

# PUBLIC HEALTH REFERENCE SHEET

## Hantavirus Disease



<b>Name</b>	<i>Bunyaviridae</i> viruses
<b>Reservoir &amp; Transmission</b>	Rodents: deer mouse ( <i>Peromyscus maniculatus</i> ), cotton rat ( <i>Sigmodon hispidus</i> ), rice rat ( <i>Oryzomys palustris</i> ), white-footed mouse ( <i>Peromyscus leucopus</i> ) Aerosol transmission from rodent excreta
<b>Incubation Period</b>	HPS: range from a few days to 6 weeks HFRS: range from a few days to 2 months, usually 2–4 weeks
<b>Common Symptoms</b>	Febrile prodrome, thrombocytopenia, leukocytosis, capillary leakage <u>Hantavirus infection, non-pulmonary syndrome</u> : nonspecific viral symptoms: fever (temperature >101.0°F or 38.3°C), chills, myalgia, headache, and/or gastrointestinal symptoms, without cardiopulmonary symptoms  <u>Hantavirus pulmonary syndrome (HPS)</u> : febrile illness (temperature >101.0°F or 38.3°C) with chills, myalgia, gastrointestinal symptoms, and at least one of the following: bilateral diffuse interstitial edema, acute respiratory distress syndrome, noncardiogenic pulmonary edema  <u>Hemorrhagic fever with renal syndrome (HFRS)</u> including Korean Hemorrhagic Fever: acute onset of fever, lower back pain, hemorrhagic manifestations, and/or renal involvement
<b>Gold Standard Diagnostic Test</b>	PCR, ELISA, IFA
<b>Risk Groups</b>	Persons in rural areas; occupational exposure or contact with rodents
<b>Geographic Significance</b>	Western United States, Canada, South America, Central America, China, Russia, and Korea

### What is Hantavirus?

Hantaviruses are a group of zoonotic disease-causing viruses that are carried by some rodents. More than 25 antigenically distinguishable viral species exist, each associated primarily with a single rodent species. In the Americas, hantaviruses cause a disease known as hantavirus pulmonary syndrome (HPS). Throughout the world, different hantaviruses cause Hemorrhagic fever with renal syndrome (HFRS).

### Hantavirus pulmonary syndrome (HPS)

HPS is a severe, sometimes fatal, respiratory disease in humans caused by infection with hantaviruses.

### What is the occurrence of HPS?

To date, no cases of HPS have been reported in the U.S. in which the virus was transmitted from one person to another. In Chile and Argentina, rare cases of person-to-person transmission have occurred among close contacts of a person who was ill with a type of hantavirus called Andes virus. While HPS remains a very rare disease, cases have occurred in all regions of the U.S. except for Alaska and Hawaii. More than 95% of reported cases have occurred in states west of the Mississippi River, and about 75% of patients with HPS have been residents of rural areas. Cases may occur among forestry workers, farmers, and Service members participating in field operations or other exercises simulating combat conditions.

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In the U.S. and Canada, the Sin Nombre hantavirus is responsible for most cases of hantavirus infection. The host of the Sin Nombre virus is the deer mouse (*Peromyscus maniculatus*), present throughout the western and central U.S. and Canada. The New York hantavirus, carried by the white-footed mouse, is associated with HPS cases in the northeastern U.S. The Black Creek hantavirus, carried by the cotton rat, is found in the southeastern U.S. Cases of HPS have been confirmed elsewhere in the Americas, including Canada, Argentina, Bolivia, Brazil, Chile, Panama, Paraguay, and Uruguay.

### How is HPS transmitted?

The rodents shed the virus in their urine, droppings, and saliva. The virus is mainly transmitted to people through airborne transmission (i.e., breathe in air contaminated with the virus). Rarely, people can become infected with hantavirus if bitten by a rodent with the virus. Rodents may transmit hantavirus to people who touch something that has been contaminated by rodent urine, droppings, or saliva.

### Who is at risk for HPS?

Anyone, regardless of age or gender, who may contact rodent droppings, urine, saliva, or nesting materials is at risk for HPS infection. Activities that increase risk of HPS include improperly cleaning up urine, droppings, and nests; cleaning a shed or cabin that has been closed; and working in areas where rodents live (e.g., barn, shed, abandoned building).

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

The incubation period is believed to be 1 to 8 weeks after exposure. Early symptoms of HPS include fever and severe muscle aches, especially in the large muscle groups (e.g., quadriceps, hips, back, shoulders). Approximately half of all individuals with HPS have headaches, dizziness, chills, and abdominal problems, such as nausea, vomiting, diarrhea, and abdominal pain. From 4 to 10 days after the initial phase of illness, late symptoms of HPS include difficulty breathing, coughing, shortness of breath, and tightness in the chest and face. Most patients recover completely. No chronic infection has been detected in humans. Some patients have experienced longer than expected recovery times, but the virus has not been shown to leave lasting effects on the patient.

