Vertebrate Ecology and Biology: Non-Avian

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Objectives

- Review vertebrate (non-avian) species
  - Review of National Surveillance Data
  - Research Projects
    - Equine
    - Canine
    - Feline
    - Swine
  - New Information
  - Serosurvey Results from 2002

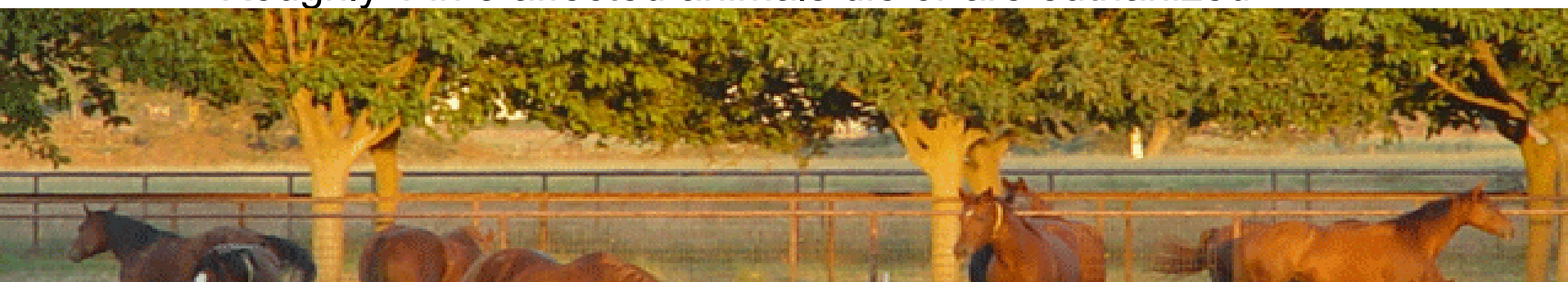
Epizootic West Nile Virus in the United States, 1999-2002

- Alpaca
- Horses
- Big Brown Bat
- Little Brown Bat
- Cat
- Dog
- Grey Squirrel
- Llama
- Alligator
- Wolf
- Fox Squirrel
- Sheep
- Eastern Chipmunk
- Rocky Mountain Goat
- Striped Skunk
- Reindeer
- Domestic Rabbit
- Harbor Seal

