Vector Biology 101 Webinar

CSTE Vectorborne Diseases Subcommittee Webinar Series

December 9, 2014

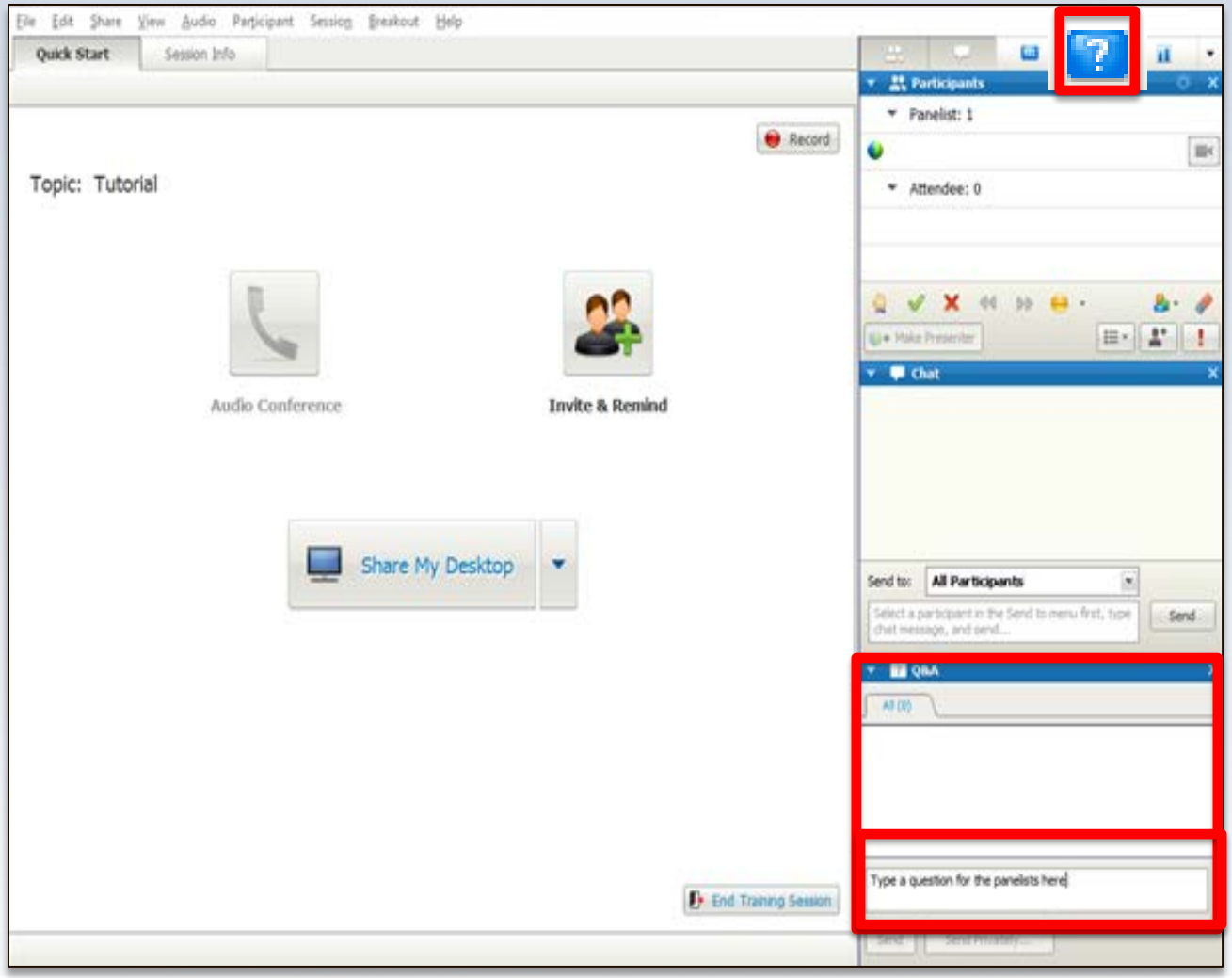
3:00 – 4:00 pm Eastern

Webinar Housekeeping

- **Please note that today's webinar is being recorded**
  - The webinar recording and presentation slides will be available in the webinar library on CSTE's website: http://www.cste.org/?page=WebinarLibrary
- **All phone lines have been placed on mute**
- **There will be a question-and-answer session at the end of the webinar**
  - To ask a question, please use the Q&A box on the right side of your screen

To Ask a Question

- Click on the blue question mark tab on the top right panel of your screen
- This will open the Q&A box on the bottom right panel on your screen
- Type a question
- Send questions to <u>All Panelists</u>
- Questions will be answered during the Q&A period



Vector Biology 101

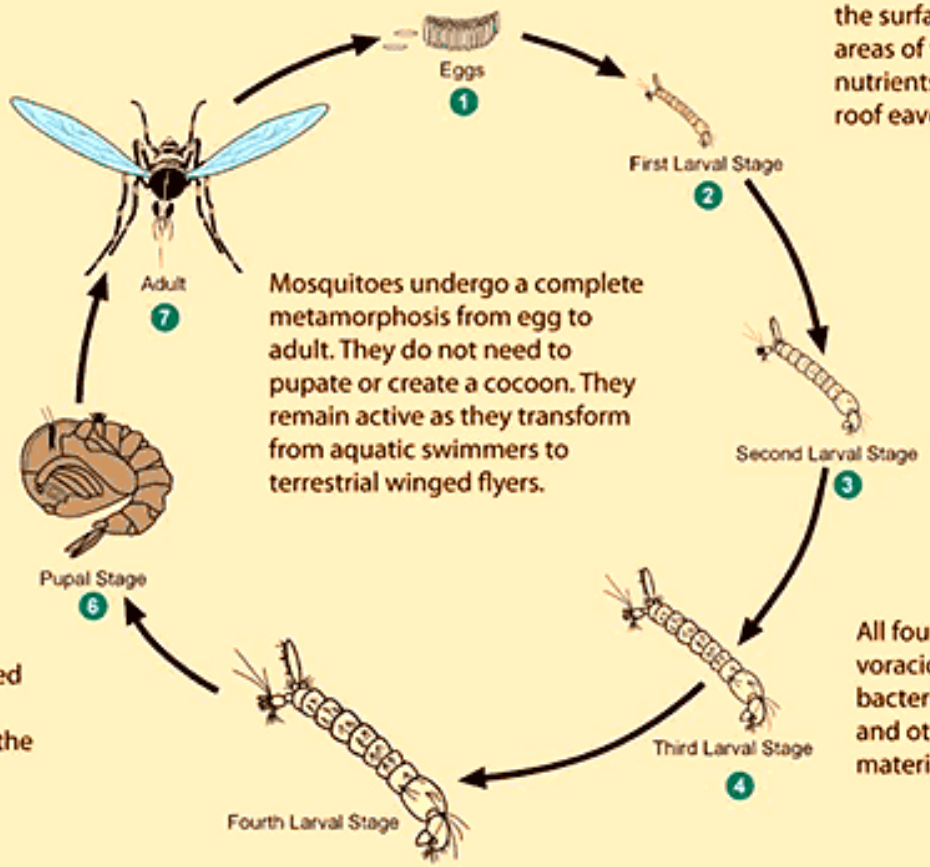
Presented by Abelardo C. Moncayo, PhD

Tennessee Department of Health
Vector-borne Diseases Section
Nashville, Tennessee

