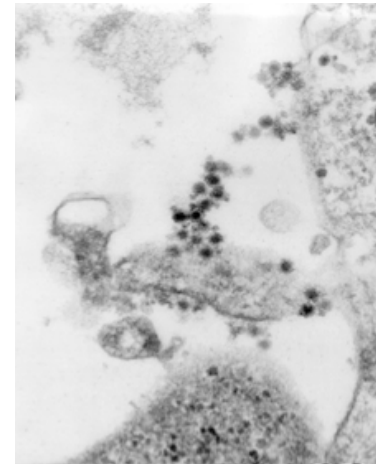
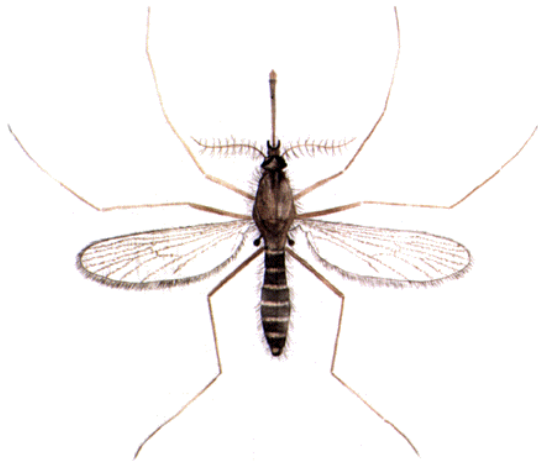


West Nile Disease Modeling



Yi Ming Yu

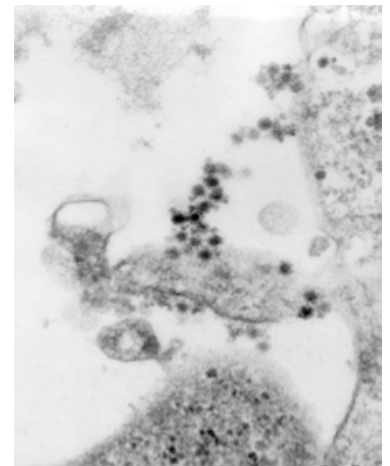
Mentor: Dr. Nina Fefferman and Ashley DeNegre

DIMACS, Rutgers University

Summer 2012

West Nile Disease

- Caused by a virus of a family of *Flaviviridae*.
- Vector-Borne disease transmitted by mosquitoes to humans and some animals.
- First identified in 1937 in eastern African and first discovered in the summer of New York in 1999.
- Since then, the virus has spread all over United States.



Ecologic Surveillance

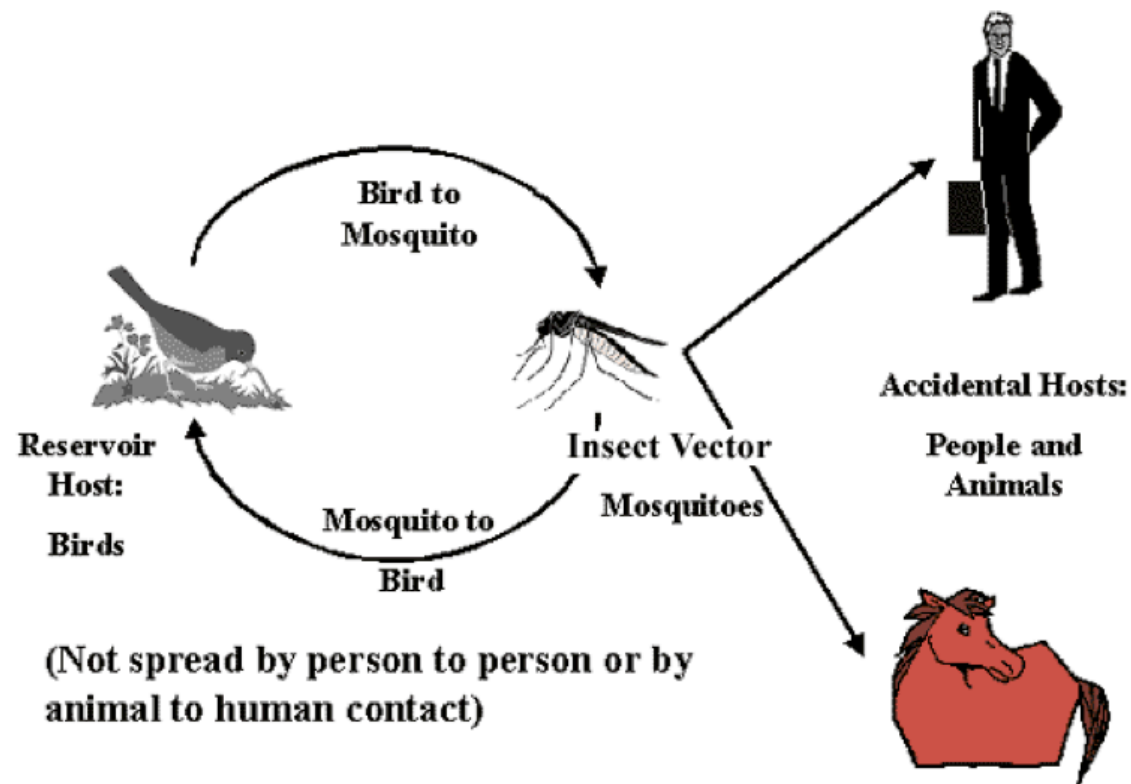
Goal: predict and prevent human and domestic animal infections.

