Hantavirus in Northern Arizona: Peridomestic Exposure as High Risk

Arizona Infectious Disease Training and Conference
July 28, 2016
Phoenix, AZ
Acknowledgements – 1st Set

• Cases and cases families
• Coconino County Public Health Services District: Helena Archer, Edwin Rodriguez, Lucy Walsh, Jeff Lee, Trish Lees, Marlene Gaither, Matt Maurer, Marette Gebhardt, Mary Ellen Ormsby
• Hayley Yaglom (ADHS)
• Clinic/hospital staff
Hantavirus Pulmonary Syndrome

- Transmission: inhalation of stirred up rodent feces or urine
- Incubation: 1-8 (12?) weeks
- No person-to-person transmission
- Affects young, healthy adults
Bunyavirus family (hanta is one of five bunyaviruses)
Enveloped
Negative polarity
Single-stranded RNA

Image courtesy of Cynthia Goldsmith, Sherif Zaki, and Luanne Elliott as shown at www.cdc.gov/hantavirus
Clinical – Prodrome (Harkins)

- 3-6 days
- Fever, chills malaise, myalgias
- GI complaints and headaches common
- Cough uncommon
- **Shortness of breath only during cardiopulmonary phase**

Prodromal Stage

Headache
Fever

Late Stage

Severe shortness of breath
Lungs fill with fluid

Gastrointestinal sx
Clinical Aspects – Late

- Severe dyspnea
- Hypotension
- Low oxygen saturation
- Tachypnea
- Tachycardia
- Elevated WBC
- Thrombocytopenia
- Lungs fill with fluid

LATE Symptoms

Cough
Lungs fill with fluid
Shortness of breath
Diagnosis (Rollins)

- IgG and IgM antibodies appear during febrile prodrome
- Blood smear evaluation at onset of cardiopulmonary phase
- RNA detected by real-time RT-PCR
- Viral antigens detected in autopsy tissue

From Rollins, P., Hantavirus Pulmonary Syndrome Hantavirus Cardio-Pulmonary Syndrome (presentation), ECHO 2016
Hantavirus Pulmonary Syndrome

- No vaccine
- No cure, supportive treatment only

Case fatality rate in US (1993-2014): 36%
CFR in Coconino County (1993-2014): 33%

Case fatality rate in Arizona (2001-2014): 42%
Hanta History

• 1978 Hantaan virus isolated from mouse near Hantan River, South Korea
• 1993 outbreak in “Four Corners” area
  – Sin Nombre virus (North and South America), one species of hantavirus
• Prior to 2013, no cases of HPS in Coconino County since 2007

HPS Cases, by State of Residence

Coconino County – 10 Cases (4 since May 2013)
Case 1

- June 2013: previously healthy woman in forties presents at hospital with nausea, body aches, shortness of breath, and fever.
- Other family members ill with GI symptoms.
- Providers suspect Hantavirus Pulmonary Syndrome (HPS) late that night.
- Case dies next day.
Case 2

- July 2013: Previously healthy woman in her fifties presents at clinic with fatigue, fever, cough - sent home with antibiotics.
- Two days later, admitted to the hospital where providers suspect HPS.
- Transferred to a Phoenix hospital; confirmed with HPS.
- Case survived.
Case 3

• Jan 2016: previously healthy teen presents at hospital with vomiting, stomach pain, weakness, pronounced thirst, throat pain, cough, chills, feverish, diarrhea, photophobia.

• Onset 7 days earlier (cough, migraines).

• Two other family members “ill” with unknown symptoms.

• Case was never transferred to hospital.
Case 4

• Male in forties who works outdoors; stays in camping/cabin locations
• Presents at facility with fever, chills, headache but low fever (99 degrees); treated
• 5 days later goes to clinic and complains of really, really bad headache; treated
• Commercial lab result (first report) positive a week later
• Convalescent specimen positive at ASL, CDC
• No links between any of the cases (1-4)
PH Hero

- Nurse where case sought care suspected hantavirus, suggested test
Environmental Investigation

- Despite good housekeeping, droppings found in garages at residences (Cases 1, 2, 4)
- Or in/around home (Case 3)
- Cases 2, 3 spent time in closed rooms
- Evidence in places where cases spent time outside of home (2, 4)
Biology Investigation

• Evidence of rodent activity suggests exposure to hantavirus
  – About 30% of the deer mice *Peromyscus maniculatus* in Four Corners have hantavirus

• Trapping and testing not necessary to confirm

• Half of cases didn’t see rodents or droppings (Rollins, 6/16)

“But I don’t even feel sick!”
However, Dr. Nathan Nieto, Northern Arizona University, Department of Biology, set traps for rodents near homes of cases for further research:

– What is seasonality of viral shedding by infected mice?
– Are different members of the population more likely to be infected?
– What conditions (habitat, houses, etc.) are necessary to have infected mice at a residence?
Implications
Cleaning or entering enclosed areas should be considered a notable risk factor even if rodents are not observed.
HPS can be transmitted in many settings, including residential neighborhoods, not just rural or recreational areas. (Seal up! Trap up! Clean up!)
Providers should be alert for EARLY warning signs of HPS.
Protect Yourself from Hantavirus

Symptoms
- Fever
- Severe muscle aches
- Fatigue
- Difficulty breathing
- Dizziness & chills
- Nausea, vomiting, & diarrhea

What is Hantavirus?
Hantavirus was first discovered in 1993 in the "Four Corners" region of the United States -- an area shared by Arizona, New Mexico, Colorado, and Utah. The disease is carried by many types of mice, including the deer mouse and white-footed mouse. Animals do not show signs of being sick. The virus can cause hantavirus pulmonary syndrome (HPS) in humans.

How can I get it?
Hantavirus is spread by breathing in infected particles from rodent urine or droppings, as well as through direct contact with wild rodents, their urine, droppings, or nesting materials. Hantavirus is not spread person to person. Symptoms can occur within 1-5 weeks of exposure.

How can I protect myself?
- Wear a mask and gloves when cleaning up rodent waste material.
- Trap rodents around the home to reduce the population.
Further research on the environmental factors encouraging the increase of the virus, rodents, and human interaction.
Acknowledgements - More

- CCPHSD: Everyone on first slide, Randy Phillips, Marie Peoples, Brittany Swiger, Kimbal Babcock, Jennifer Corrigan, Eric Bohn, Hugh Murray
- Arizona Department of Health Services: Hayley Yaglom, Laura Adams, Jen Pistole, Selam Tecle, Joli Weiss, Kristen Herrick, Ken Komatsu
- Maricopa County Department of Public Health: Clare Kioski, Craig Levy, Tammy Kafenbaum
- National Park Service: Martin Stephens, David Wong
- Navajo Nation: Del Yazzie, David Nez, Herman Shorty, Angie Maloney
- Infection Prevention Teams at Flagstaff Medical Center, Tuba City Regional Healthcare Center, Northcountry Healthcare, Banner Page Hospital and many others who contributed. Thank you.