Goals for the webinar

- Discuss key concepts in vector biology
- Discuss new findings in vector biology
- Provide tools to answer questions from the public

Life Cycle of the Mosquito



After resting to dry its wings, the adult flies off. A female usually mates only once, carrying the male's sperm inside her body to fertilize eggs as she lays them.

Females lay 100 to 250 eggs individually or in clusters on the surface of small confined areas of water rich in organic nutrients, such as birdbaths, roof eaves and tires.

Mosquitoes undergo a complete metamorphosis from egg to adult. They do not need to pupate or create a cocoon. They remain active as they transform from aquatic swimmers to terrestrial winged flyers.

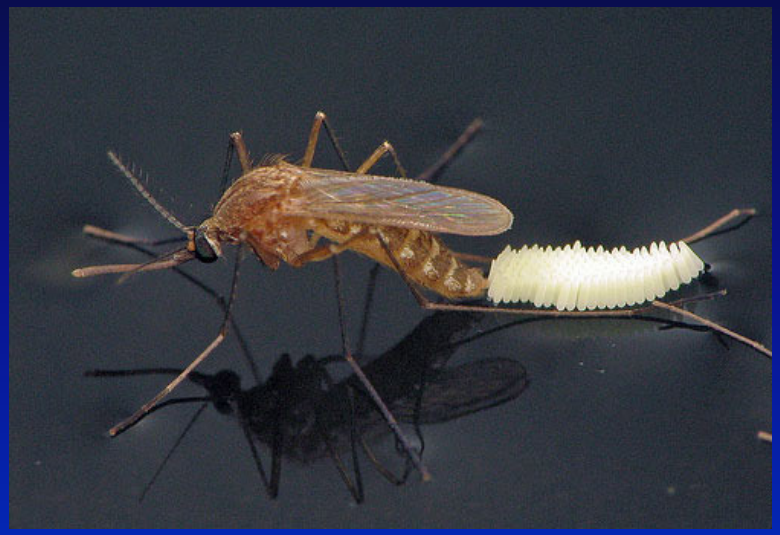
In about 10 days, the larva changes to a comma-shaped pupa. Two days later, after developing adult features, the pupa emerges as an adult mosquito.

All four larval stages are voracious eaters, devouring bacteria, fungal spores, algae and other microscopic organic material in the water.

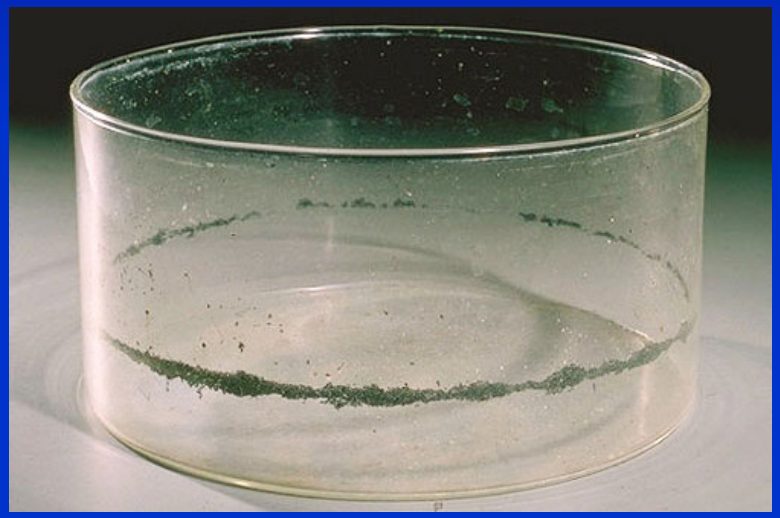
So far…

- Mosquitoes go through complete metamorphosis
- Vectors are part of the food chain
- Vector survival is important for transmission

Egg stage



Culex



Aedes

Culex habitat

Gravid trap

Aedes habitat

Oviposition cup


Site 1 5/24


Site 2 5/24
Site 2 5/24

BG Sentinel trap

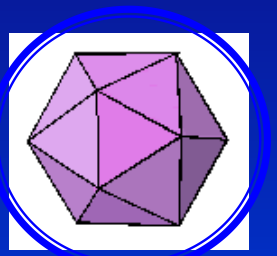
Floodwater mosquitoes

Psorophora ciliata

What does it take to be a good vector?

West Nile Virus

Enzootic (Maintenance/Amplification)



