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**CDC HEALTH ADVISORY**

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## **Investigation of Seoul Virus Outbreak Associated with Home-based, Rat-breeding Facilities in Wisconsin and Illinois**

### **Summary**

CDC and health officials from Wisconsin and Illinois are conducting an investigation of Seoul virus infections among pet rats and persons exposed to rats at rat-breeding facilities in Wisconsin and Illinois. Seoul virus is a member of the hantavirus group of rodent-borne viruses. Trace-back and trace-out investigations of possibly infected rodents have identified distribution chains in other states that may require additional investigations. People who become infected with this virus often exhibit relatively mild or no symptoms, but some will develop a form of hemorrhagic fever with renal syndrome (HFRS) with death in approximately 1–2% of HFRS cases. Although serologic studies have indicated the presence of Seoul virus in wild rats in the United States, this is the first known outbreak associated with pet rats in the United States.

- As part of the outbreak investigation, CDC and Illinois and Wisconsin health officials are conducting trace-back and trace-out investigations to determine where rodents from confirmed-positive facilities may have been distributed.
- CDC currently recommends testing of all persons who report recent or current illness after (1) handling rats from a facility with Seoul virus infection that was confirmed by laboratory testing (either rat or human), or (2) handling rats from a facility that sold rats to a facility with Seoul virus infection. Testing is also offered to persons without illness but (1) who are reporting exposure to rats from a facility with Seoul virus infection that was confirmed by laboratory testing, or (2) who are reporting exposure to rats from a facility that sold rats to a facility with Seoul virus infection but where no illness has been reported.
- In general, CDC recommends consideration of hantavirus testing in all persons with symptoms of Seoul virus infection and rat contact, even if the rat was not associated with a facility where a confirmed infection in a rat or human was reported.
- In the United States, hantavirus infections in people are notifiable conditions. Healthcare providers who suspect hantavirus infection in a patient should contact their state or local health department.

### **Background**

During early December 2016, a home-based rat breeder in Wisconsin developed an acute febrile illness. During late December 2016, CDC tested a blood specimen from the patient and confirmed that the infection was caused by Seoul virus, a member of the hantavirus family of rodent-borne viruses. A family member who worked with rodents also tested positive for Seoul virus. Both people have recovered. A follow-up investigation of rat breeders who supplied the initial patient's rats revealed six additional human cases of Seoul virus infections occurring at two Illinois rat-breeding facilities. Of the eight confirmed cases in Wisconsin and Illinois, two were hospitalized. Rats at these facilities have also tested positive for Seoul virus.

Human and animal health officials are working together to trace-back from where infected rodents may have come, and trace-out where potentially infected rodents may have been distributed, and make sure infected rats are not distributed further. Persons at risk of Seoul virus infection due to exposure to infected rats are also being identified. To date, state health officials in Alabama, Arkansas, Colorado, Illinois,

Indiana, Louisiana, Michigan, Minnesota, South Carolina, Tennessee, Utah, and Wisconsin have been notified that their residents may have infected rats.

Seoul virus is transmitted from rats to people. People who become infected with this virus often exhibit relatively mild or no symptoms, but some develop HFRS (<https://www.cdc.gov/hantavirus/hfrs>), which can result in death in approximately 1–2% of HFRS cases. Symptoms include fever, severe headache, back and abdominal pain, chills, blurred vision, redness of the eyes, or rash. HFRS is characterized by a prodromal phase with non-specific symptoms and can progress to hypotension, decreased urine output, and renal failure, which often resolves after a diuretic phase. Coagulopathy and pulmonary edema are rare complications. Laboratory findings include low platelets, elevated white blood cell counts, electrolyte abnormalities, elevated blood urea nitrogen (BUN) and creatinine, and proteinuria.

People can become infected after exposure to aerosolized urine, droppings, or saliva of infected rodents or after exposure to dust from their nests or bedding. Transmission may also occur from rat bites or when contaminated materials are directly introduced into broken skin or onto mucous membranes. The incubation period for humans ranges from 1 to 8 weeks; however, most individuals develop symptoms 1 to 2 weeks after exposure. Seoul virus is not spread from human to human. Infected rats do not become sick but can shed virus for many months.

Seoul virus infection in humans is confirmed by testing for Seoul virus IgM and IgG antibodies or by detection of viral RNA. IgM is commonly detectable within a few days after symptom onset and is detectable for approximately 2 to 3 months. IgG can usually be detected within a week after symptom onset and can remain detectable for years. Viral RNA is often detectable in blood from patients with acute disease. In coordination with state health departments, CDC offers testing for patients suspected of having Seoul virus infection.

There is no specific treatment for Seoul virus infection. Individuals with acute disease should have blood values monitored with laboratory testing, including complete blood count, basic metabolic profile, liver enzymes, and urinalysis. Supportive therapy is a mainstay of care. Care includes careful management of the patient's hydration, renal function, and electrolyte levels; care also includes 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 is an investigational drug that can be available on an emergency use basis for severe disease (<http://www.fda.gov/Drugs/DevelopmentApprovalProcess/HowDrugsareDevelopedandApproved/ApprovalApplications/InvestigationalNewDrugINDApplication/ucm090039.htm>).

## Recommendations

1. CDC currently recommends laboratory testing for all persons who report recent or current illness after (1) handling rats from a facility with Seoul virus infection that was confirmed by laboratory testing (either rat or human), or (2) handling rats from a facility that sold rats to a facility with Seoul virus infection. Testing is also offered to persons with exposure to rats from a facility with Seoul virus infection that was confirmed by laboratory testing, or to persons with exposure to rats from a facility that sold rats to a facility with Seoul virus infection but where no illness was reported. All testing should be coordinated with the healthcare provider's local or state health department.
2. Persons with potentially infected rats should not sell, trade, or release their rats. They should contact their state health department with any questions. Healthcare providers should emphasize the importance of safe animal practices with their patients (<https://www.cdc.gov/healthypets/pets/small-mammals/petrodents.html>).
3. Health care providers may also consider laboratory testing of patients with symptoms suggestive of Seoul virus infection and a history of rat contact, regardless of whether there is known interaction with rats or rat facilities with laboratory confirmed Seoul virus infections.
4. As with all human hantavirus infections, Seoul virus infection is a notifiable disease. Healthcare providers who suspect Seoul virus infection in a patient should report it to their local health department.

5. For laboratory testing inquiries, healthcare providers should contact their state or local health department. Prior approval is required by the state health department.

**For More Information:**

CDC Seoul virus FAQs: <https://www.cdc.gov/hantavirus/outbreaks/seoul-virus/faqs.html>

CDC healthy pets website: <https://www.cdc.gov/healthypets/pets/small-mammals/petrodents.html>

**DEPARTMENT OF HEALTH AND HUMAN SERVICES**

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