

# Hantavirus in Northern Arizona: Peridomestic Exposure as High Risk

Arizona Infectious Disease Training  
and Conference

July 28, 2016

Phoenix, AZ



# Acknowledgements – 1<sup>st</sup> Set

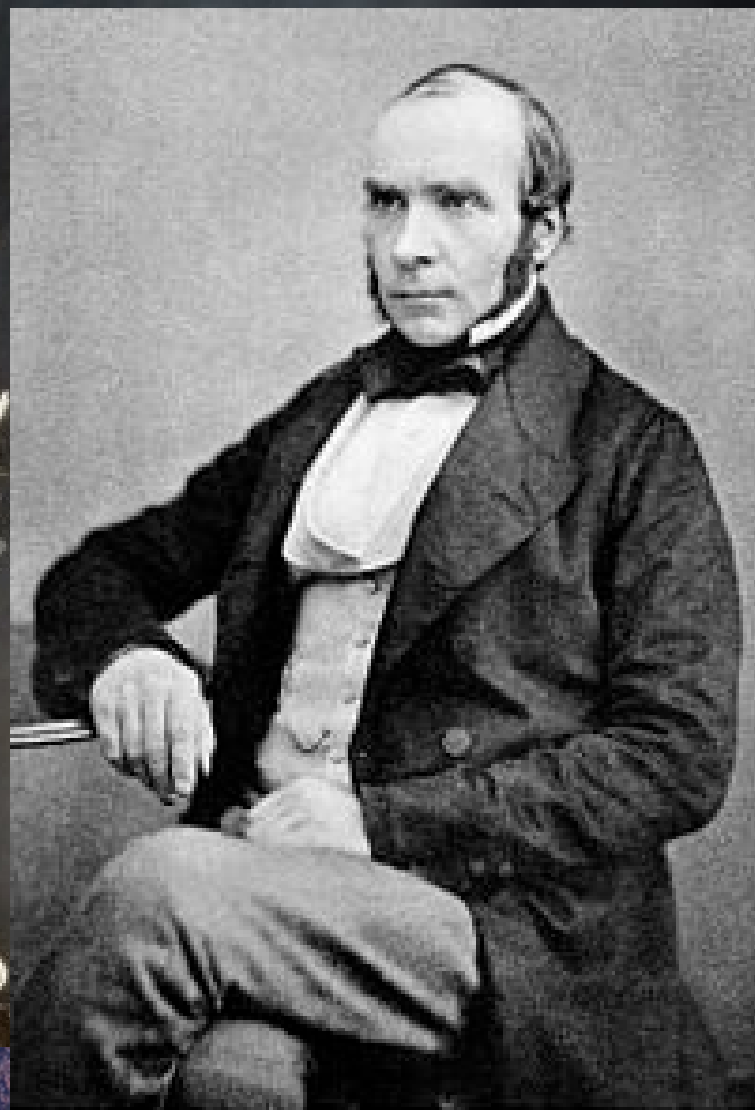
- Cases and cases families
- Coconino County Public Health Services District: Helena Archer, Edwin Rodriguez, Lucy Walsh, Jeff Lee, Trish Lees, Marlene Gaither, Matt Maurer, Marette Gebhardt, Mary Ellen Ormsby
- Hayley Yaglom (ADHS)
- Clinic/hospital staff











*John Snow*

# 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





# Virology

- 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](http://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**

Hallin, Crit Care Med, 1996 in *Hantavirus: A Tale of Mice and Men*, Michelle Harkins, UNM Health Sciences Center, July 2016, presentation.

