



# Public Health Mōno-Gram



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## HANTAVIRUS PULMONARY SYNDROME

### What is hantavirus pulmonary syndrome (HPS)?

HPS is a potentially severe disease of the lungs which was first recognized in 1993 in the "Four Corners" area (where Utah, Colorado, Arizona, and New Mexico meet) of the southwestern United States (U.S.). The disease is caused by hantaviruses, most frequently Sin Nombre virus, which causes HPS in the western U.S. Cases of HPS occur throughout the U.S. but are most common in the Southwest. The Eastern Sierra has been the source of most cases identified in California. HPS is a rare, but often fatal, disease.

### What is being done locally to prevent human cases?

Your local Mono County Public Health and Environment Health staff, in collaboration with the California Department of Health Services, provides surveillance of animal populations. They also provide education and materials to both the local and visiting public about HPS and methods to minimize risk.

### How are hantaviruses maintained in nature?

In the U.S., the hantaviruses that cause HPS are maintained in nature in wild rodents. In the Eastern Sierra, the Deer Mouse (*Peromyscus maniculatus*) is the usual culprit. It is a deceptively cute animal, with big eyes and big ears. Its head and body are normally about 2 - 3 inches long, and the tail adds another 2 - 3 inches in length. You may see it in a variety of colors, from gray to reddish brown, depending on its age. The underbelly is always white and the tail has sharply defined white sides. The deer mouse is found almost everywhere in North America. Usually, the deer mouse likes woodlands, but also turns up in desert areas.





Other rodents, including squirrels, chipmunks, and house mice, are rarely, if ever, infected and do not pose a risk of HPS to humans.

### **How do you get HPS?**

Infected rodents shed hantavirus in their urine, droppings, and saliva. Most patients become infected by breathing air contaminated with aerosolized rodent urine or droppings, such as when cleaning out a rodent-infested space. Individuals can also be infected by: 1) consuming food contaminated with rodent urine or droppings; 2) touching surfaces where rodents have been, and then putting their hand in their mouth; 3) being bitten by an infected rodent.

### **Transmission Details: So How Does "Aerosolization" Really Work?**

For a hantavirus to cause HPS, the virus must travel from the rodents that carry it to a person. A common way this happens is when a person breathes in the hantavirus from the air.

Let's create an imaginary scenario and go through the process step by step. Say you have a storage room in your home that you hardly ever enter. You keep old furniture there, old newspapers and magazines, and so on. At some point, a group of deer mice find their way into the room, looking for places to build nests. They found their way into the room through a crack—deer mice can squeeze through holes as small as a shirt button! Some mice chew through the fabric of an old armchair and build a nest inside it. Other mice shred bits of magazines and build nests under the shredded pieces.

A few of these mice are infected with the hantavirus. The infected mice don't show any signs of being sick. In fact, the virus does not seem to make them ill at all; it simply lives in their bodies. However, the virus is shed continuously



from them: into the droppings and urine they leave around the room, and into their saliva, which dries on anything they have chewed, such as nesting material. Out in the environment like this, the virus can live for several days.

Meanwhile, you decide to clean up your storage room. You go inside, spend a few minutes moving boxes and furniture. The mice hear you coming and scurry away, leaving a trail of fresh urine! Because you find mouse droppings and some of the furniture stuffing the mice have used as nesting material, you get a broom and sweep up the mess. As you move around and sweep, tiny particles of fresh urine, droppings and saliva, with the virus in them, get kicked up into the air. This is the aerosolization. It is these tiny particles that you breathe in—and this is the beginning of becoming sick with HPS.

Because the virus is spread when virus-containing particles are stirred up into the air, an essential HPS tactic in areas showing signs of rodents is to avoid actions that raise dust and to carefully wet the area down with disinfectant. The less chance the virus has to get into the air, the less chance it will be breathed in!

### **What are the signs and symptoms of HPS?**

Typically, infected persons develop symptoms one to two weeks after exposure. Early symptoms of HPS include fever, headache, and muscle aches, especially the thighs, hips, back, and shoulders. Other early symptoms include dizziness, chills, nausea, vomiting, diarrhea, and abdominal pain. After two to seven days of these symptoms, patients develop breathing difficulties that range from cough and shortness of breath to severe respiratory failure. Approximately 40 percent of HPS patients die from the disease.

### **How is HPS diagnosed?**

Persons with HPS can be readily diagnosed by specific blood tests.

### **What treatment is recommended for HPS patients?**

Currently, there is no specific treatment for HPS. However, if infected individuals are recognized and hospitalized early, supportive care can increase their chance for survival. Patients with severe respiratory disease can require intensive support of their heart and lung function.

### **How can I avoid getting HPS?**

Avoid contact with all wild rodents, their droppings, and nesting materials. Store all food items securely in rodent-proof containers. Examine the outside of all buildings and block up any holes or other areas that would let rodents get inside. Before entering an enclosed area that may be contaminated with



rodent material, allow it to air out for several hours. Surfaces where rodents may have been should be wetted with a dilute bleach solution before mopping up. Do not use a broom or vacuum to clean these areas. Promptly dispose of all cleaning materials when done, and wash hands and clothes.