*Data reported from USDA, CDC (ArboNET) and State Health and Veterinary Labs

Equine Background

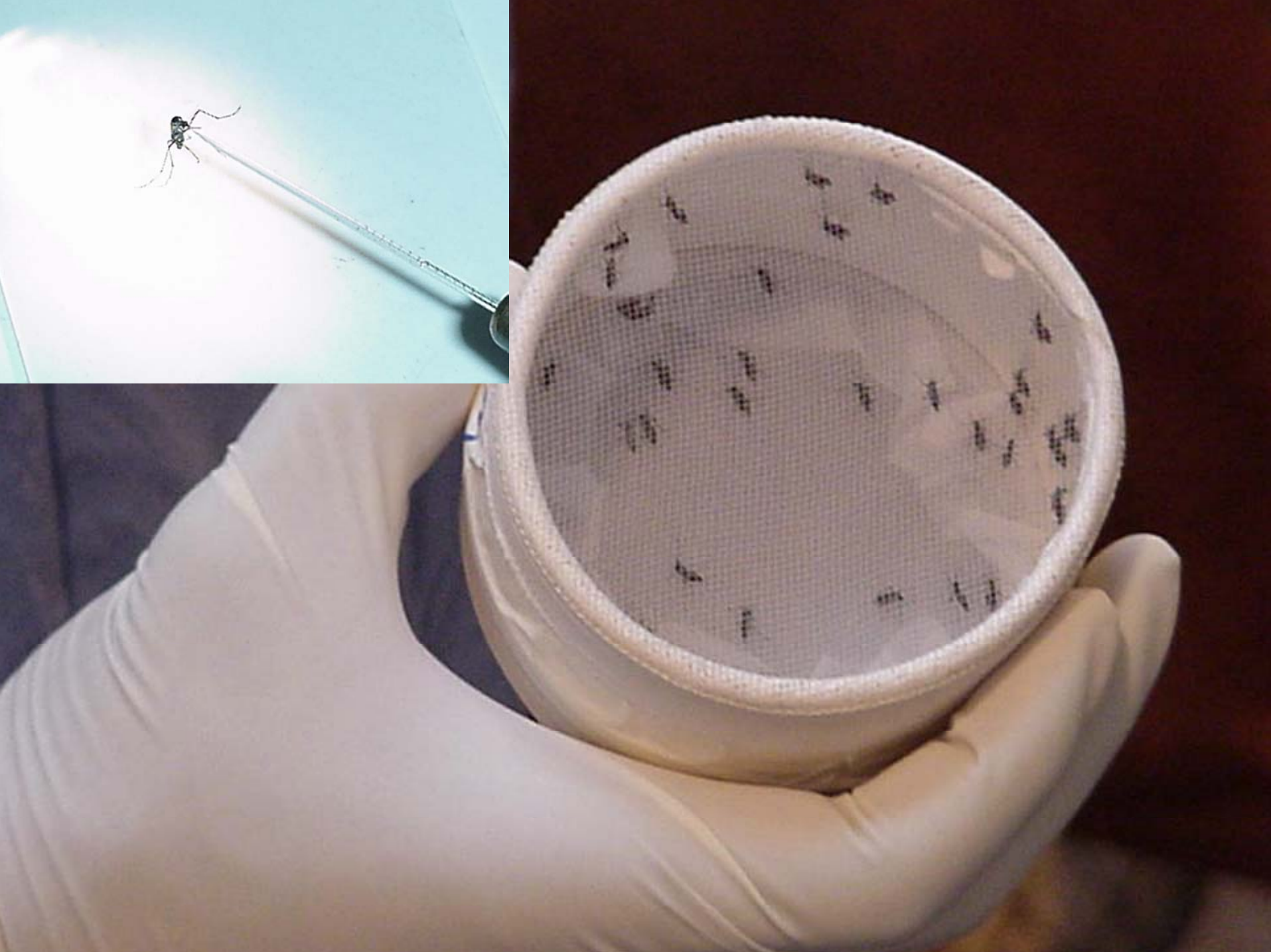
- West Nile virus responsible for outbreaks of encephalomyelitis in humans and equids
- Concerns about equine
  - Sentinel host for humans
  - Dead end or amplification host
  - Public Health ramifications
- Incidence in 2002: ~12,000 cases in US
  - Clinical attack rate ~ 0.1 (10%)
  - Roughly 1 in 3 affected animals die or are euthanized