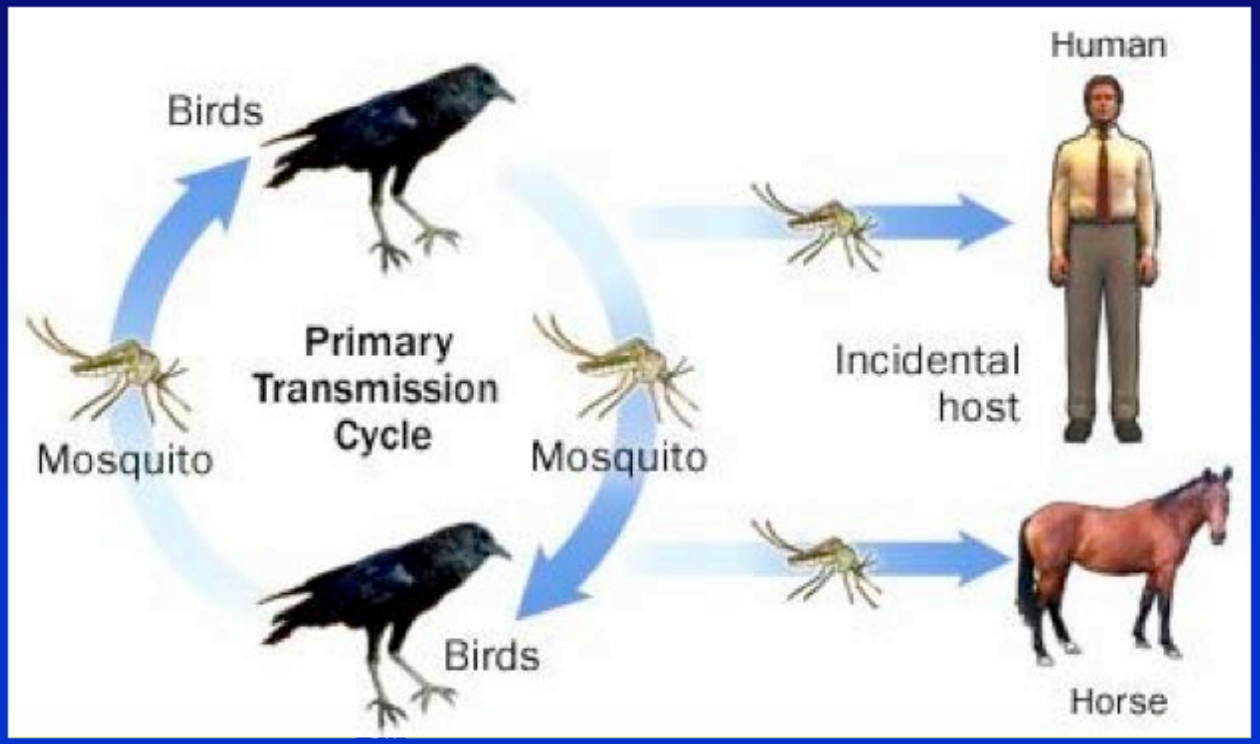
Amplifying hosts

Epidemic

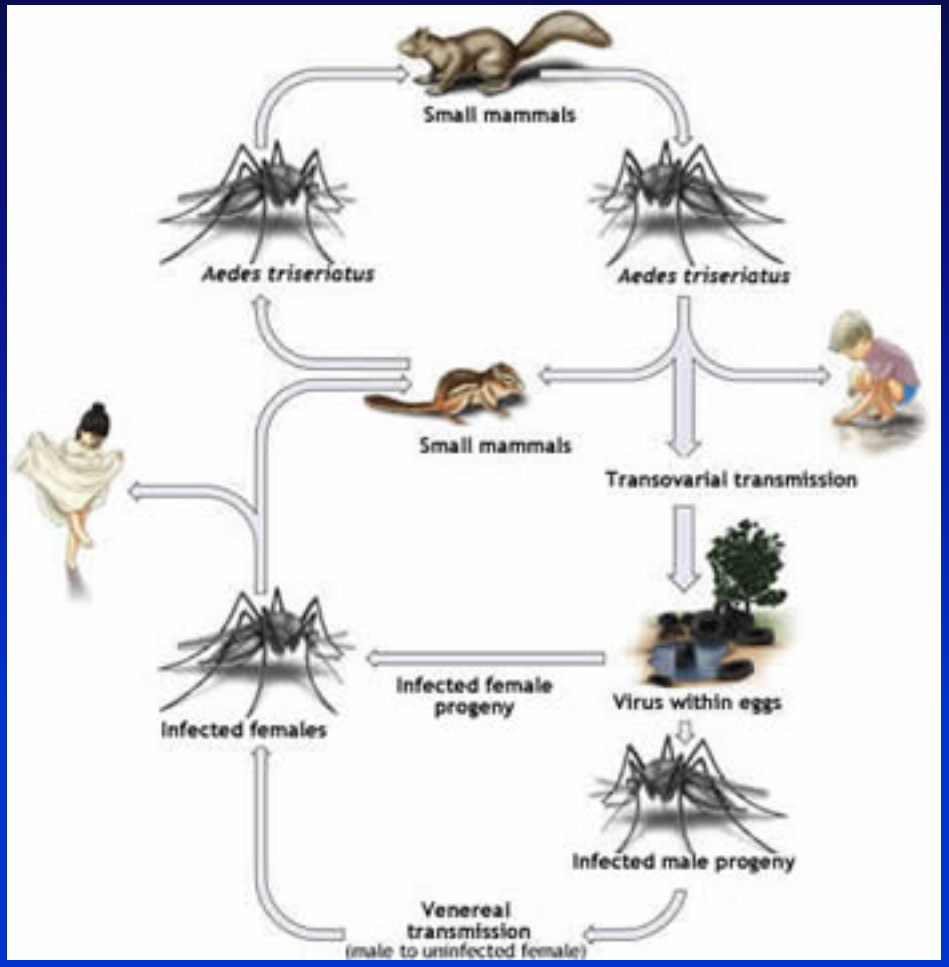
Epizootic

Incidental hosts

Eastern Equine Encephalitis Virus



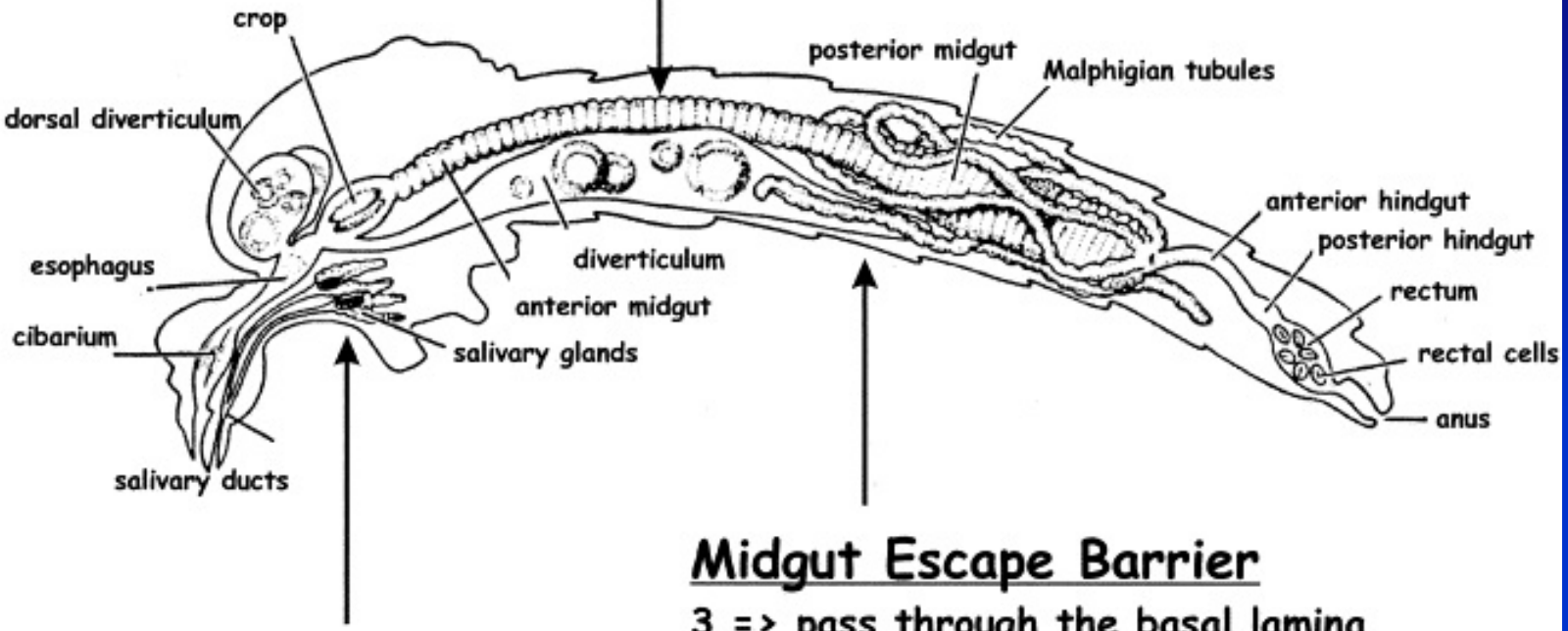
La Crosse Encephalitis Virus



Chikungunya Virus

Anthroponotic transmission

Vector Competence



So, can a swarm of mosquitoes cause huge outbreaks? Not likely

CHIK in holiday travelers?

Vectorial Capacity

- Describes the number of new infections disseminated per case per day by a vector

