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Hantavirus Pulmonary Syndrome -- Virginia, 1993*

Hantavirus pulmonary syndrome (HPS) was first recognized in June 1993 as a result of the investigation of a cluster of fatal cases of adult respiratory distress syndrome (ARDS) in the southwestern United States[1]. During that month, a 61-year-old man was admitted to a hospital in southern Pennsylvania with ARDS; recent testing of all available specimens from this patient has confirmed the diagnosis of HPS. This report summarizes the case investigation.

When hospitalized on June 28, 1993, the man reported a 4-day history of fever, chills, headache, myalgia, nausea, vomiting, and diarrhea. After admission, he became hypotensive and increasingly short of breath and was transferred to a tertiary-care medical center. Laboratory findings included leukocytosis (white blood cell count 25,300/mm^3), hemoconcentration (hemoglobin of 20.0 g/L), thrombocytopenia (platelet count 65,000/mm^3), and elevated blood urea nitrogen, creatinine (peak value 6.8 µg/dL), prothrombin time, activated partial thromboplastin time, aspartate aminotransferase (peak value 8500 U/L), lactic dehydrogenase, and lipase levels. A chest radiograph indicated bilateral diffuse infiltrates. During his prolonged hospital course, he required respiratory and circulatory support and hemodialysis. He was discharged on July 22, 1993.

An enzyme-linked immunosorbent assay with heterologous antigens performed on serum samples obtained on July 2 and July 20 were highly suspect for hantavirus antibodies. Subsequent retesting of these samples, as well as of an additional sample obtained in September 1994, with Sin Nombre virus (SNV) antigens confirmed the diagnosis of HPS.

In April 1993, the patient had started hiking on the Appalachian Trail northbound from Georgia through North Carolina, Tennessee, Virginia, and West Virginia. From May 13 through June 20, he hiked primarily along the Appalachian Trail in Virginia and reported evidence of mice, including excreta and rodent traps in shelters and bunkhouses.

To further characterize the prevalence of hantavirus in local rodent populations, the offices of Epidemiology and Environmental Health of the Virginia Department of Health, local health departments, the National Park Service, and CDC are conducting rodent trapping.

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VEB Editorial Note: Hantavirus disease presents as a febrile illness characterized by unexplained bilateral interstitial pulmonary infiltrates and respiratory compromise requiring supplemental oxygen. A typical prodrome consisting of chills, myalgias, headaches and gastrointestinal symptoms occurs approximately two weeks after exposure, with the incubation period ranging from three days to six weeks. Typical clinical laboratory findings include hemoconcentration, left shift, neutrophilic leucocytosis, thrombocytopenia and circulating blast cells.

This report describes the first known case of HPS in the mid-Atlantic states. The prodromal illness and respiratory failure were consistent with HPS[2]; the renal involvement characteristic of Eurasian hemorrhagic fever with renal syndrome (HFRS) has not been typical of HPS. Moderate elevations (greater than 2.5 µg/dL) in serum creatinine have occurred in only 10% of fatal cases of HPS; prominent renal involvement, such as that which occurred in this patient, has been documented in only two cases, both from the southeastern United States, and believed to have been associated with hantaviruses other than SNV (provisionally named Black Creek Canal virus and Bayou virus)[3,4]. Thus, the marked liver transaminase elevation in this patient has not been a prominent feature in other cases of HPS, although the prominent liver dysfunction has occurred with HFRS[5,6]. However, because both renal and hepatic dysfunction can be caused by antecedent hypotension and other factors, additional case investigation is ongoing to clarify the relevance of these findings.

The patient's infection was probably acquired along the Appalachian Trail in Virginia, an area inhabited by the primary rodent reservoir of SNV, *Peromyscus maniculatus* (deer mouse). While laboratory results from rodent trapping currently underway will not be available for several

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months, previous studies have detected antibody titers to three different hantaviruses (Sin Nombre, Seoul, and Prospect Hill) in rodents trapped in Giles, Madison, and Rappahannock counties. Hantavirus isolation will be attempted on available carcasses of antibody positive rodents.

Since June 1993, when HPS was first recognized in the United States, 98 cases have been identified in 21 states. The patients have ranged in age from 12 to 69 years (mean=35.1 years) with 52 (54%) cases occurring in men. Over half (51/98) of the patients have died. The earliest retrospectively identified case, inferred by a history of a compatible illness and elevated IgG titers detected for SNV, occurred in a 38-year-old man in Utah in 1959.

Because rodents infected with a hantavirus may be found anywhere in the country, we would expect to have sporadic human cases in any state. National surveillance for HPS continues in order to characterize the spectrum of clinical illness associated with SNV and identify additional patho-

Procedure for Submitting Specimens for Hantavirus Analysis

All specimens must be sent to the state laboratory (Division of Consolidated Laboratory Services) which will forward them to CDC for testing. CDC recommends the following guidelines for determining which patients should be considered for testing.