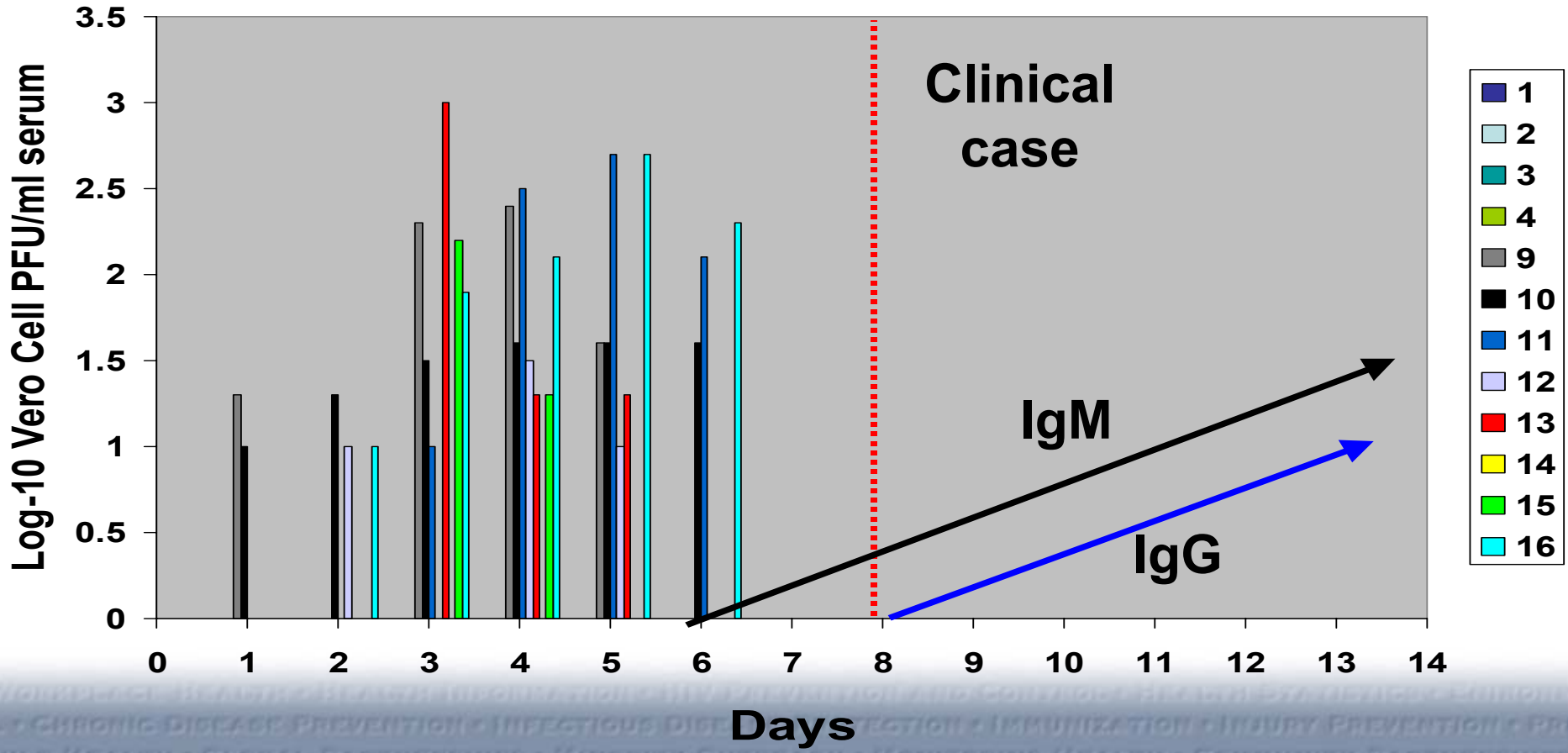
Equine WNV: Initial Trials

- 12 horses: range of ages and breeds; seronegative for WNV and SLE
- Infect via bites of infected *Aedes albopictus* (horse vs crow isolates)
- Clinical observations and serum for virus assay BID for 14 days

•**Published Bunning ML**, Bowen RA, Cropp CB, Sullivan KG, Davis BS, Komar N, Godsey MS, Baker D, Hettler DL, Holmes DA,
• Biggerstaff BJ, Mitchell CJ. Experimental Infection of horses with West Nile virus . Emerg Infect Dis 2002;8:380-6.

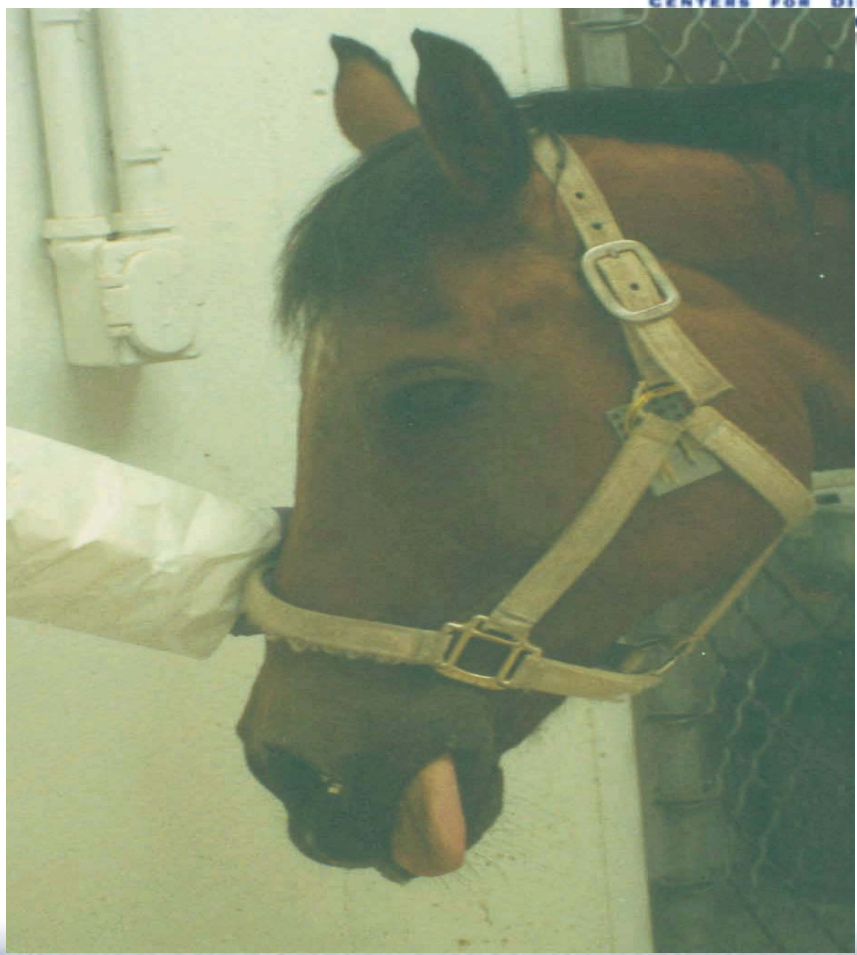


Equine Serology/Viremia Time Line



Equine Clinical Case

- CNS Disease
  - Ataxia
  - Circling
  - Hind limb weakness
  - Proprioceptive deficits
  - Lip droop/paralysis



