A West Nile Virus Outbreak in Eared Grebes and Bald Eagles in Utah: Enhanced Surveillance and Outcomes

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Learning Objectives

• At the conclusion of this presentation, participants will be able to:
  – Demonstrate knowledge of the transmission cycle of West Nile virus (WNV)
  – Describe the events of the WNV outbreak among grebes and bald eagles
  – Consider potential new routes of WNV transmission not previously discussed in literature
West Nile Virus (WNV)
Transmission Cycle of WNV

West Nile Virus Transmission Cycle

In nature, West Nile virus cycles between mosquitoes (especially Culex species) and birds. Some infected birds can develop high levels of the virus in their bloodstream and mosquitoes can become infected by biting these infected birds. After about a week, infected mosquitoes can pass the virus to more birds when they bite.

Mosquitoes with West Nile virus also bite and infect people, horses and other mammals. However, humans, horses and other mammals are ‘dead end’ hosts. This means that they do not develop high levels of virus in their bloodstream, and cannot pass the virus on to other biting mosquitoes.

Photo found on cdc.gov
WNV Fever
WNV Neurological Disease

WNV Human Infection "Iceberg"

- <1% CNS disease
- ~20% "West Nile Fever"
- ~80% Asymptomatic

~10% fatal (<0.1% of total infections)

Crude estimates
Utah’s WNV Program

WEST NILE VIRUS
Take the bite out of camping

- Evening through morning:
  - Use bug spray with DEET
  - Cover up when bugs are biting
  - Wear long pants and long sleeves
  - Use a tent with screened doors and windows
  - Call your doctor if you have fever, headache or stiff neck

For more information, visit www.health.utah.gov/wnv

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The Great Salt Lake
Eared Grebe  \((Podiceps nigricollis)\)
Eared Grebes
Eared Grebes
Eared Grebe Die-off
Bald Eagle (*Haliaeetus leucocephalus*)
What was found

Photo Credit: Wildlife Rehabilitation Center of Northern Utah – Dalyn Erickson-Marthaler
What was found

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Photo Credit: Wildlife Rehabilitation Center of Northern Utah – Dalyn Erickson-Marthaler
Locations of Bird Mortality/Morbidity Events through March 2014
Eared Grebe Necropsy
Histopathology & Immunohistochemistry

• Eagles
  – Heart: Necrosis & inflammation
  – Brain: Encephalitis & gliosis
  – Viral distribution: Heart, brain, peripheral nerves, lung, oral mucosa, kidney, thyroid gland, ventriculus, intestine
Bald Eagle Necropsy

Photo credit: Dalyn Erickson-Marthaer, WRCNL
Bald Eagle Necropsy

A. Van Wettere, UVDL
What Was Ruled Out

• Lead poisoning and other heavy metals
• Organophosphate and poisoning
• Avian cholera
• Avian botulism
• Avian vacuolar myelinopathy
• Avian paramyxovirus and exotic Newcastle virus
• Other bacterial and viral infections
Testing Summary

• 44 birds from 7 counties tested
  – 10 Bald eagles (7 counties)
    ▪ 9/10 WNV positive by RT-PCR
  – 30 Eared grebes (all from Davis County)
    ▪ 30/30 WNV positive by RT-PCR
  – 4 Eurasian collared doves (Utah County)
    ▪ 0/4 ECDO WNV-positive by RT-PCR

• Apparent titer is higher in cloacal swabs than tracheal swabs
WNV Activity Near Great Salt Lake, Utah, 2013

• 2 humans in Weber County
  – 1 human in Salt Lake County
  – 2 equine cases and 7 positive mosquito pools in Box Elder County
  – 2 positive mosquito pools in Utah County
  – 2 sentinel chickens placed near Antelope Island Causeway in Davis County
What was blamed for the event

• Fukushima Daiichi nuclear disaster in Japan
• Mercury and heavy metals
• Obama’s policy on wind power
• Obama in general
• Oil and gas wells
• Fracking
• Contrails made by airplanes
• Other Government conspiracies
The Perfect Storm
Management Activities
Next Steps

• Examine the phylogenetic relationship of the WNV strains affecting bald eagles and grebes in Utah in 2013-14

• Deriving isolates from WNV-positive mosquito pools from counties surrounding the Great Salt Lake

• Deriving isolates from WNV-positive raptors in adjacent regions
Next Steps

- Final list of viruses to be sequenced will be selected once a total set of viruses is available.
- Experimental infection trials
- Human health impact
- Climate change and mosquito transmission
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