1. Patients from whom specimens are submitted must have one of the following:

- a febrile illness (temperature ≥101°F [38.3°C]) occurring in a previously healthy person characterized by unexplained adult respiratory distress syndrome, OR bilateral interstitial pulmonary infiltrates developing within one week of hospitalization with respiratory compromise requiring supplemental oxygen,

  OR

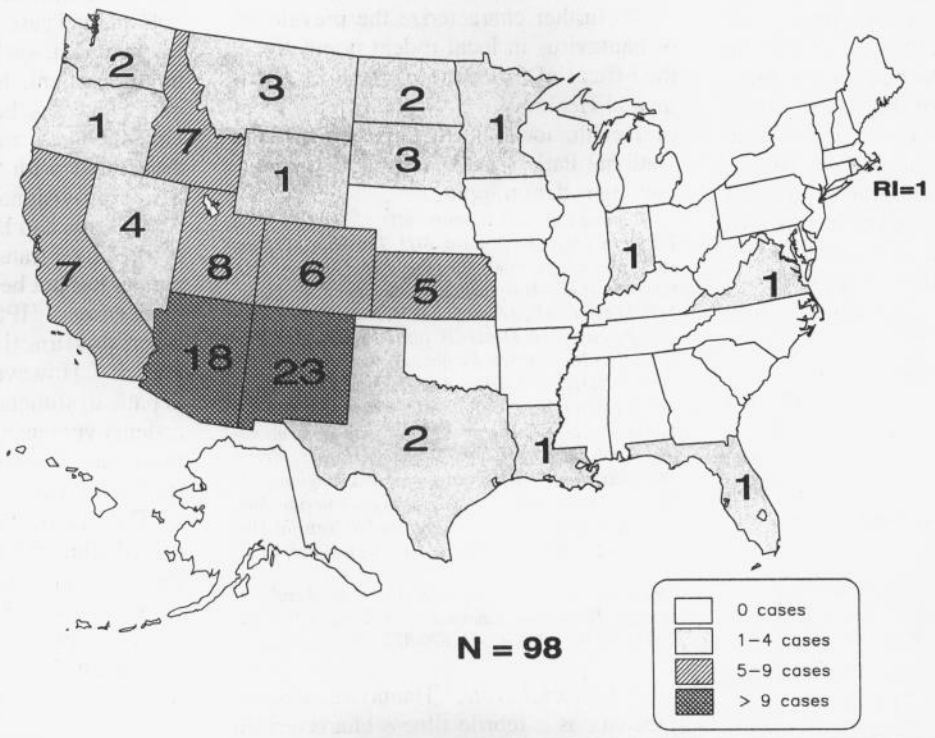
- an unexplained respiratory illness resulting in death in conjunction with an autopsy examination demonstrating noncardiogenic pulmonary edema without an identifiable specific cause of death.

2. Patients from whom specimens are submitted should not have any of the following:

- a predisposing underlying medical condition (e.g., severe underlying pulmonary disease, solid tumors or hematologic malignancies; congenital or acquired immunodeficiency disorders; medical conditions [eg., rheumatoid arthritis or organ transplant recipients] requiring immunosuppressive drug therapy [e.g., steroids or cytotoxic chemotherapy]).
- an acute illness that provides a likely explanation for the respiratory illness (e.g., recent major trauma, burn or surgery; recent seizures or history of aspiration; bacterial sepsis; another respiratory disorder such as respiratory syncytial virus in young children, influenza, or *Legionella* pneumonia).

3. If the above criteria are met, please call the Division of Consolidated Laboratory Services' Immunology laboratory (804/786-5142) to obtain the forms that must accompany the specimen. Either serum or tissue may be submitted. For serological testing, two specimens are preferred in order to detect rising titers of IgG antibodies. The second specimen should be drawn 21 days after onset. Due to the acute nature of the disease and the long turn around time for testing, serology cannot be used for making treatment decisions.

Figure 1. Number of reported confirmed cases of HPS - United States, November 17, 1994



genic hantaviruses and rodent hosts. Suspected cases of HPS should be reported to the local health department or the Office of Epidemiology for evaluation and investigation.

The findings of this report emphasize the continued importance of minimizing exposure to rodents and their excreta[7]. People should avoid disturbing or sleeping near rodent droppings or burrows. Buildings, garages or basements that have been closed should be aired out for at least one hour before spending time in them. Persons should use a disinfectant to wet down dusty areas that may be contaminated with rodent droppings or urine before cleaning them up. The Virginia Department of Health has prepared an information sheet on hantavirus disease designed for public distribution. This information sheet contains detailed information on preventing hantavirus illness. To obtain a copy please call the Office of Epidemiology at (804)786-6261. The CDC has prepared two videos on hantavirus disease, one designed for the public and the other for health professionals. Both are available for loan at your local health department.

References

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FYI

Still no influenza activity in Virginia

But it may be coming... As of December 13, 1994, 20 states reported "sporadic" influenza activity and one reported "regional" activity for the second week. Nationally, thirteen laboratory isolates have been reported, eight were type "A" (H3N2) and five were type "B". With so many people traveling for the holidays, Virginia activity may increase over the next month.