### **What kind of activities are risky?**

Any activity that puts you in contact with rodent droppings, urine, saliva, or nesting materials can place you at risk for infection. Hantavirus is spread when virus-containing particles from rodent urine, droppings, or saliva are stirred into the air. It is important to avoid actions that raise dust, such as sweeping or vacuuming. Infection occurs when you breathe in virus particles.

### **Opening and Cleaning Previously Unused Buildings**

Opening or cleaning cabins, sheds, and outbuildings, including barns, garages and storage facilities, that have been closed during the winter is a potential risk for hantavirus infections, especially in rural settings.

### **Housecleaning Activities**

Cleaning in and around your own home can put you at risk if rodents have made it their home too. Many homes can expect to shelter rodents, especially as the weather turns cold.

### **Work-related Exposure**

Construction, utility and pest control workers can be exposed when they work in crawl spaces, under houses, or in vacant buildings that may have a rodent population.

### **Indoors:**

- Keep a clean home, especially kitchen (wash dishes, clean counters and floor, keep food covered in rodent-proof containers).
- Keep a tight-fitting lid on garbage. Discard uneaten pet food at the end of the day.
- Set and keep spring-loaded rodent traps. Set traps near baseboards because rodents tend to run along walls and in tight spaces rather than out in the open. Check traps frequently, as any fleas now left without a meal will be seeking a new host – you and your pet dog or cat!
- Seal all entry holes 1/4 inch wide or wider with lath screen or lath metal, cement, wire screening or other patching materials, inside and out.

Since bubonic plague is a problem in our area, do not use rodenticides to kill mice. This is important. If you control rodents but do not control fleas as well, you may increase the risk of infection with bubonic plague, since fleas will leave rodents once the rodents die and will



seek out other food sources, including dogs, cats, and humans. Although your dog and cat may not have fleas due to the altitude in which you live, rodent fleas can live at a higher elevation. Dogs usually do not get very sick with plague, but cats and humans can die.

### **Campers and Hikers**

There is no evidence to suggest that travel into areas where HPS has been reported should be restricted. Most usual tourist activities pose little or no risk that travelers will be exposed to rodents or their urine and/or droppings.

However, persons who do outdoor activities such as camping or hiking should take precautions to reduce the likelihood of their exposure to potentially infectious materials.

### **Useful Precautions:**

- Avoid coming into contact with rodents and rodent burrows or disturbing dens (such as pack rat nests).
- Air out, then disinfect cabins or shelters before using them. These places often shelter rodents.
- Do not pitch tents or place sleeping bags in areas in proximity to rodent droppings or burrows or near areas that may shelter rodents or provide food for them.
- If possible, do not sleep on the bare ground. In shelters, use a cot with the sleeping surface at least 12 inches above the ground. Use tents with floors or a ground cloth if sleeping in the open air.
- Keep food in rodent-proof (and bear-proof!) containers!
- Promptly 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.
- And last but not least, do not play with or handle any rodents that show up at the camping or hiking site, even if they appear friendly.

### **Clean Up Infested Areas, Using Safety Precautions:**

Put on latex rubber gloves before cleaning up.

**Do not** stir up dust by sweeping up or vacuuming up droppings, urine or nesting materials.

Instead, thoroughly wet contaminated areas with detergent or liquid to deactivate the virus. Most general purpose disinfectants and household detergents are effective. However, a hypochlorite solution prepared by mixing 1 and 1/2 cups of household bleach in 1 gallon of water may be used in place



of commercial disinfectant. When using the chlorine solution, avoid spilling the mixture on clothing or other items that may be damaged.

Once everything is wet, take up contaminated materials with a damp towel, then mop or sponge the area with disinfectant.

Spray dead rodents with disinfectant, then double-bag along with all cleaning materials and throw out in usual waste disposal system.

Finally, disinfect gloves *before taking them off* with disinfectant or soap and water. After taking off the clean gloves, thoroughly wash hands with soap and warm water.

When going into cabins or outbuildings (or work areas) that have been closed for awhile, open them up and air out before cleaning.

### **Hantaviruses and Disinfectants**

Hantaviruses are surrounded by a lipid (fatty) envelope, so they are somewhat fragile. The lipid envelope can be destroyed and the virus killed by fat solvents, such as alcohol, ordinary disinfectants and household bleach. That is why one of the most important ways to prevent transmitting the disease is to carefully wet down dead rodents and areas where rodents have been with disinfectant and/or bleach. When you do this, you are killing the virus itself and reducing the chance that the virus will get into the air.

It is recommended that a 10% bleach solution be used to inactivate hantaviruses.

### **Where can I find more information about HPS?**

The Centers for Disease Control and Prevention has information available at their website <http://www.cdc.gov/ncidod/diseases/hanta/hps/index.htm>

