Hantavirus Pulmonary Syndrome
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Disease: **Hantavirus Pulmonary Syndrome (HPS)**; etiological agent- *Sin Nombre Virus* (2).

**Transmission:**

*Sin Nombre Virus* is primarily contracted via airborne transmission (inhalation) of an infected rodent’s droppings, urine or saliva. For example, the virus is aerosolized by kicking up in the air by a sweeping broom. In North America, there has not been any person to person direct transmission. However, in South America there have been a few cases of direct transmission between an infected and healthy person. These findings indicate a possibility of varying strains (3). Secondarily, researchers believe indirect transmission through fomites (food, furniture, etc.) that have been contaminated by an infected rodent’s dropping, urine or saliva is possible (2).

**Reservoirs:**

I. Deer Mouse, *Peromyscus maniculatus* (2)
II. White-tailed Mouse, *Mystromys albicaudatus* (2)
III. Cotton Rat, *Sigmodon hispidus* (2)
IV. Rice Rat, *Oryzomys palustris* (2)

**General Characteristics:**

Hantaviruses, including the *Sin Nombre virus*, are in the *Bunyaviridae* family of viruses (1). They are spherical, single-stranded RNA viruses with a lipid bilayer envelope. The specificity of Hantaviruses is determined by the helical nucleocapsids within their viral envelope. These are segmented into a (L) large, (M) medium and (S) small RNA segments that make up the nucleocapsid (N) protein (5). Furthermore, they contain specific grid-like surface projections located upon their viral envelope that measure 7-10 nanometers (5).

**Key tests for identification:**

The diagnosis of Hantavirus Pulmonary Syndrome involves a variety of tests that increase evidence of the *Sin Nombre Virus* as the culprit. These include an Oxygen Saturation Test, CT scan of chest, X-ray of chest, complete metabolic panel, Complete Blood Count (CBC), and blood tests (1). The primary means of diagnosis involves specific blood tests. The enzyme-linked immunosorbsent assay (ELISA) test can reveal if the patient’s body has made specific IgM associated with the virus (1). The other blood test involves the detection of Hantavirus RNA by Reverse Transcriptase-Polymerase Chain Reaction (RT-PCR) (1).
Signs and Symptoms:

The symptoms associated with Hantavirus Pulmonary Syndrome (HPS) include fever, chills, headaches, nausea, fatigue, dizziness, aching of large muscle groups and shortness of breath (1). The signs associated include low blood pressure, high heart rate, increased body temperature, vomiting, diarrhea and coughing with secretions (2). The danger of Hantavirus Pulmonary Syndrome is its effects occur in two distinct sections. The less threatening symptoms (fever, dizziness, muscle aches) occur during 1-4 days, but quickly turn into a pulmonary (increased fluid in lungs) issue between 4-10 days (2). This increases the importance of proper diagnosis and swiftness of medical intervention.

Historical Information:

In May 1993, an outbreak occurred in the “Four Corners” areas of Arizona, New Mexico, Colorado, and Utah. The patient zero was a young Navajo male in New Mexico who was rushed to a hospital with the aforementioned symptoms and died shortly thereafter (4). From June-August 1993, 1700 rodents were trapped by the Center for Disease Control and sent to their prospective laboratories (4). The results found that 30% of the Deer Mice within those 1700 rodents were infected with an unknown Hantavirus (4). In November 1993, the Special Pathogens Branch at CDC used the tissue from a Deer Mouse that had been captured near the home of patient zero to isolate the unknown virus and grow it in their laboratories (4). The new virus was originally called the Muerto Canyon Virus and later changed to the Sin Nombre Virus. The Sin Nombre Virus is translated from Spanish to mean “the nameless virus.” Furthermore, the new disease associated with the virus was called Hantavirus Pulmonary Syndrome (2).

Virulence Mechanisms:

The virulence mechanisms of the Sin Nombre Virus and similar Hantaviruses are not fully understood. However, the extraction and experimentation of infected tissue post-mortem has provided a few indications of the possible viral processes. It is believed that the entry into the host cell is achieved by endocytosis of enveloped protein after attachment of virions to cellular receptors (5). The Hantavirus replicates exclusively in the host cell’s cytoplasm. The process involves Endonuclease activity via the (L) nucleocapsid protein that cleaves the host cell mRNA and initiates transcription of Hantavirus mRNA. The replicated virions are formed and released by exocytosis (5). Ultimately, the newly formed Hantaviruses infect surrounding cells which further propagates the spread of the virus.

Control/Treatment:

At this time there is not a specific treatment or medication for patients diagnosed with Hantavirus Pulmonary Syndrome (HPS). Thus, an increase in control and prevention of contraction of the Sin Nombre Virus is the number one priority. This includes minimization of contact with rodents in the home or workplace (1). It is advised to seal up holes and gaps inside the home, garage, or work shed. The use of traps and rodenticides are recommended. Furthermore, in the case of rodent feces, it is best to saturate the feces with 10% Chlorine Bleach for proper disposal. Also, “airing out” confined spaces by opening windows is preferable,
especially in barns or sheds that haven’t been occupied for long periods of time (1). Ultimately, the preferred motto in and around the home should be, “cleanliness is next to godliness.” When control fails medical treatment is required. The most common treatment is patient intubation followed by extracorporeal membrane oxygenation (mechanical ventilation) (5). The earlier the patient enters the hospital, the greater chance of survival (5).

**Vaccine Information:**

No specific antiviral therapy has been accepted for use combating Hantavirus Pulmonary Syndrome by the World Health Organization (6).

**Local Cases or Outbreaks:**

As of July 9, 2013, there have been 634 cases reported in the United States. Furthermore, there are 20-40 cases of Hantavirus Pulmonary Syndrome (HPS) reported in the United States every year (4). More specifically, incidence of Hantavirus Pulmonary Syndrome has been found in 34 states across the United States (4). The most cases are found in New Mexico, Colorado, Arizona and Texas with 91, 80, 67 and 34 reported since 1993, respectively (4). The overall mortality rate is 36% (2).

**Global Cases or Outbreaks:**

Outside of the United States, the cases of Hantavirus Pulmonary Syndrome are mainly found in the Southern Americas. These countries include Argentina, Bolivia, Brazil, Chile, Ecuador, Paraguay, Panama, Uruguay and Venezuela (3). In 1996, Argentina had 18 cases in a small town which proliferated the possibility of person to person transmission (3). Since 1993, Argentina has recorded a total of 530 incidences. From 1993-1998, Chile reported 485 incidences. From 1995-1997, Paraguay reported 575 incidences (3). The overall data is sporadic because of varying degrees of medical sophistication and exact diagnosis of Hantavirus Pulmonary Syndrome via the Sin Nombre Virus. However, the fragmented data obtained from varying countries were reporting a consistent mortality rate of approximately 36% (3).

**Works Cited:**


and Zoonitic Infectious Diseases (NCEZID). 29 August 2012.