$$V = \frac{m * a^2 * b * p^N}{-ln\ p}$$, where

m = density with respect to human population

a = feeding frequency

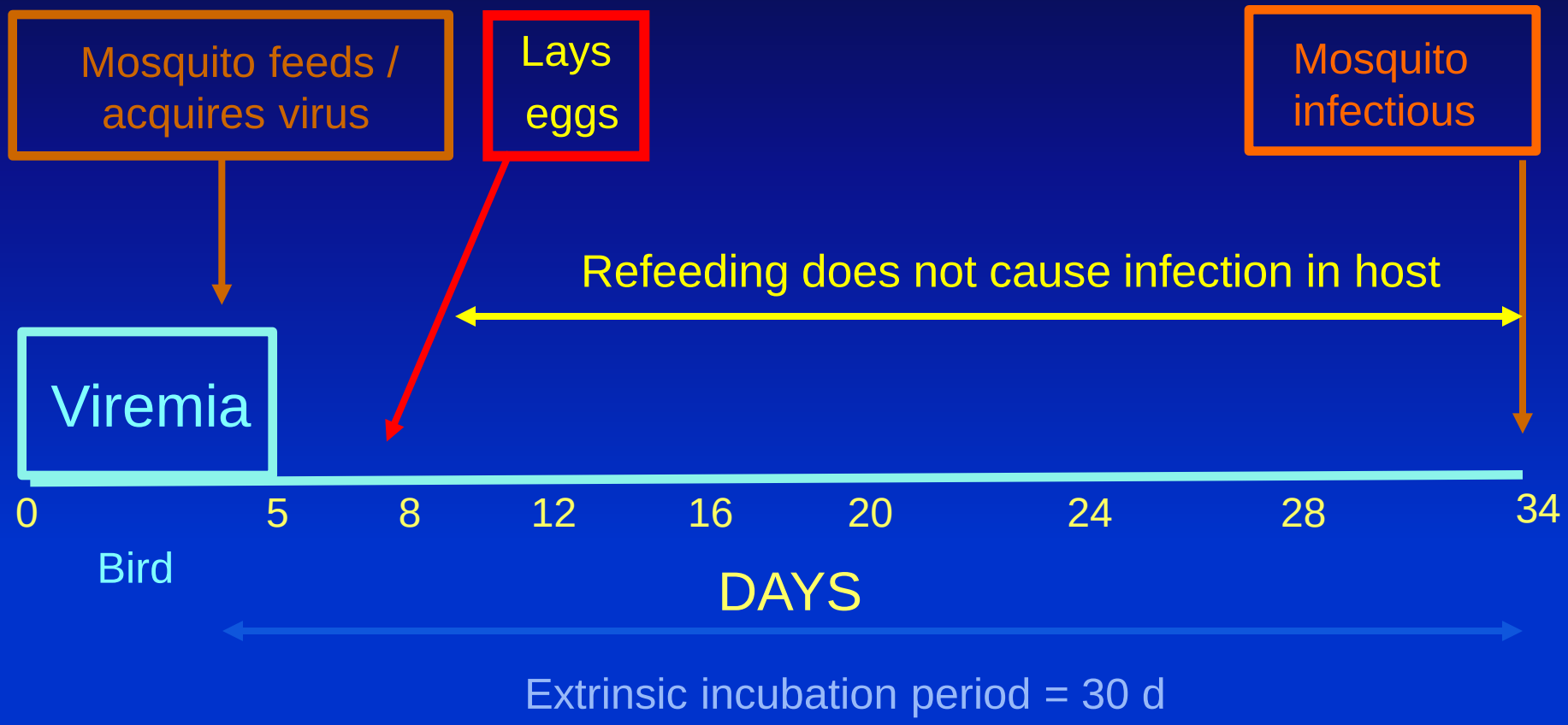
b = competence

p = daily survival rate

