



Hantavirus Surveillance Protocol

Provider Responsibilities

(1) Report confirmed or suspected cases of Hantavirus pulmonary syndrome (HPS) to the local health department within one week; do not wait for laboratory confirmation. Anticipate the need to collaborate with public health on:

- a) Confirmation of the clinical diagnosis.
- b) Laboratory confirmation of the diagnosis. **Anticipate the need for confirmatory testing through CDC. Contact Infectious Disease Epidemiology to arrange (800-423-1271).**
- c) Investigation of the source of infection. Health officials will need to investigate urgently to identify the source of infection. This investigation will usually begin with interviews of the patient, family and close friends.

(2) Complete the provider (yellow) portion of the WVEDSS Hantavirus form and forward to the local health department. Forward copies of the laboratory reports (complete blood count, creatinine and hantavirus testing) and chest radiograph report to the local health department, with the case report.

Laboratory Responsibilities

(1) Report results of positive tests for hantavirus to the local health department immediately. Consult with Infectious Disease Epidemiology (800-423-1271) urgently regarding any requests for testing or confirmation of Hantavirus in a clinical or environmental sample.

Public Health Action

- 1) Prior to the occurrence of a hantavirus case
 - a) Protect employee health: Educate employees:
 - i) Hantavirus is NOT transmitted from a person who has the disease. Standard precautions should be used with persons diagnosed with hantavirus.
 - ii) Hantavirus CAN be transmitted by direct contact with or inhalation of the virus in a contaminated environment. Untrained workers should NOT enter an area known or suspected to be contaminated with Hantavirus virus.
 - b) Educate health care providers and the public in the recognition and diagnosis of Hantavirus pulmonary syndrome (HPS).
 - c) Educate providers and laboratories to report Hantavirus pulmonary syndrome (HPS) infections to the local health department in the patient's county of residence immediately.

Infectious Disease Epidemiology

350 Capitol Street, Room 125, Charleston, WV 25301-3715
Phone: 304.558.5358 Fax: 304.558.6335 www.wvidep.org

Hantavirus Surveillance Protocol

- 2) If a suspected case of Hantavirus pulmonary syndrome (HPS) is reported, the LHD should contact Infectious Disease Epidemiology (IDE) immediately (do not wait for lab confirmation to contact IDE). The local health department should anticipate the need to collaborate with IDE, other state and local jurisdictions and Federal public health officials.
- 3) Steps in investigation
 - a) Confirm cases:
 - i. For each suspected case, immediately obtain a complete clinical and laboratory history. Review the WVEDSS Hantavirus pulmonary syndrome (HPS) Investigation Form, complete any missing data, and determine whether a case is clinically or laboratory confirmed (See Case Definition).
 - ii. Assure that appropriate laboratory specimens are obtained on each suspected case (see Laboratory Notes). Specimens will be packaged and shipped to OLS according to the OLS laboratory protocol.

Prevention Objectives

Prevent disease through:

- Education of the general public in prevention of rodent infestations.
- Education of personnel in safe cleanup of rodent infestations.

Disease Control Objectives

Prevent unnecessary illness and death through rapid identification of environments contaminated with hantavirus so that:

- public access can be prevented while the environment remains contaminated
- safe cleanup of contaminated environments can be accomplished
- the public can be alerted to avoid environments with rodent infestation.

Surveillance Objectives

Rapidly detect and confirm a case or outbreak of Hantavirus pulmonary syndrome (HPS) if it occurs in WV

Infectious Disease Epidemiology

350 Capitol Street, Room 125, Charleston, WV 25301-3715
Phone: 304.558.5358 Fax: 304.558.6335 www.wvidep.org

Hantavirus Surveillance Protocol

Public Health Significance

A highly publicized outbreak of hantavirus pulmonary syndrome (HPS) in the southwestern United States in 1993 changed clinician perceptions of hantavirus disease. Old-world hantavirus infections were predominantly characterized by hemorrhagic and renal manifestations. The new hantavirus (Sin Nombre virus) caused a febrile illness characterized by rapid progression to respiratory failure. After recognition of this new Sin Nombre virus and its natural reservoir, *Peromyscus maniculatus* (deer mouse), several related North American hantaviruses have been recognized each with a characteristic geographic distribution and reservoir (see “reservoir”)

The collective range of these rodents includes virtually all of North America and Mexico. West Virginia has reported one case in a resident of the state, and a total of 3 cases who were exposed in the state.