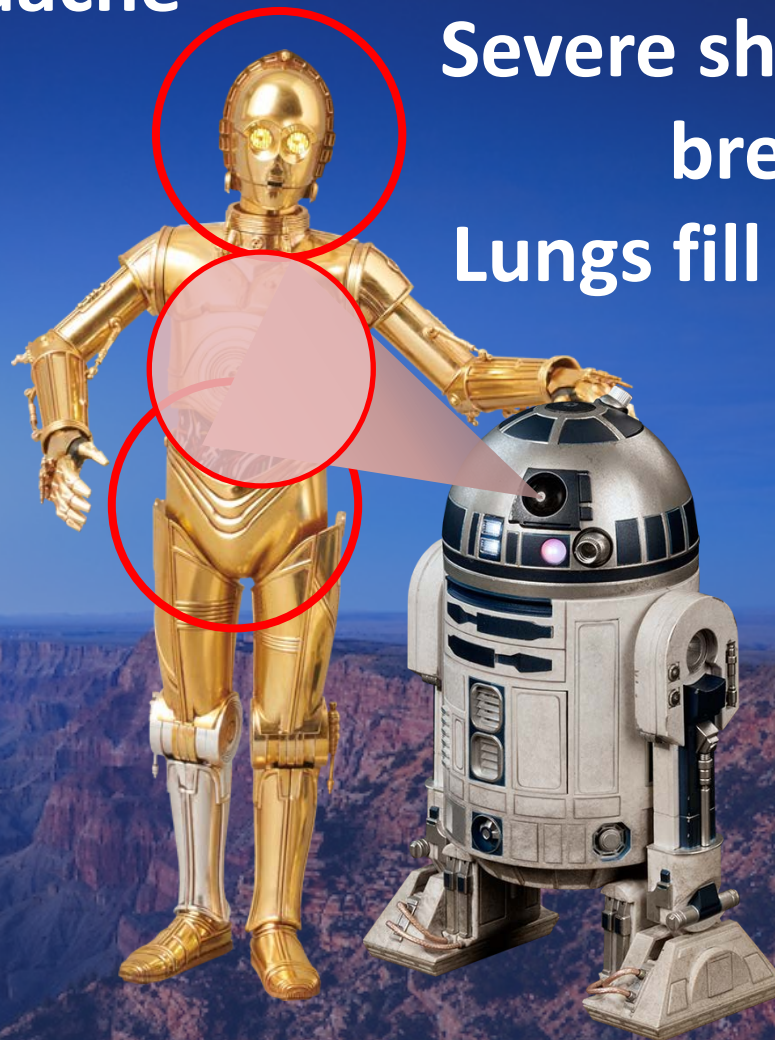
# Prodromal Stage

Headache  
Fever

Gastrointestinal  
SX

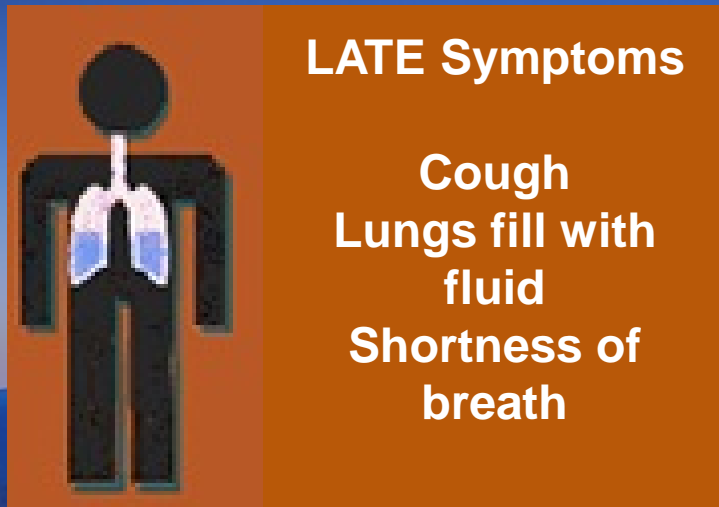
# Late Stage

Severe shortness of  
breath  
Lungs fill with fluid



# Clinical Aspects – Late

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



# 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

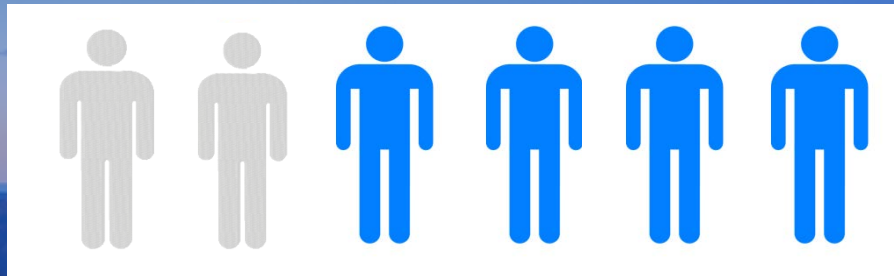
Ksiazek et al Identification of North American hantavirus *AmJTropMedHyg*1995, 52:1017  
Hjelle et al Rapid and specific detection of Sin Nombre virus antibodies *JClinMicrobiol*1997,35:600