N = extrinsic incubation period

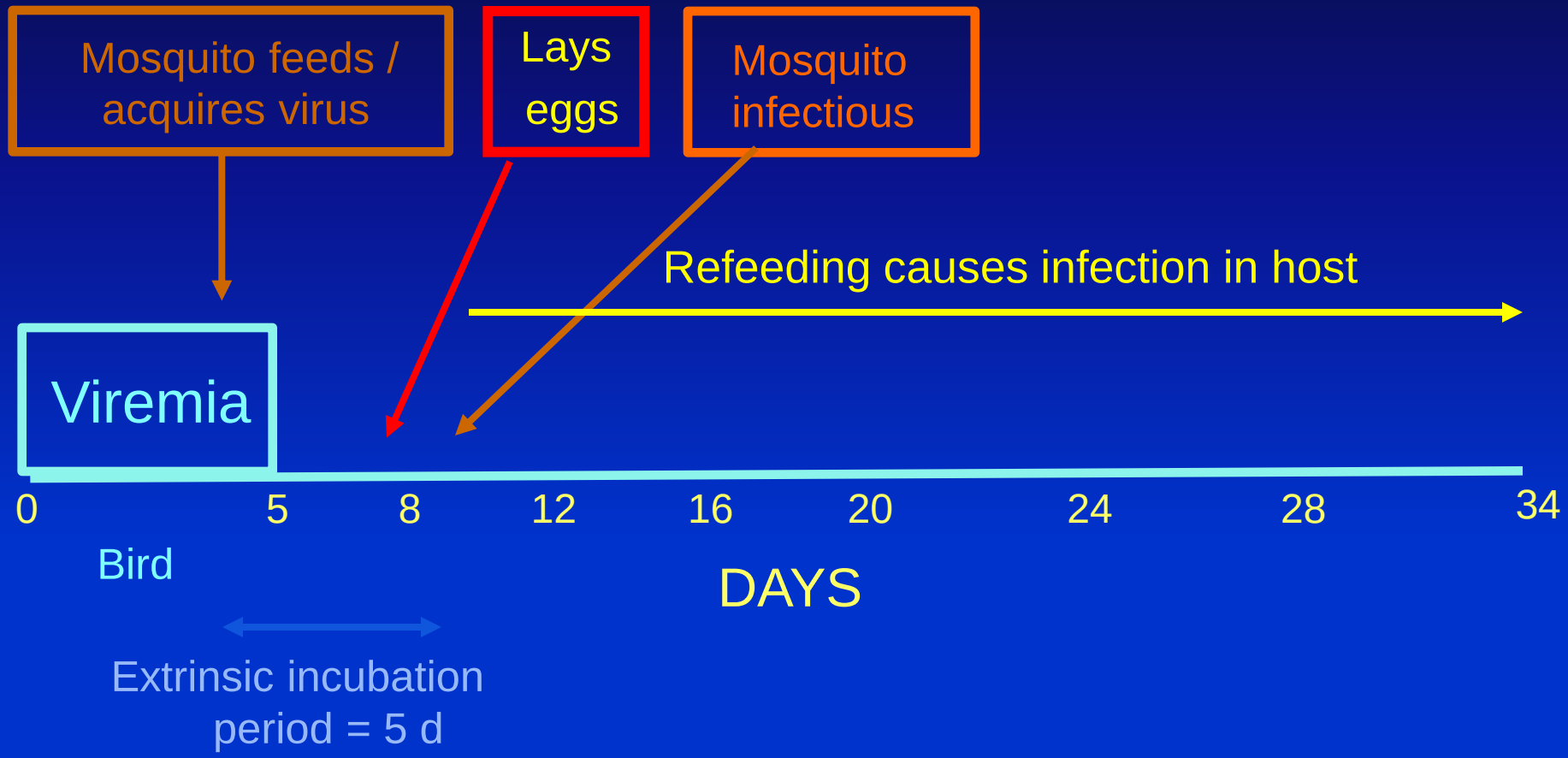
A race against time…

Transmission of WNV in *Culex tarsalis* at 17 degrees C

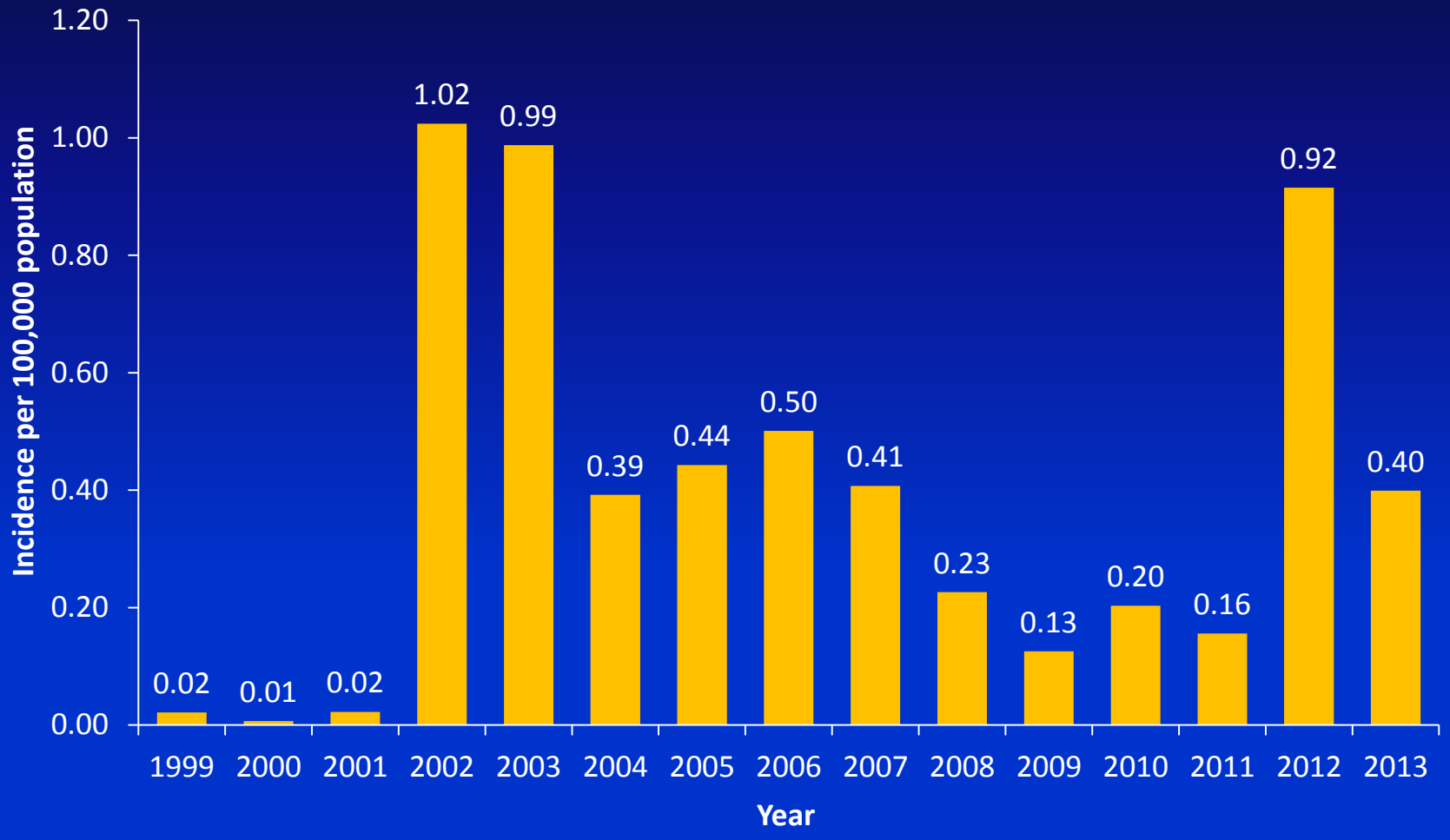


A race against time…