Recognition of these new hantaviruses also called attention to the important role of public health in dealing with “emerging infectious diseases.” This resulted in increased federal funding for infectious disease surveillance, prevention and control; as well as increased demands and expectations placed on public health to protect citizens from these novel pathogens. This disease also highlighted the need for collaboration between laboratorians, epidemiologists and field biologists in the management of some zoonotic diseases. It is one of several diseases potentially linked to global warming through resultant increases in rainfall and increases in the population of rodent reservoirs.

Clinical Description

Hantavirus pulmonary syndrome (HPS), commonly referred to as Hantavirus Disease, is a febrile illness characterized by bilateral interstitial pulmonary infiltrates and respiratory compromise usually requiring supplemental oxygen and clinically resembling acute respiratory disease syndrome (ARDS). The typical prodrome consists of fever, chills, myalgia, headache, and gastrointestinal symptoms. Typical clinical laboratory findings include hemoconcentration and hypoalbuminemia due to fluid shift into the lungs. The white blood cell count is often elevated with a marked left shift. The combination of atypical lymphocytes, significant bandemia, and thrombocytopenia in the setting of pulmonary edema is highly suggestive of hantavirus pulmonary syndrome. Management is supportive. The disease carries a high case fatality rate – approximately 50% even with intensive care. However, if hypoxia and shock can be successfully managed for a few days, the patient can recover completely.

Infectious Disease Epidemiology

350 Capitol Street, Room 125, Charleston, WV 25301-3715
Phone: 304.558.5358 Fax: 304.558.6335 www.wvdeh.org



Hantavirus

Surveillance Protocol

Etiologic Agent

Hantaviruses belong to the bunyavirus family of viruses. There are 5 genera within the family: bunyavirus, phlebovirus, nairovirus, tospovirus, and hantavirus. Each is made up of negative-sense, single-stranded RNA viruses. All these genera include arthropod-borne viruses, with the exception of hantavirus, which is rodent-borne.

The most important North American hantavirus is the Sin Nombre virus; other North American hantaviruses include: New York virus, and the bayou and Black Creek hantaviruses (see below).

Reservoir

Rodents acquire a life-long chronic infection with hantavirus and shed virus in the saliva, feces and urine.

The table below summarizes important North American hantaviruses and the host range:

Table

North American Hantaviruses

Hantavirus	Geographic Range	Rodent Reservoir
Sin Nombre virus	Western US	<i>Peromyscus maniculatus</i> (deer mouse)
Bayou virus	Louisiana, Texas	<i>Oryzomys palustris</i> (rice rat)
Black Creek Canal virus	Florida	<i>Sigmodon hispidus</i> (cotton rat)
New York-1 virus	Eastern US	<i>Peromyscus leucopus</i> (white-footed mouse)

Nearly the entire continental United States falls within the range of one or more of these host species. Several other rodent species in the United States are associated with additional hantaviruses that have yet to be implicated in human disease.

Modes of Transmission

Human infection occurs most commonly through the inhalation of infectious aerosolized saliva or excreta. High risk of exposure has been associated with handling or trapping rodents; entering or cleaning closed, rarely used rodent-infested structures; cleaning feed storage or animal shelter areas; and living in a home with an increased density of rodents. For backpackers and campers, staying in a rodent-infested structure has been associated with hantavirus infection. Weather conditions resulting in increased rainfall

Infectious Disease Epidemiology

350 Capitol Street, Room 125, Charleston, WV 25301-3715
 Phone: 304.558.5358 Fax: 304.558.6335 www.wvdeh.org



Hantavirus Surveillance Protocol

and improved rodent food supply are associated with increased risk for human disease.

Rarely, infection has been associated with rodent bites or contamination of broken skin with rodent excreta. Person-to-person transmission has not been associated with HPS cases in the United States. However, person-to-person transmission was documented for an outbreak of Andes virus in Argentina; however a review of US cases documented no person-to-person transmission with indigenous hantaviruses. Therefore, standard precautions are recommended for healthcare workers treating patients with US-acquired hantavirus.

Incubation Period

From a few days to six weeks, usually 2 weeks

Infectious Period

Hantavirus pulmonary syndrome (HPS) has not been associated with nosocomial or person to person transmission in the United States.

