

Presence of West Nile Virus in non-*Culex* mosquitoes in Nebraska

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West Nile Today

- WNV established as important encephalitis disease
- First discovered in NYC, 1999
- Mosquito-bird-mosquito life cycle
- Dead-end hosts
- Reservoirs & bridge vectors?



Vector Competency

- Turell et al. (2005)
 - Examined 25 *spp.*
 - *Culex* are most efficient vectors
 - WNV isolated from vectors under natural conditions?
- Medlock et al. (2005)
 - Since 1999, isolated from 75 *spp.*
 - Most not directly involved in transmission
 - Many field isolations
 - *Ae.*, *Oc.*, *Coq.*, *Culiseta*, *Psorophora*,

Bridge Vectors

- Allow WNV to be maintained in nature via transmission between susceptible vertebrate hosts
- Most *spp.* prefer either mammals or birds...some are opportunistic
- *Ae. albopictus*, *Cq. perturbans*, *Culex tarsalis*, *Culex salinarius*, *Oc. trivittatus*, *Ae. vexans*, *Cs. melanura*

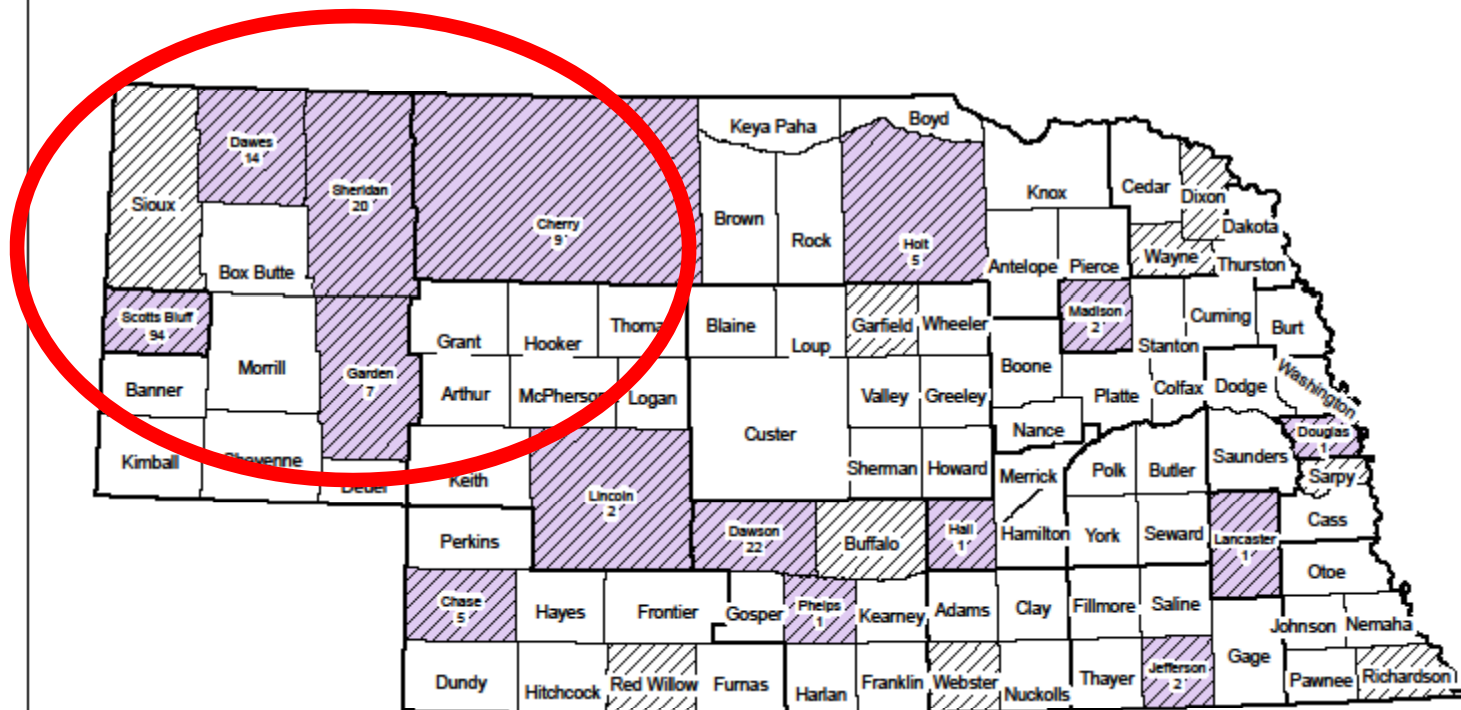
The Project

- Nebraska Dept. of Health & Human Services
- University of Nebraska-Lincoln, Dept. of Entomology
- Institute of Agriculture and Natural Resources




WNV in Nebraska

- Primary vectors are *Culex tarsalis* and *Culex salinarius*
- 2007 data:
 - Humans = 179 clinically positives, 4 deaths
 - Animals = 186/2816 positive(mosq.), 55/126 positive(dead birds), 8/8 equines
- 2008 data:
 - Humans = 52 clinically positives, 0 deaths
 - Animals = 81/1592 pos.(mosq.), 17/67 pos.(dead birds), 2/2 equines
- NE has 8 mosquito genera

West Nile Virus Mosquito Surveillance, Nebraska 2007



Legend

-  Surveillance Regions
-  Routine Testing Sites (24 counties)
-  Positive Mosquito Pools

Positive / Tested Totals

Mosquito Pools: 186 / 2816
 Counties: 15 / 24

Source: Nebraska Department of Health and Human Services

Presence in non-*Culex*

- Pools of non-*Culex* from 2006 and 2007
- Collected using CDC light traps(CO₂) 2X per month from 24 counties, May-October
- Pools <50 sent to University of Nebraska Medical Center, Omaha
- Non-*Culex* pools selected from counties abundant in positive WNV pools
- Tested using Rapid Analyte Measurement Platform (RAMP[®])

RAMP®



- Highly sensitive & pre-screening test
- Identifies *Ab* in mosquitoes and birds
- Quantitative analysis
 - >35.0 units = positive

RAMP[®] vs. VecTest[™]

- RAMP[®] concentration = $3.7 \log_{10}$ PFU/ml
 - VecTest[™] = $5.7 \log_{10}$
- Burkhalter et al. (2006)
 - 100 field collected mosquitoes +WNV by RT-PCR
 - 94 positives via RAMP[®]
 - 65 positives via VecTest[™]
- RAMP[®] is 100x more sensitive, similar to ELISA's
- Both capable of producing false-positives!

Results!

- 2 +WNV
- *Aedes vexans*, 20 August 2007, Jefferson County
 - 42.4 units
- *Ochlerotatus melanimon*, 14 August 2007, Scotts Bluff County
 - 94.3 units



Aedes vexans

False Positives?

- 42.4 & 94.3 are relatively low
- RAMP[®] units can be as high as 600
- RT-PCR produce more definitive results
- However:
 - Turell et al. (2005) reported that *Aedes vexans* and *Oc. melanimon* can serve as bridge vectors

Conclusion

- *Culex* remain most efficient and important vectors of WNV
- Despite high transmission rates in non-*Culex*, not considered serious threat
- Allows virus to be maintained in nature

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Questions?