Horse 11, Tissue Virus (Log10 PFU/gram)

- Medulla 6.8
- Cerebellum 5.0
- Frontal cortex 5.2
- Occip cortex 4.3
- Hippocampus 3.3
- Cervical cord 5.0
- Thoracic cord 4.0
- Lumbar cord 4.3
- Radial n. neg
- Spleen neg
- Liver neg

Equine Conclusions

- Viremias
  - Highest viremia
    - Day-3 post infection
    - 3 Log-10 Vero cell PFU/ml serum
  - One clinical case
    - Apparent to inapparent = 1:11
    - Virus titers in brain and spinal cord, day-9
      - Log $10^{4.0}$ to $10^{6.8}$ PFU/gram
- None of the virgin mosquitoes became infected

Equine Conclusions

- Equines infected with WNV develop viremias of low magnitude and short duration
- Infected horses are unlikely to serve as amplifying hosts for WNV in nature
- Care should be taken on postmortem exam
- Clinical attack rate is roughly 10% in experimental and field studies
- Clinical signs usually characteristic of encephalomyelitis

Canine Research

Experimental Infection of Canine with WNV

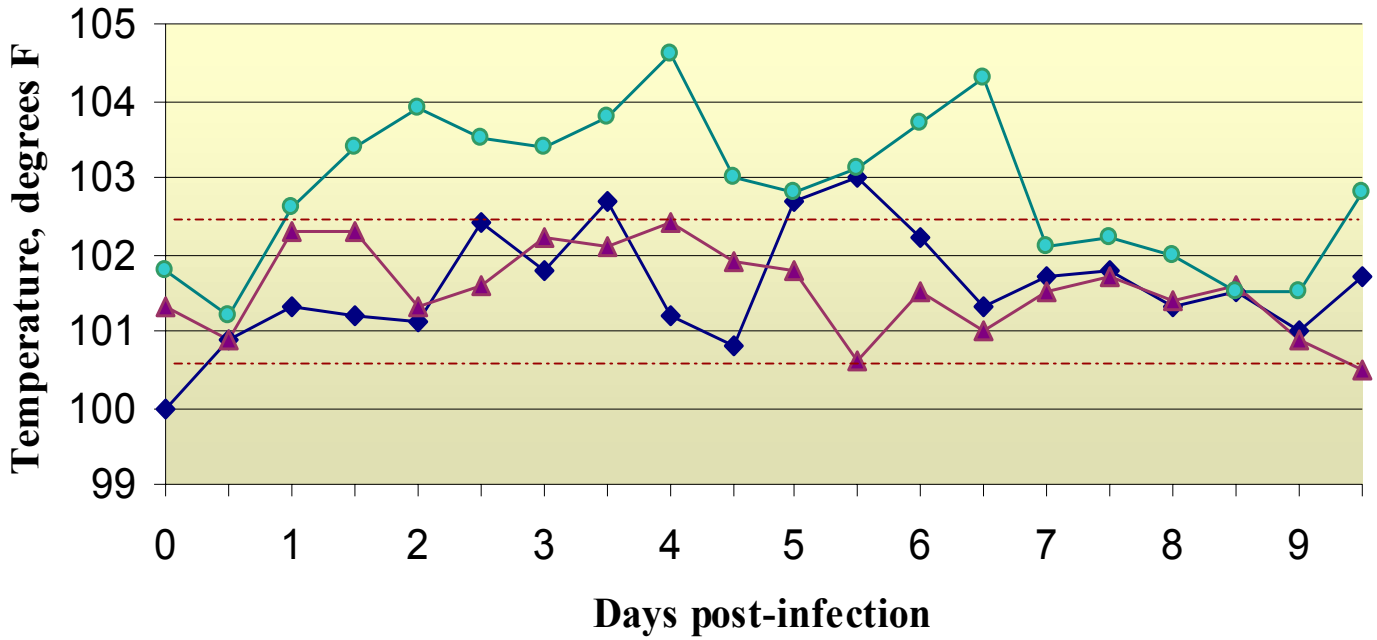
- Is WNV readily transmitted to dogs by feeding of infected mosquitoes?
- What is the duration and magnitude of viremia and antibody response
- Are dogs likely to serve as amplifying hosts?

