicolored tail, the top half being darker than below.

Rats and mice are objectionable in many ways. For example, they eat and contaminate food with their urine, droppings, and hair. They can cause structural damage to buildings by their gnawing and nest-building activities. They can chew up wiring as well as insulation, resulting in fire hazards. Rats and mice can gnaw pipes, chew water hoses, and cut through mortar and cement. They also can damage wood doors, floors, walls, clothing, and furniture.

Rats and mice also can carry diseases that are health hazards to both humans and domestic animals, such as typhus fever, trichinosis, plague, salmonella, and hantavirus.

Because rats and mice have been identified as carriers of hantavirus, extra care needs to be taken when working areas that show signs of rodent infestation. Considering how long humans and rodents have shared common environments, the number of cases is surprisingly low. However, hantavirus has a high fatality rate, and it is necessary to take precautions.

DESCRIPTION OF HANTAVIRUS

In 1993, hantavirus was diagnosed in the Four Corners area of Arizona, Colorado, New Mexico, and Utah. It had not been identified in the United States prior to that outbreak, however, similar viruses were known in other parts of the world, primarily in the eastern hemisphere. Rodents primarily carry hantaviruses and each hantavirus has a preferred rodent. Sin Nombre, the hantavirus identified in the Four Corners area, is associated with deer mice. Deer mice are found almost everywhere in North America. However, the Sin Nombre virus is not restricted to deer mice. It also occurs in other species of the genus *Peromyscus*.

Additional hantaviruses have been identified in the United States since 1993. These are associated with the hispid cotton rat (*Sigmodon hispidus*) and the rice rat (*Oryzomys palustris*), both found in the southeastern United States; white-footed mouse (*Peromyscus leucopus*), found in New England and the mid-Atlantic and southern states, the Midwest and the western states; and commensal rodents, found in the U.S. port cities. All of these rodent species occur in New Mexico, except for the rice rat. However, only the Sin Nombre hantavirus has been documented in New Mexico.

SIGNS AND SYMPTOMS OF ILLNESS

Hantavirus symptoms are much like the flu: fever, headache, severe muscle aches, shortness of breath, nausea, vomiting, abdominal pain and diarrhea. These symptoms may last from a few hours to several days, at which time the infection can cause a serious respiratory disease called hantavirus pulmonary syndrome (HPS). The lungs fill with fluid and respiratory failure follows. HPS is the term most medical professionals use.

Symptoms of HPS usually appear within two weeks of infection but can appear as early as three days or as late as six weeks after infection.

The severe respiratory distress is what leads to the high fatality rate. Hantavirus can be difficult to diagnose, because the symptoms mimic the common flu. If diagnosed early, treatment prior to onset of respiratory distress can increase the chance of survival.

CONTRACTING HANTAVIRUS

Rodents are the only animals known to play a direct role in transmitting hantavirus. Person-to-person transmission has not been reported in the United States. The virus is carried in the rodents' saliva, feces, and urine. Hantavirus infection usually is spread by inhaling the virus. The danger occurs when people breathe in contaminated dust while working in or cleaning a rodent problem area. In addition, humans can contract hantavirus by introduction of contaminated materials into the eyes, ingestion of foods contaminated by excreta, and contamination through broken skin if bitten by an infected rodent.

Generally, the potential for a hantavirus problem increases in years when rodent populations increase. For example, wet years can result in increased vegetation that supports a larger rodent population. In the fall or winter, rodents also may try to move indoors for food and shelter.

REDUCING THE LIKELIHOOD OF CONTRACTING HANTAVIRUS

Although once contracted, the virus is not always fatal. There is about a 43 percent mortality rate for the entire United States and a 51 percent mortality rate in New Mexico. However, the likelihood of contracting hantavirus can be decreased. Minimizing exposure to rodents is essential. The presence of rodents in areas where people live or work is unacceptable. Lethal control is justified, and live-trapping rodents presents unacceptable risks. The precautions described below will protect people from the virus when dealing with rodent problems.

ELIMINATING RODENT PROBLEMS

The following steps should be followed when eliminating rodents in a domestic or work setting (fig. 5). First, try to eliminate them immediately using snap traps. Rodenticides also should be used to eliminate trap-shy rodents and for preventative control. Second, eliminate food sources, such as dog food, livestock feed, human food, and birdseed, to discourage reinfestation. Third, eliminate potential nesting sites, such as lumber, junk, and insulation piles. Finally, exclude all rodents from entering a structure. This is the only long-term prevention method, which requires time and energy as described below.