- Detection of WNV in dead bird and mosquito populations.

Failure of prediction

- Failure of sampling data
- Factor being estimated doesn't have a strong biological relationship with human disease case.

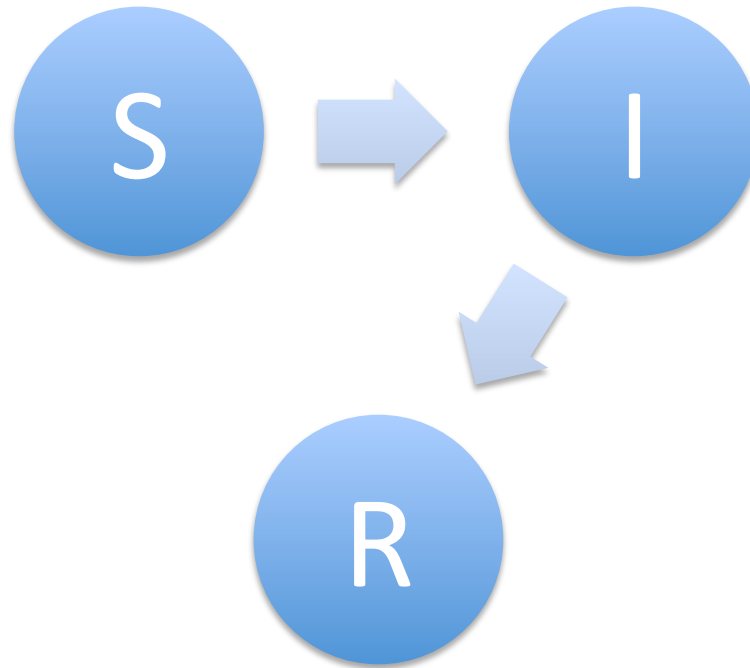
WNV Transmission Cycle



Question of the Project?

Would the prevalence of the West Nile virus be underestimating by surveillance programs that targets only the numbers of dead bird or mosquitos or both may due to many mosquitoes feeding only on birds too weakened by disease ?

SIR Model



SIR strands for
Susceptible – Infected – Recovered

Approach

- Modeling the dynamical system by SIR model in Mathematica
- Expecting that the model will show a small number of positive dead bird with a large number of infective mosquitos over a certain period of time
- Examining the sensitivity of the number of dead bird to the feeding rate of mosquitos to sick bird
- Examining the sensitivity of the number of infective mosquitos to the feeding rate of mosquitos to the sick bird

Reference

- Eldridge, B. F. 1987. Strategies for surveillance, prevention, and control of arbovirus diseases in western North America. American Journal of Tropical Medicine and Hygiene 37 (3): 77S-86S.
- West Nile Virus. A.D.A.M. Medical Encyclopedia. Web. June 6, 2011
- Epidemic/Epizootic West Nile Virus in the United States: Guidelines for Surveillance, Prevention, and Control.(2003). Centers for Disease Control and Prevention.

Thank You !!