### What are potential complications of HPS?

HPS can be fatal. The mortality rate is 38%.

### How is HPS diagnosed?

Almost every hantavirus case can be traced to direct contact with rodents or with rodent infestations in enclosed spaces. Diagnosing HPS in an individual who has only been infected for a few days is difficult because early nonspecific symptoms, such as fever, muscle aches, and fatigue, are easily confused with influenza. However, HPS is likely if the individual is experiencing fever and fatigue and has a history of potential rural rodent exposure, combined with shortness of breath.

### How is HPS treated?

There is no specific treatment, cure, or vaccine for Hantavirus infection. Early recognition and supportive treatment improve outcomes.

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### **Hemorrhagic fever with renal syndrome (HFRS)**

HFRS is a group of clinically similar illnesses caused by hantaviruses. HFRS includes diseases such as Korean hemorrhagic fever, epidemic hemorrhagic fever, and nephropathia epidemica. The viruses that cause HFRS include Hantaan, Dobrava, Saaremaa, Seoul, and Puumala.

### **What is the occurrence of HFRS?**

HFRS is found throughout the world. Hantaan virus is widely distributed in eastern Asia, particularly in China, Russia, and Korea. Puumala virus is found in Scandinavia, western Europe, and western Russia. Dobrava virus is found primarily in the Balkans, and Seoul virus is found worldwide. Saaremaa virus is found in central Europe and Scandinavia.

### **How is HFRS transmitted?**

Rodents are the natural reservoir for hantaviruses. Known carriers include:

- The striped field mouse (*Apodemus agrarius*), the reservoir for both the Saaremaa and Hantaan virus;
- The brown or Norway rat (*Rattus norvegicus*), the reservoir for Seoul virus;
- The bank vole (*Clethrionomys glareolus*), the reservoir for Puumala virus; and
- The yellow-necked field mouse (*Apodemus flavicollis*), which carries Dobrava virus.

People can become infected with these viruses and develop HFRS after exposure to aerosolized urine, droppings, or saliva of infected rodents or after exposure to dust from their nests. Transmission may occur when infected materials are directly introduced into broken skin or onto the mucous membranes of the eyes, nose, or mouth. Individuals can be exposed to hantaviruses through rodent bites from infected animals. Transmission from one human to another may occur, but it is extremely rare.

### **Who is at risk for HFRS?**

Individuals who live or work in areas with known rodent carriers are at risk for HFRS.

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

Symptoms of HFRS usually develop within 1 to 2 weeks after exposure to infectious material, but in rare cases, they may take up to 8 weeks to develop. Initial symptoms begin suddenly and include intense headaches, back and abdominal pain, fever, chills, nausea, and blurred vision. Individuals may have flushing of the face, inflammation or redness of the eyes, or a rash. Later symptoms can include low blood pressure, acute shock, vascular leakage, and acute kidney failure, which can cause severe fluid overload. The severity of the disease varies depending upon the virus causing the infection. Hantaan and Dobrava virus infections usually cause severe symptoms, while Seoul, Saaremaa, and Puumala virus infections are usually more moderate. Complete recovery can take weeks or months.

### **What are potential complications of HFRS?**

Depending upon which virus is causing the HFRS, death occurs in less than 1% to as many as 15% of patients. Fatality ranges from 5 to 15% for HFRS caused by Hantaan virus, and it is less than 1% for disease caused by Puumala virus.

### **How is HFRS diagnosed?**

Several laboratory tests are used to confirm a diagnosis of HFRS in patients with a clinical

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history compatible with the disease. Patients are determined to have HFERS if they have serologic test results positive for hantavirus infection, evidence of hantavirus antigen in tissue by immunohistochemical staining and microscope examination, or evidence of hantavirus RNA sequences in blood or tissue.

### How is HFERS treated?

Supportive therapy includes managing hydration and electrolytes, oxygenation, and blood pressure. Intravenous ribavirin, an antiviral drug, has been shown to decrease illness and death associated with HFERS if used very early in the disease. Treat secondary infections.

### How can Hantavirus be prevented?

- Educate personnel and provide proper personal protective equipment to those tasked with inspections for rodent infestations and/or cleanup.
- Avoid all wild mice and rats.
- Keep rodents out of residences, workplaces, and dining facilities.
- Keep food and garbage in thick plastic or metal containers with tight lids.
- Do not leave pet-food or water bowls out overnight.
- Do not sweep or vacuum up mouse or rat urine, droppings, or nests as this will disperse virus particles into the air to be inhaled.
- Use wet mopping with a disinfectant or mixture of bleach and water.
- Wear an approved respirator when cleaning.

### What are some public health considerations?

- Specify the clinical form of the disease.
- Document relevant travel and deployment history occurring within the incubation period.
- Document the circumstances under which the case patient was exposed including duty exposure, occupational activities, environmental exposures, or other high-risk activities.

### References:

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