Trapping

Snap traps with wooden bases are recommended. Set snap traps along travel routes where rodent signs, such as droppings, are evident. Snap traps should be set at right angles to the wall and in such a manner that the rodent, in following its natural course, will pass directly over the trigger (fig. 6). To make the trap more effective, attach a 2-by-2 inch piece of cardboard to the trigger (fig. 7). Peanut butter, oats, chocolate, and bacon are good baits for

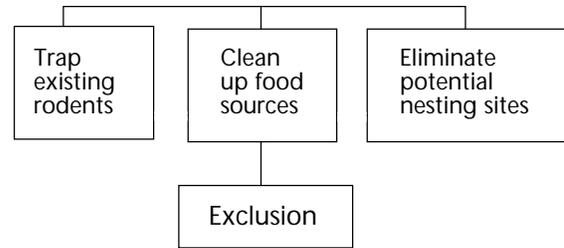


Figure 5. Steps to eliminate rodents in a domestic or work setting.

rodents. Although cheese often is used for bait, it quickly becomes stale and loses its attractiveness. All baits should be fresh and changed daily.

The following measures should be used to protect yourself against contracting hantavirus when trapping rodents. Place the baited snap trap on newspaper. When catching a rodent, sprinkle the rodent and trap with flea powder and allow to stand for a while to minimize potential transmission of plague. Then soak the rodent and trap with a disinfectant solution. The disinfectant solution should be 10 percent chlorine bleach and 90 percent water (1.5 cups of bleach to 1 gallon of water). The chlorine bleach destroys the virus. Some cleaning solutions will kill the hantavirus but others will not. That's why it is best to use chlorine bleach. However, use Lysol if a surface could be damaged by bleach.

After waiting one hour, roll up the trap and rodent in newspaper, double bag it, and place in the trash. Always wear latex or rubber gloves when trapping rodents. Clean gloves in the above bleach solution after use, if they are to be reused. Disposable plastic gloves can be purchased. Until gloves are disinfected, do not touch anything like door handles or countertops. In addition, do not reuse snap traps because of the increased risk of exposure to the virus.

Rodenticides

A baiting program using an approved rodenticide works well when rats and mice are a continual problem; where alternative methods, such as trapping, do not work; and where poisons can be safely used. There are many different rodenticides avail-

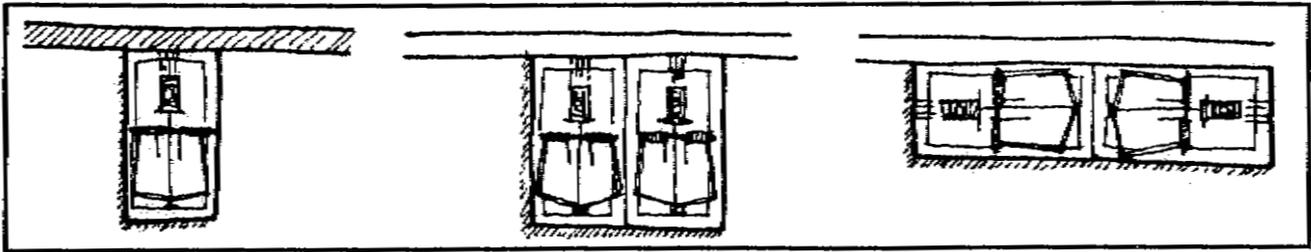


Figure 6. Proper single and double trap placement along a wall. Figure taken from West and Messmer (1998).

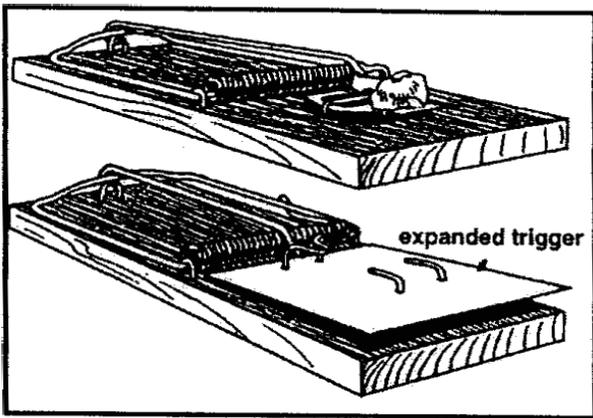


Figure 7. Extend trap trigger using a piece of cardboard. Figure taken from Texas Wildlife Damage Management Service (1998).

able on the market. Most are anticoagulants, which cause death to the rodent by internal bleeding. Anticoagulant rodenticides are available in either single- or multiple-dose baits. Rats and mice normally begin dying 3 to 10 days after feeding on the baits. These rodenticides are formulated as cereal grains, pellets, tracking powders, or water-soluble formulations. They can be purchased in ready-to-use forms at farm and ranch supply, hardware, and grocery stores.

Placing the baits properly can be as important as the type of bait used. All baits should be placed in rodent travel ways. It is best to locate the bait where it will be in the rodent's normal travel line.

Results from a bait program cannot always be measured by counting dead rats and mice. A successful bait program is achieved when baits are no longer being eaten, when there are no fresh droppings, and when no live rats or mice are seen.