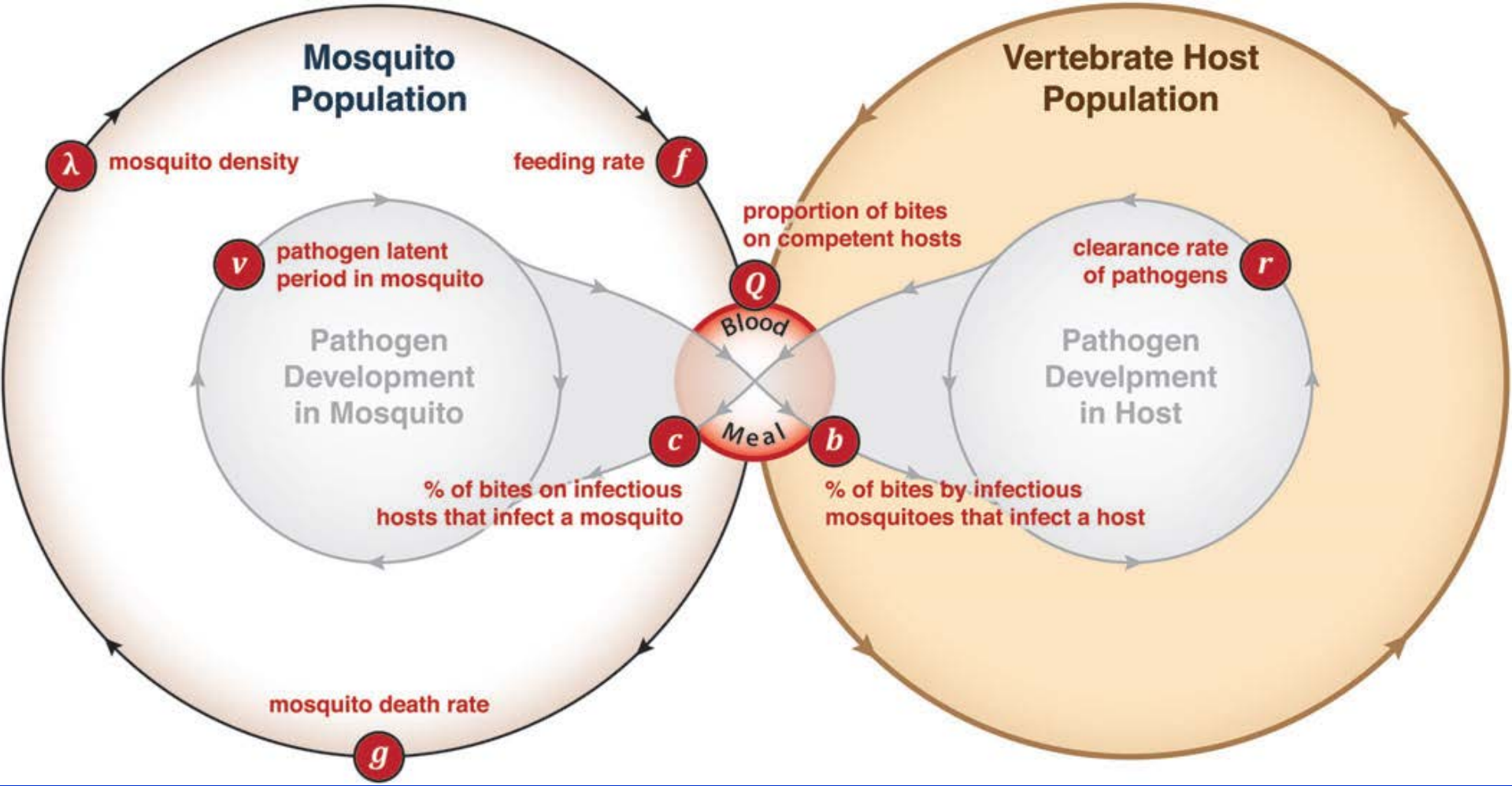
Transmission of WNV in *Culex tarsalis* at 30 degrees C



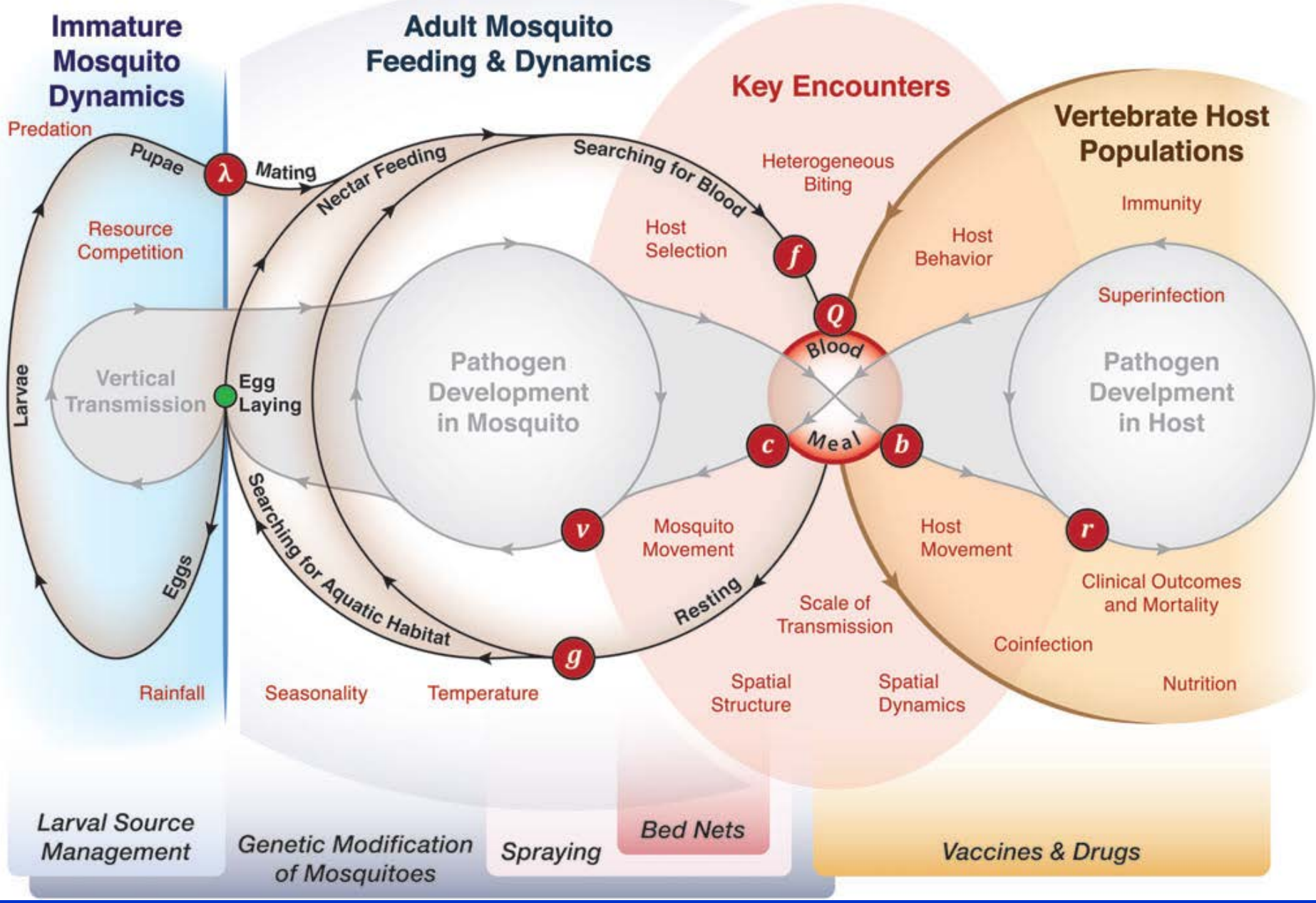
WNV neuroinvasive disease incidence per 100,000 population by year, 1999 – 2013