Animal Rabies:Common Questions from Veterinarians

-- Ask Dr. Jenkins

1. I have a dog in the clinic that received its first and only rabies vaccination when it was 4 months old. It is now a year overdue for its second vaccination. Do I need to readminister a 1 year vaccine or can I use one labeled for three years and consider it a 3 year booster?

Assuming that you use a vaccine labeled for 3 years duration, you can consider this immunization a 3 year booster. As long as there is a history of a rabies vaccination at some time in the past and the animal is over 6 months of age, you can give a certificate for 3 years.

2. What if the dog in the first question had been in a fight with a raccoon?

Decisions like this are made by the local health director (in consultation with the public health veterinarian) on a case by case basis depending on the number of previous vaccinations, the length of time since the last vaccination, and the seriousness of the exposure. In the situation described above, the dog would be considered unvaccinated. The owner has two choices, either euthanasia or 6 months of strict isolation (no human or animal contact). If the owners opt for the latter, an immediate booster vaccination **might** *provide some protection. There is a possibility that enough immune "memory" remains for the animal to get an anamnestic response, but because we cannot be sure, the 6 months isolation is required to be safe. By law, a vaccination is required 1 month before release.*

3. What is the earliest age at which puppies and kittens can be vaccinated?

The vaccine labels and the Compendium of Animal Rabies Control recommend initiating rabies vaccination at 3 months of age. Virginia state law requires vaccination by 4 months of age. This gives owners a month's grace period to comply with the law. Three months was selected because by that time most young animals have a mature enough immune system to mount an immune response to rabies vaccine. There is no medical contraindication to vaccinating younger animals, but they are less likely to develop immunity. In situations where valuable puppies or kittens are being raised outdoors and are at risk for exposure to rabid wildlife, you may wish to attempt to protect them by administering rabies vaccine earlier than 3 months of age. If you do that, be sure to repeat the vaccination between 3 and 4 months of age to assure an immune response and to comply with the law.

Cases of Selected Notifiable Diseases, Virginia, October 1 through October 31, 1994.*

Disease	Total Cases Reported This Month						Total Cases Reported to Date in Virginia		
		Regions							
	State	NW	N	SW	C	E	This Yr	Last Yr	5 Yr Avg
AIDS	108	4	8	19	33	44	966	1424	686
Campylobacteriosis	77	14	21	16	15	11	660	589	549
Gonorrhea†	1248	-	-	-	-	-	11282	9996	13424
Hepatitis A	26	3	9	5	4	5	151	121	181
Hepatitis B	20	1	5	5	2	7	112	117	186
Hepatitis NANB	2	0	0	1	1	0	22	31	37
Influenza	13	0	0	13	0	0	838	1059	922
Kawasaki Syndrome	0	0	0	0	0	0	21	22	22
Legionellosis	2	0	0	0	1	1	8	8	13
Lyme Disease	8	0	2	4	0	2	121	71	91
Measles	1	1	0	0	0	0	3	4	31
Meningitis, Aseptic	62	8	17	2	5	30	252	270	299
Meningitis, Bacterial‡	10	2	1	4	0	3	68	78	111
Meningococcal Infections	5	3	0	1	0	1	59	40	44
Mumps	3	0	0	3	0	0	38	28	68
Pertussis	7	1	5	0	1	0	36	58	28
Rabies in Animals	55	16	15	10	7	7	353	328	249
Reye Syndrome	0	0	0	0	0	0	1	3	2
Rocky Mountain Spotted Fever	2	0	0	0	1	1	17	11	18
Rubella	0	0	0	0	0	0	0	0	0
Salmonellosis	127	9	34	19	39	26	943	897	1047
Shigellosis	22	0	8	6	5	3	584	563	320
Syphilis (1° & 2°)†	58	1	0	2	5	50	649	542	648
Tuberculosis	37	6	16	3	3	9	292	377	357

Localities Reporting Animal Rabies: Accomack 1 otter, 3 raccoons, 2 skunks; Albemarle 2 cats; Amelia 2 raccoons; Arlington 2 raccoons; Augusta 1 bat, 2 raccoons; Bedford 1 raccoon; Campbell 2 skunks; Charlotte 1 skunk; Culpeper 1 skunk; Fairfax 1 dog, 1 groundhog, 2 raccoons; Fluvanna 1 skunk; Franklin County 2 skunks; Frederick 1 cat; Hanover 1 bat; Loudoun 1 fox, 4 skunks; Louisa 1 cat; Lunenburg 1 raccoon; Petersburg 1 raccoon; Prince George 1 raccoon; Prince William 1 cat, 3 raccoons; Pulaski 1 raccoon, 1 skunk; Rockbridge 2 skunks; Rockingham 2 skunks; Smyth 1 raccoon, 1 skunk; Stafford 1 raccoon, 1 skunk; Tazewell 1 skunk; Warren 1 raccoon; Williamsburg 1 raccoon.

Occupational Illnesses: Asbestosis 6; Carpal Tunnel Syndrome 35; Coal Workers' Pneumoconiosis 30; Loss of Hearing 18.

*Data for 1994 are provisional.

†Total now includes military cases to make the data consistent with reports of the other diseases.

‡Other than meningococcal.

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