# Hantavirus Pulmonary Syndrome

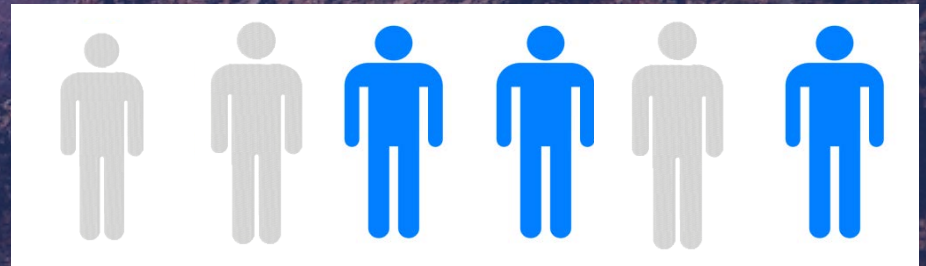
- No vaccine
- No cure, supportive treatment only

Case fatality rate in US (1993-2014): 36%

CFR in Coconino County (1993-2014): 33%



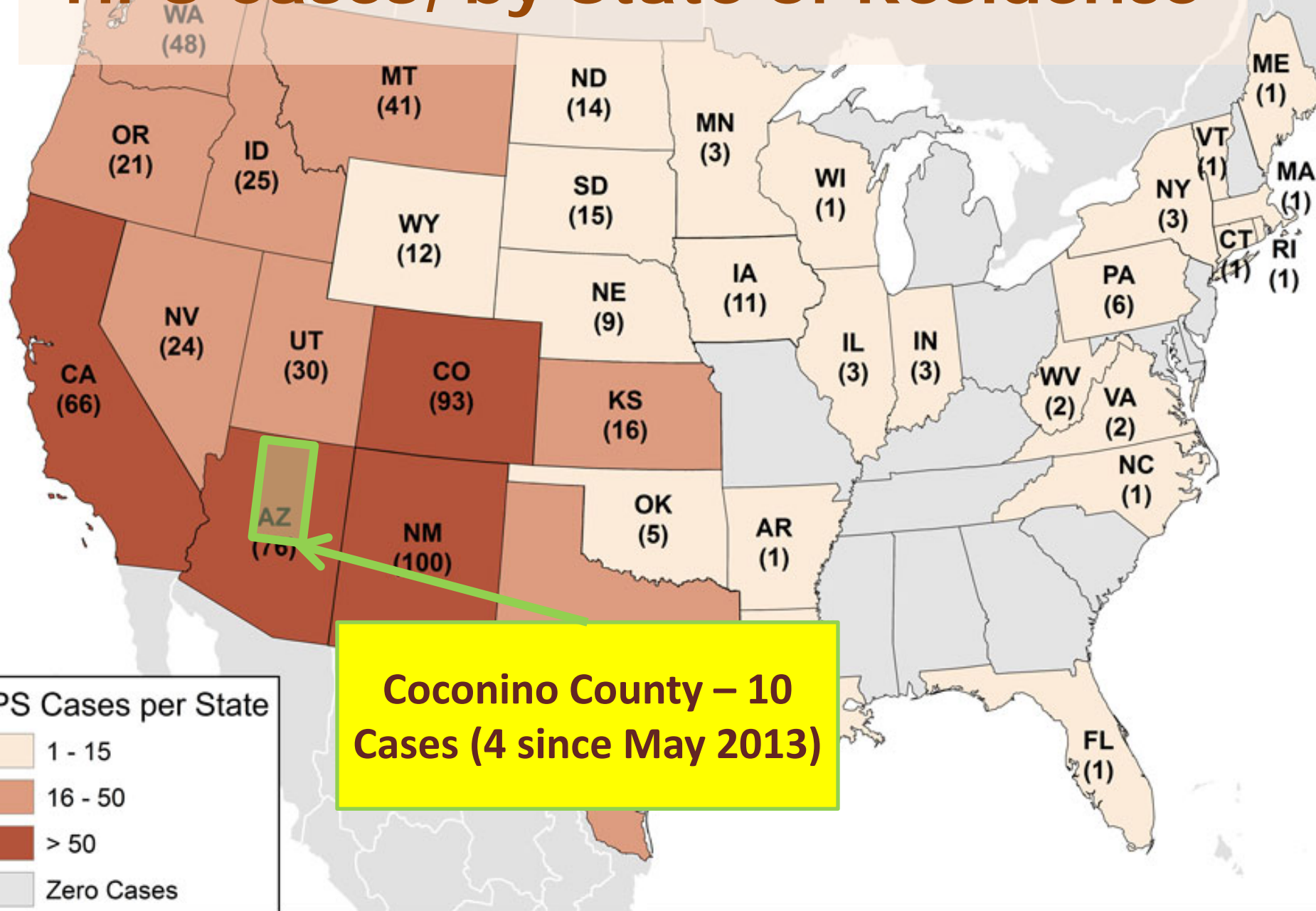
Case fatality rate in Arizona (2001-2014): 42%