Case Definition

Clinical description

Hantavirus pulmonary syndrome (HPS), commonly referred to as hantavirus disease, is a febrile illness characterized by bilateral interstitial pulmonary infiltrates and respiratory compromise usually requiring supplemental oxygen and clinically resembling acute respiratory disease syndrome (ARDS). The typical prodrome consists of fever, chills, myalgia, headache, and gastrointestinal symptoms. Typical clinical laboratory findings include hemoconcentration, left shift in the white blood cell count, neutrophilic leukocytosis, thrombocytopenia, and circulating immunoblasts.

Clinical case definition

An illness characterized by one or more of the following clinical features:

- A febrile illness (i.e., temperature greater than 101.0 F [greater than 38.3 C]) characterized by bilateral diffuse interstitial edema that may radiographically resemble ARDS, with respiratory compromise requiring supplemental oxygen, developing within 72 hours of hospitalization, and occurring in a previously healthy person
- An unexplained respiratory illness resulting in death, with an autopsy examination demonstrating noncardiogenic pulmonary edema without an identifiable cause

Laboratory criteria for diagnosis

Infectious Disease Epidemiology

350 Capitol Street, Room 125, Charleston, WV 25301-3715
Phone: 304.558.5358 Fax: 304.558.6335 www.wvdeh.org



Hantavirus Surveillance Protocol

- Detection of hantavirus-specific immunoglobulin M or rising titers of hantavirus-specific immunoglobulin G, or
- Detection of hantavirus-specific ribonucleic acid sequence by polymerase chain reaction in clinical specimens, or
- Detection of hantavirus antigen by immunohistochemistry

Case classification

Confirmed: a clinically compatible case that is laboratory confirmed

Comment

Laboratory testing should be performed or confirmed at a reference laboratory. Because the clinical illness is nonspecific and ARDS is common, a screening case definition can be used to determine which patients to test. In general, a predisposing medical condition (e.g., chronic pulmonary disease, malignancy, trauma, burn, and surgery) is a more likely cause of ARDS than HPS, and patients who have these underlying conditions and ARDS need not be tested for hantavirus.

Outbreak Recognition

Since hantavirus pulmonary syndrome is a rare disease in West Virginia, an outbreak is defined as two or more cases occurring within the same season.

Preventive Interventions

1. CDC has detailed recommendations for cleanup of rodent-infested areas:
http://www.cdc.gov/rodents/cleaning_up/index.htm
2. Prevention of rodent infestation is the most effective preventive intervention. Homes and structures should be sealed to prevent rodent infestation. Trapping can also reduce rodent populations.

References

American Academy of Pediatrics [Hantavirus Pulmonary Syndrome]. In Pickering LK, Baker CJ, Long SS, McMillan JA, eds. *Red Book: 2006 Report of the Committee on Infectious Diseases*, 27th ed. Elk Grove Village, IL; American Academy of Pediatrics; [318-321]

Epstein PR. *Emerging diseases and ecosystem instability: new threats to public health*. Am J Public Health, 1995; 85:168-72.

Infectious Disease Epidemiology

350 Capitol Street, Room 125, Charleston, WV 25301-3715
Phone: 304.558.5358 Fax: 304.558.6335 www.wvidep.org

May, 2009



Hantavirus Surveillance Protocol

Heymann DL. Control of Communicable Diseases Manual [Hantaviral Diseases]. *Control of Communicable Diseases Manual 18th edition* [240-245]

McCaughey C and Hart CA. *Hantaviruses*. J Med Microbiol, 2000; 49:587-99.

Peters CJ. [California Encephalitis, Hantavirus Pulmonary Syndrome, and Bunyavirid Hemorrhagic Fevers]. In Mandell GL, Bennett JE, Dolin R, eds. *Principles and Practice of Infectious Diseases, 6th Edition*. Elsevier, Churchill Livingstone, Philadelphia, PA [2086-2090].

Young JC, Mills JN, Enria DA, Dolan NE, Khan AS, Ksiazek TG. *New World hantaviruses*. Br Med Bull, 1998; 54:659-73.

Websites

<http://www.cdc.gov/ncidod/diseases/hanta/hps/index.htm>

Infectious Disease Epidemiology

350 Capitol Street, Room 125, Charleston, WV 25301-3715
Phone: 304.558.5358 Fax: 304.558.6335 www.wvidep.org