Canine Research Results

- There was no evidence of clinical disease
- Mild leukopenia
- Virus capable of replicating (4/4)
- Virus was not isolated from saliva
- Dogs are not likely to be amplifying hosts

Feline Research

Cats as West Nile virus hosts



Clinical Disease in Feline

- Mild clinical disease, lasting two to three days

Oral Transmission

- 2 cats fed a West Nile virus infected mouse, one daily for 3 days
- 2 cats fed a single West Nile virus infected mouse
- Clinical exams, BID serum for virus isolation

Feline Oral Transmission Studies

Feline Oral Infections

- Cats were readily infected by consuming infected mice (4/4)
- No clinical disease
- Occasional mosquitoes may become infected by feeding on infected cats

Feline Research Results

- Virus capable of replicating (12/12)
- Virus not isolated from saliva
- Mild, nonspecific disease
- Inconsistent hematologic disturbances, fever
- Cats develop a level of viremia that may be capable of infecting mosquitoes

Swine Research

Alligators

- Epizootic characterized by neurologic disease which occurred at a 9,000-head alligator farm in Florida.

- Approximately 300 alligators (*Alligator mississippiensis*) died during this outbreak

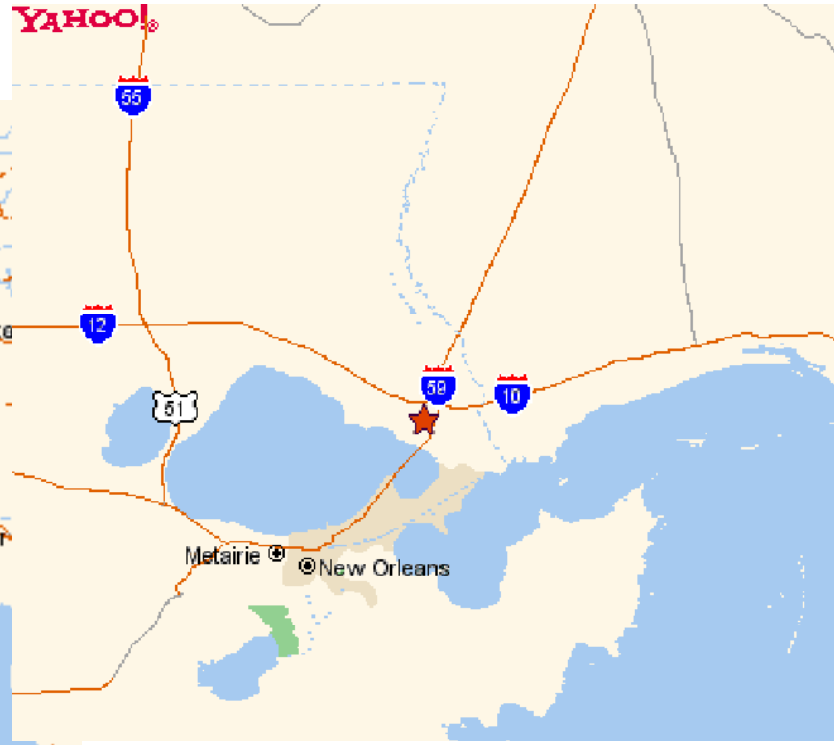

Picture courtesy
of Elliott R Jacobson

*Information provided by University of Florida, preliminary data

Alligators

- Of the tissues sampled, liver had the highest viral loads (maximum $10^{8.9}\log_{10}$ pfu/0.5cm^3)
- Brain and spinal cord had the lowest viral loads (maximum $10^{6.6}\log_{10}$ pfu/0.5cm^3) each
- Viral loads in plasma ranged from $10^{3.6}$ to $10^{6.5}$ $\log_{10}$ pfu/mL

Slidell, Louisiana: West Nile Virus Mammal Serosurvey -2002



Serosurvey

- First hot spot of summer 2002, ending with:
  - ~ 37 human cases in St. Tammany Parish, La
  - ~ 18 human cases in Slidell, La
- August - October serosurvey teams were assembled to work in Slidell, LA for collection of specimens from a wide array of species

WNV Mammal Serosurvey Team Members

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