Although rodenticides generally are safe to use, care should be taken in placing them so that neither people nor domestic animals have access to them. Containers known as bait boxes can be purchased that protect baits from the weather and restrict access mainly to rodents. Bait boxes will provide safeguards for people, pets, and other nontarget animals. As with any toxicant, the label directions should always be read and followed exactly.

Frightening Devices

Rats and mice can be frightened by loud or unfamiliar sounds. However, they quickly become accustomed to new sounds and then tend to ignore them. Many devices that produce ultrasonic sound and electromagnetic fields have been marketed as effective and easy ways to frighten mice and rats away. Unfortunately, these devices have not withstood scientific scrutiny. Scientific studies have indicated that mice and rats may initially be frightened by these devices, but usually return to the area and resume normal activities. Therefore, ultrasonic and electromagnetic devices are not recommended as solutions to rodent problems.

Removal of Rodent Food Supplies and Shelters

Good sanitation is very effective in reducing rat and mice populations in human dwellings or work places. The best way to eliminate the food supply is to store foodstuffs in rodent-proof containers, such as metal containers, glass bottles, and heavy plastic containers with tight-fitting lids. Paper boxes, plastic bags, and cellophane packages are easily accessible by rodents. Waste and garbage also should be disposed in tightly covered metal cans. Keep all dog and cat

food cleaned up after each feeding and store feed in a metal container so it is unavailable to rodents.

Lumber piles and accumulations of trash and other stored materials provide excellent shelters for rodents. Waste, such as empty boxes and cartons, should be disposed of promptly so that it will not serve as shelter for rodents. Locate hay, wood, and compost piles as far away from the home as possible. Materials should be stored at least 18 inches off the ground or floor, and with space between the material and the wall. Removing vegetation and debris around structures also can discourage rats and mice from entering dwellings.

Rodent Exclusion

Whenever possible, rodent exclusion is recommended as the most permanent means of control. All openings rodents can enter should be covered with rodent-resistant materials, such as 1/4-inch hardware cloth. Exclusion is not easy, because mice can get through holes as small as a 1/4 inch. This is the size of a dime or shirt button. Rats can fit through a 1/2-inch hole. Do not use steel wool, because rodents can gnaw through the material. Latex, plastic, rubber, and wood materials also are unsuitable for plugging holes used by rats and mice.

Seal cracks in building foundations and openings for water pipes, vents, and utilities with metal or concrete. Doors, windows, and screens should fit tightly. Cover the edges of doors and windows with metal to prevent gnawing.

CLEANING EXCRETA

To protect against hantavirus, never sweep or vacuum rodent droppings. This may spread the virus through the air, allowing it to become inhaled. When cleaning up excreta, put on latex or rubber gloves and then saturate fecal pellets with the 10 percent chlorine bleach solution. Wait one hour and then pick up saturated pellets with paper towels and double bag and place in trash. Also wipe down all surfaces where the droppings were found, such as shelves, counters, and cabinets, with disposable rags or paper towels soaked in the solution.

CLEANING RODENT NESTS

First, put on latex or rubber gloves. Next, to protect against plague when cleaning rodent nests, dust nest with flea powder and wait one day. Then saturate the nest with the 10 percent chlorine bleach solution. Wait one hour and then pick up saturated nest with paper towels. Finally, double bag and throw in trash.

AIRING OUT CONFINED AREAS

Extra care must be taken to protect against hantavirus when cleaning a confined area, especially if it has been vacant for some time and there is evidence, such as rodent droppings, of high rodent activity. Wear protective clothing, including latex or rubber gloves. Masks need to be worn if the confined area is infested with rodents. Inexpensive painters' masks are not effective and may give a false sense of security. Masks need to have a HEPA (high efficiency particulate air) or N-100 filter.

Open doors and windows to allow the area to ventilate for at least one hour. Electric fans also can be used to facilitate this process. Finally, clean the area according to previously defined guidelines.

ADDITIONAL INFORMATION

Do not be reluctant to seek further information, especially when treating areas heavily infested with rodents or previously known to have hantavirus. These situations require more protection and care according to specific guidelines.

For additional information, contact the New Mexico Department of Health (1-800-879-3421) or the Centers for Disease Control and Prevention (1-800-311-3435). In addition, Internet sites for hantavirus information include the Centers for Disease Control and Prevention (www.cdc.gov) and the Emerging Viruses Research Center (thor.unm.edu/Hanta/Website1.htm), located at the University of New Mexico's Medical Research Center.

ACKNOWLEDGEMENTS

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Figures in this publication were taken directly from the following sources:

- Figures 1, 2 and 3: Burt and Grossenheider 1980. Figure taken from Western Exterminator Company (2002). Bugs and Pests. Available online: www.west-ext.com (Jan. 3, 2002).
- Figure 4: Burt and Grossenheider 1980. Figure taken from Sevilleta Long-Term Ecological Research Project (2002). Deer Mouse. Available online: sevilleta.unm.edu/data/species/mammal/profile/deer-mouse-photo.html (Jan. 3, 2002).

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