Learn About Hantavirus Pulmonary Syndrome

Hantavirus pulmonary syndrome (HPS) is a rare but potentially life-threatening viral illness. The virus is transmitted to humans by inhaling infected rodent urine, droppings, or saliva. The presence of infected rodents in and around the home environment is the primary risk factor for infection. Even healthy adults can develop this illness.

Key Facts

- People exposed to rodent secretions (such as urine or saliva) or with a history of recent travel to rural areas (potential rodent exposure) are at risk for developing HPS.
- Symptoms include abrupt onset of fever, chills, weakness, nausea, vomiting, and abdominal pain followed by difficulty breathing.
- HPS can be rapidly fatal if not identified and treated promptly.
- There isn’t a vaccine for HPS, and treatment is mainly to support breathing, reducing symptoms, and avoiding side effects.

What Is Hantavirus?

The ‘Hantavirus’ is a group of rodent-borne viruses that causes hantavirus pulmonary syndrome (HPS). It was first identified in the Southwestern United States in 1993 when a group of healthy adults suffered rapid breathing difficulty followed by respiratory failure from an unknown cause. Blood samples from these patients tested positive for exposure to the hantavirus. At the time, prior case reports had linked hantavirus infection to rodents in a single area. An extensive rodent-catching campaign led to the discovery of an unusually large population of infected deer mice near these patients. This was the first large group of patients with HPS attributed to rodent exposure. Several more cases were found when looking back. We now know that hantavirus caused illness in both North and South America, with more than 600 cases identified from 1993 to 2013 (see below).

How Hantavirus Affects Your Body

Hantavirus can infect both rodents and humans, although rodents seem not to get sick. On the other hand, humans can develop severe symptoms and may die.

The hantavirus enters the body by inhaling of virus particles from infected rodent bodily fluids. The virus has a tendency to affect the heart, lungs and kidneys and reduces the function of these organs. The virus also enters the bloodstream where it continues to spread, replicate, and cause further organ damage.

The body attempts to fight the virus by creating inflammation. The combination of the virus infecting various organs and the inflammation created by the body leads to intense bodily damage. The virus causes blood vessels throughout the body to become “leaky.” In the lungs, leaky blood vessels cause flooding in the air sacs, causing breathing difficulty. When the virus infects the heart, the damage reduces its ability to pump blood around the body. Failure of the heart to pump and leaky vessels with reduction in blood flow causes very low blood pressure (“shock”), and oxygen is not available to all the cells of the body. This can rapidly lead to failure of most or all of the organs and can rapidly lead to death.

Put together, damage to the blood vessels of several organs (specifically heart and lungs) – leading to respiratory failure, “shock,” and death lead to what is now known as “hantavirus
pulmonary syndrome” (HPS) or “cardiopulmonary syndrome” (HCPS).

How Serious Is HPS?
HPS is an extremely serious and life-threatening disease. According to the Centers for Disease Control and Prevention (CDC), 606 cases of HPS were identified in the United States between 1993 and 2013. Around a third of these patients died. Cases have been identified in 34 states, with more than 90% identified in states west of the Mississippi River.

Several strains of the virus have been identified, with the Sin Nombre Virus (SNV) and Andes virus associated with the most severe form of the illness. Mild infections can cause death in about 10% to 30% of cases, whereas in severe illness, case fatality rates are as high as 50%.

Hantavirus Pulmonary Syndrome (HPS) Symptoms, Causes, and Risk Factors

What Are Symptoms of HPS?
HPS has three phases. The first phase is the “incubation” phase, when the virus is inhaled into the lungs, ingested by immune cells, and then transported via the blood to other organs. This phase lasts for 2 to 3 weeks, and the patient has no symptoms.

The second phase lasts 2 to 8 days and includes rapid development of fever, dry cough, body aches, headaches, diarrhea, and abdominal pain. Heart and lung failure can develop during this phase. Blood vessels become leaky and lead to collection of fluid in the lungs, bleeding, and failure of the heart to pump. The combination of these changes leads to shock failure of several organs and often death.

In the third phase, there are alternating periods of high and low urine production.

In the fourth and final phase, patients who remain alive have improving symptoms and recovery of organ function. Complete recovery occurs over several weeks. The symptoms of HPS seem to resolve as rapidly and dramatically as its onset.

Key symptoms and signs to watch for (especially with a history of rodent exposure) include:
- Fever greater than 101ºF, chills, body aches, headaches
- Nausea and vomiting and abdominal pain
- New rash (faint red spots)
- A dry cough followed by rapid onset of breathing difficulty

What Causes HPS?
HPS is acquired via inhalation of virus particles from contact with infected rodents. Transmission is only known to occur from rodents to humans. To date, there are no confirmed reports of human-to-human transmission. There are several strains of hantavirus that are responsible for various syndromes of illness.