Vectorial Capacity



Smith, Trans R Soc Trop Med Hyg 2014; 108: 185



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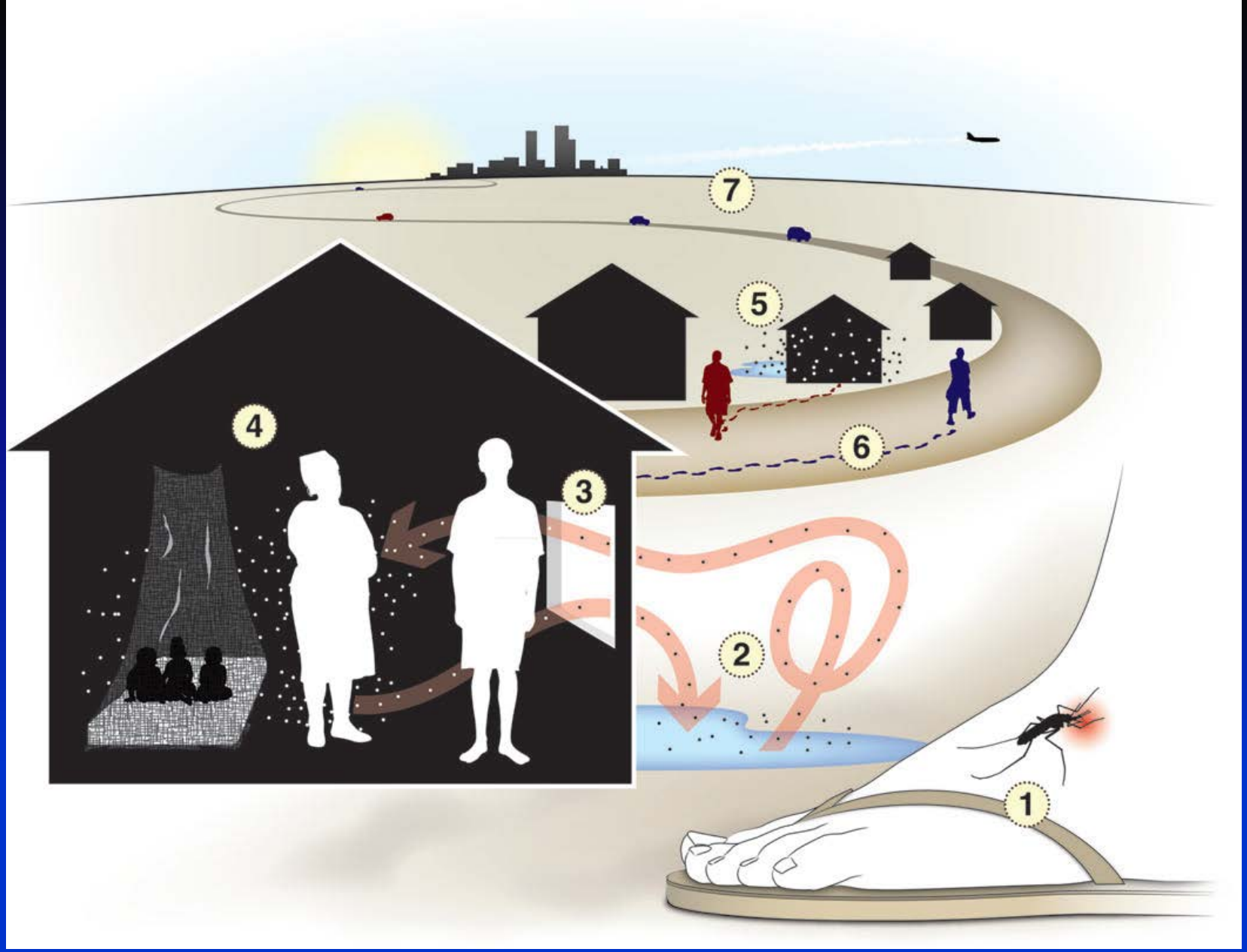


