



Hemorrhagic Fever with Renal Syndrome

Fact Sheet

What is hemorrhagic fever with renal syndrome?

Hemorrhagic fever with renal syndrome (HFRS) is a group of clinically similar illnesses caused by hantaviruses from the family *Bunyaviridae*. HFRS includes diseases such as Korean hemorrhagic fever, epidemic hemorrhagic fever, and nephropathis epidemica. The viruses that cause HFRS include Hantaan, Dobrava-Belgrade, Seoul, and Puumala.



Apodemus agrarius, reservoir for Hantaan virus.

Where is HFRS Found?

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 Russia. Dobrava virus is found primarily in the Balkans, and Seoul virus is found worldwide. In the Americas, viruses in the same family cause a different disease known as [hantavirus pulmonary syndrome](#).

How do humans get HFRS?

Hantaviruses are carried and transmitted by rodents. 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 also occur when infected urine or these other materials are directly introduced into broken skin or onto the mucous membranes of the eyes, nose, or mouth. In addition, individuals who work with live rodents can be exposed to hantaviruses through rodent bites from infected animals. Transmission from one human to another may occur, but is extremely rare.

Which rodents carry the hantaviruses that cause HFRS in humans?

Rodents are the natural reservoir for hantaviruses. Known carriers include the striped field mouse (*Apodemus agrarius*), the reservoir for 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.

What are the 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 and Puumala virus infections are usually more moderate. Complete recovery can take weeks or months.

How is HFRS diagnosed?

Several laboratory tests are used to confirm a diagnosis of HFRS in patients with a clinical history compatible with the disease. Such patients are determined to have HFRS 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 HFRS treated?

Supportive therapy is the mainstay of care for patients with hantavirus infections. Care includes careful management of the patient's fluid (hydration) and electrolyte (e.g., sodium, potassium, chloride) levels, maintenance of correct oxygen and blood pressure levels, and appropriate treatment of any secondary infections. Dialysis may be required to correct severe fluid overload. Intravenous ribavirin, an antiviral drug, has been shown to decrease illness and death associated with HFRS.

Is HFRS ever fatal?

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

How is HFRS prevented?

Rodent control is the primary strategy for preventing hantavirus infections. Rodent populations near human communities should be controlled, and rodents should be excluded from homes. Individuals should avoid contact with rodent urine, droppings, saliva, and nesting materials, and the safety measures described below should be followed when cleaning rodent-infested areas.

Recommendations for cleaning rodent-infested areas:

- Wear rubber, latex, vinyl, or nitrile gloves.
- Do not stir up dust by vacuuming, sweeping, or any other means.
- Thoroughly wet contaminated areas with a hypochlorite (bleach) solution or household disinfectant. A bleach solution can be made by mixing 1½ cups of household bleach in 1 gallon of water. (Note: bleach solution is an irritant and should not be used on humans or live animals. Care should be used to avoid splashing when mixing the solution.)
- Once everything is wet, remove contaminated materials with a paper towel and then mop or sponge the area with bleach solution or household disinfectant.
- Spray dead rodents with bleach solution or disinfectant and double-bag them along with the used cleaning materials (paper towels). Discard the bagged waste in an appropriate garbage container to be collected by the sanitation department. Alternate disposal, such as burying or burning the waste, should only be used in accordance with local and state health and safety regulations.
- Remove gloves, and thoroughly wash hands with soap and water (or use a waterless alcohol-based hand rub when soap is not available and hands are not visibly soiled),

Suggested Reading:

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Peters CJ. Viral hemorrhagic fevers. In: *Viral Pathogenesis*. New York City: Lippincott-Raven Publishers, 1997, 779-94.

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