# 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





# 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

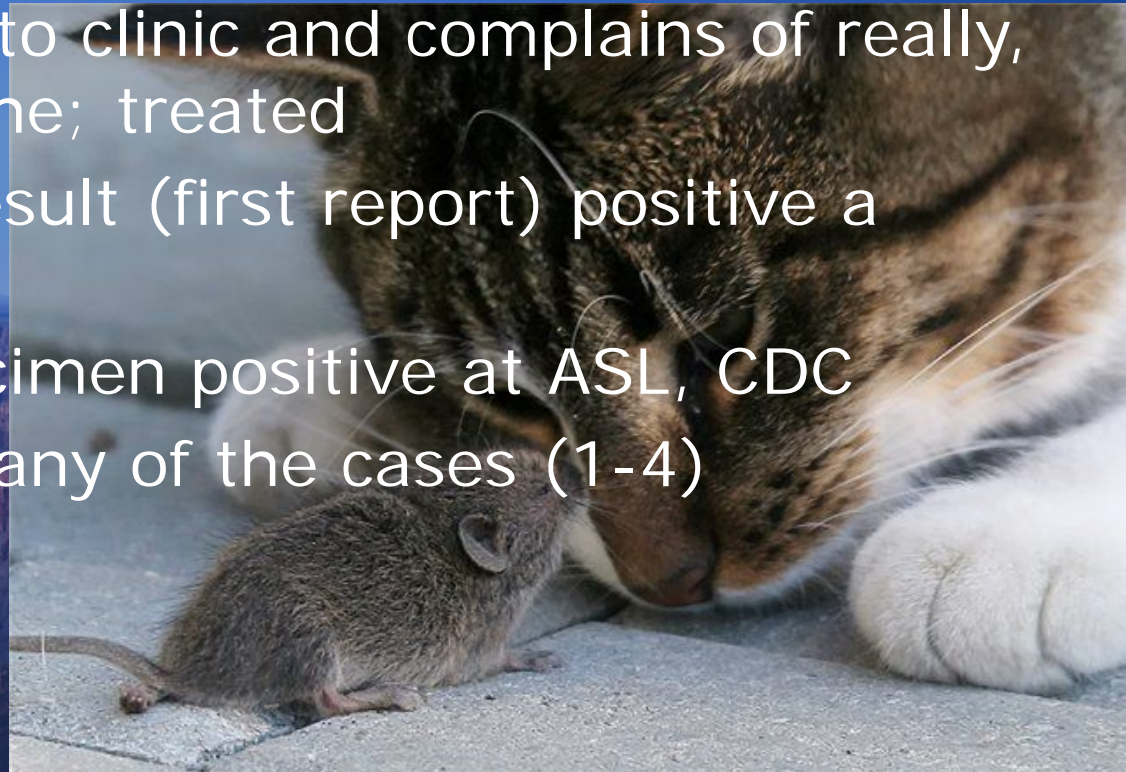
- July 2013: Previously healthy woman in her fifties presents at clinic with fatigue, fever, cough - sent home with antibiotics.
- Two days later, admitted to the hospital where providers suspect HPS.
- Transferred to a Phoenix hospital; confirmed with HPS.
- Case survived.

# 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)



**NURSE SITTING DOWN**



## PH Hero

- Nurse where case sought care suspected hantavirus, suggested test

**CLEARLY  
PHOTOSHOPPED**



COCONINO COUNTY

# 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!”*

# Biology Investigation

- 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.**



Reality

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

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**END**