Smith et al, Trans R Soc Trop Med Hyg 2014; 108: 185

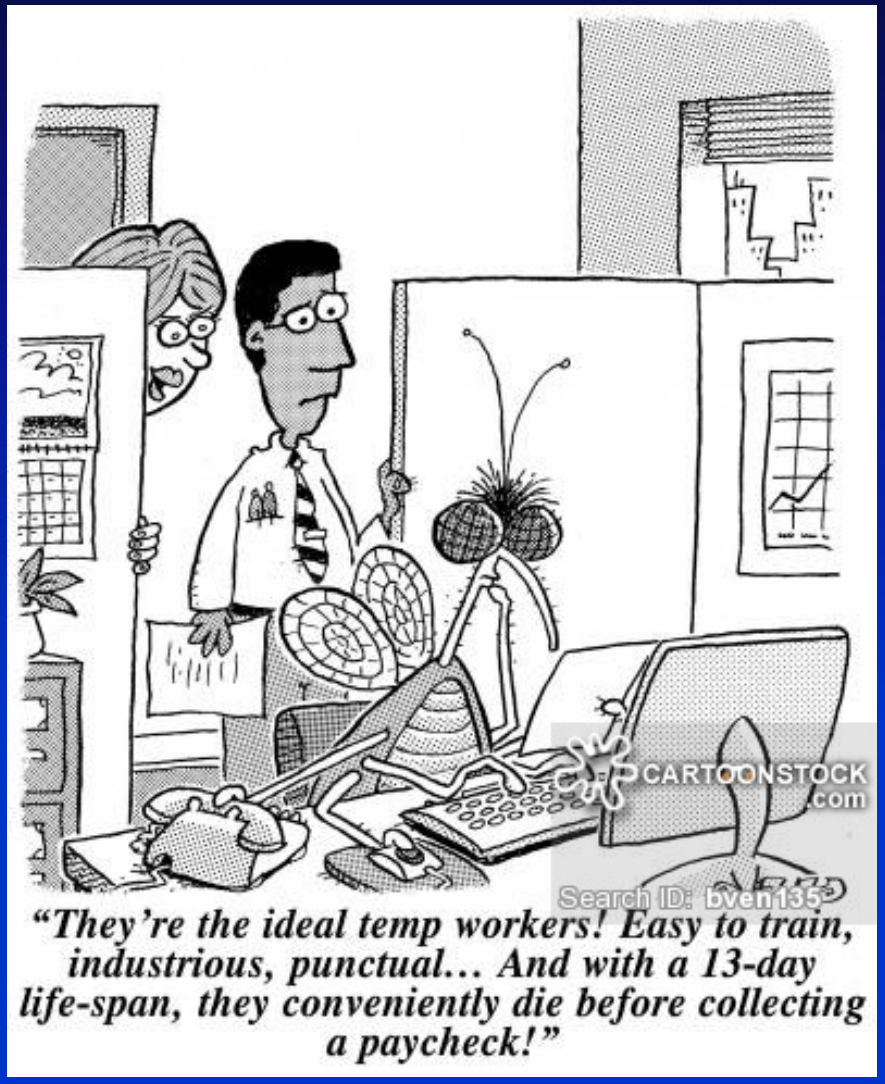
Bed Bugs as Vectors of *Trypanosoma cruzi*

Salazar et al, Am J Trop Med Hyg 2014, Nov 19

Bed bugs and Chagas disease?

- Primary amplification host
- Key blood meal/fecal encounters
- Clearance rate in host
- Vector competence
- Survival and extrinsic incubation period

Thank you!



"They're the ideal temp workers! Easy to train, industrious, punctual… And with a 13-day life-span, they conveniently die before collecting a paycheck!"

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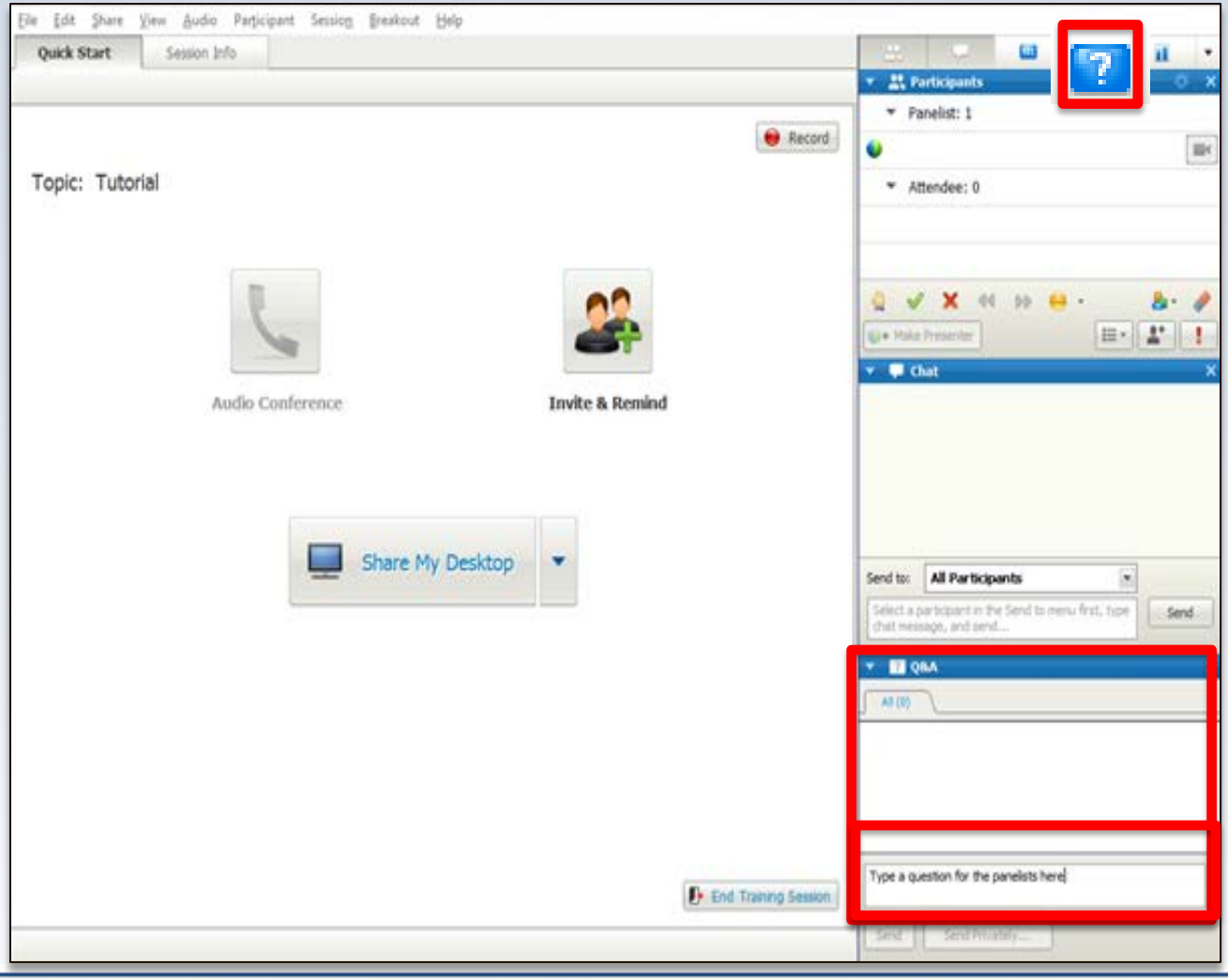

Thank you for your participation!

- Please complete the webinar evaluation: https://www.research.net/s/CSTE_VBD

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