What Are Risk Factors?
Environmental factors: Rural populations with potential exposure to wild rodents are at risk. There are cases of patients developing HPS without any obvious exposure to rodents, but it is possible that patients may not recognize their rodent exposure. In these cases, an awareness of other cases of HPS in the area and suspicious signs and symptoms should alert one to seek help and clinicians to establish early diagnosis and treatment.

Note: Any adult with exposure to the virus can develop hantavirus infection. It does not only affect those with weak immune systems.

When to See Your Doctor
If you have unexplained fever, body aches, abdominal pain, diarrhea, headaches, dry cough, or severe breathing difficulty, you should see a health-care provider. This is especially true if you are exposed to large rodent populations and their secretions (urine, saliva, and/or feces).
Diagnosing and Treating Hantavirus Pulmonary Syndrome (HPS)

Diagnosing HPS can be challenging. Symptoms are vague and easily mistakable for other viral illnesses. That is why a doctor must suspect hantavirus to pursue additional testing for HPS.

What to Expect
Patients living in, or with history of recent travel to areas with large rodent populations (rural areas) are at a special risk for developing the hantavirus infection. Patients in these settings should be especially alert if they develop the unexplained symptoms mentioned above. These symptoms can easily be mistaken for the “local flu,” however, could be early warning signs of HPS. These symptoms can occur anywhere between a few days to 6 weeks after your initial contact with rodents that may cause hantavirus, and are usually followed by nausea, vomiting, and abdominal pain. Within 2 to 10 days from the start of a hantavirus infection, your symptoms can rapidly progress to those of respiratory failure requiring prompt and potentially life-saving medical attention. Local populations and patients should be educated and encouraged to seek local help in the event of exposure to rodents and the symptoms that suggest HPS.

How HPS Is Diagnosed
Diagnosis relies on finding antibodies against hantavirus. Antibodies are specific proteins produced by the immune system to fight infections, and detecting antibodies against hantavirus in a patient with exposure and hantavirus symptoms can be used to confirm a hantavirus infection.

How HPS Is Treated
There is no cure for HPS. Treatment of HPS is supportive. Supportive care includes oxygen therapy, fluid replacement, and use of medications to support blood pressure. Due to the risk of rapid respiratory deterioration, patients suspected to have HPS should be transported immediately to a hospital with intensive care monitoring, support with mechanical ventilation (respirator), and kidney dialysis.

Sometimes antiviral drugs, such as ribavirin, are used to treat other strains of hantavirus and associated infections (HFRS). However, no large trials have proven them to work, but doctors may try in very severe cases.

Living With Hantavirus Pulmonary Syndrome

About 4 out of 10 patients with HPS do not survive their illness. However, patients who recover usually do so rapidly. Supportive treatment during the severe stages of illness, allows the body and its organs to rest and defend themselves as the viral illness runs its course and resolves completely.

What to Expect
With treatment, cases of HPS can resolve completely, and patients can return to normal life and functioning. There are no reports of chronic infection with hantavirus, there seem to be no long-term effects of having suffered from HPS.

Managing and Preventing HPS
The best treatment is prevention. With HPS, prevention is directed toward minimizing rodent exposure and early identification of any exposed/infected patients.

- Seal up (using cement or other patching material) holes or cracks through which rodents may gain entry to your home or work environment. Remember, they can get through opening that are much smaller than you may think.
- Identify potential nesting sites, and clean up debris, clear bushes, and trap rodents to remove them.
- Open and aerate well any chronically closed rodent-infested spaces before entering them.
- Heavily infested areas should be brought to the attention of the relevant state or federal health officials prior to cleaning campaigns.

Finding Support
The Lung Association recommends patients and caregivers join our Living with Lung Disease Support Community to connect with others facing this disease. You can also call the Lung Association’s Lung HelpLine at 1-800-LUNGUSA to talk to a trained respiratory professional who can help answer your questions and connect you with additional support.

The following are some resources you can access to gain more information about this disease:
- [http://www.cdc.gov/hantavirus/](http://www.cdc.gov/hantavirus/)
- [http://www.mayoclinic.org/diseases-conditions/hantavirus-pulmonary-syndrome/basics/definition/con-20030129](http://www.mayoclinic.org/diseases-conditions/hantavirus-pulmonary-syndrome/basics/definition/con-20030129)

Questions to Ask Your Doctor About Hantavirus Pulmonary Syndrome (HPS)
Making notes before your visit, as well as taking along a trusted family member or friend, can help you through the first appointment with your doctor.
- Have there been cases of hantavirus infections reported near my home or work environment?
- What are the common surroundings that are prone to rodent exposure (alleys, dark closed rooms, shrubs, farm spaces)?
- Can pet mice and squirrels be infected?
- What are the most common HPS symptoms that should alarm me to seek evaluation and treatment?
- How many days does it take for symptoms of infection to become evident?
- How can I prevent infection?