PMI 214 Notes

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Course Overview

Ecology, Epidemiology, and Control of Vector-Borne Diseases

- Sep 27 - Mosquito Control in CA
- Sep 29 - Dirofiliaria
- Oct 4 - West Nile virus Epidemiology and Ecology
- Oct 6 - Impact of Environmental Change on Vector-Borne Desease
- Oct 11 - Zika Virus
- Oct 13 - Dengue Virus
- Oct 18 - Malaria
- Oct 20 - African Horse Sickness & Blue Tongue Viruses
- Oct 25 - Midterm Review
- Oct 27 - MIDTERM (50%)

Surveillance & Control of Vector-Borne Diseases

- Nov 1 - Modeling & surveillance of vector-borne diseases
- Nov 3 - Integrated VEctor Control
- Nov 8 - Genetically modified mosquitoes for malaria control
- Nov 10 - Genome evolution of malaria vectors in response to vector control
- Nov 15 - Dengue control by Introducing Wolbachia in A. aegypti populations (Turelli !!!)
- Nov 17 - Ecology of Rickettsiaceae
- Nov 22 - Leishmaniases
- Nov 24 - THANKSGIVING
- Dec 3 - Mechanisms of Arbovirus
- Dec 6 - FINAL EXAM (50%) (not cumulative)

Lecture 1

Objectives

- Factors affecting efficiency of transmission
- parasite acquisition
- modes of replication and transmission of different parasites

Factors Affecting Efficienct of Transmission

- "Nidus of Transmission" - where the host, vector, and parasite come together in a permissive environment
- Transmission
  - Mechanical Transmission (typically bacterial pathogens)
    - Does not involve biological association between pathogen and vector
    - typically mouth parts of insects like houseflies
      - flies eat fecal matter, land on breakfast cereal, and transfer enough to get the kid sick
    - vector serves only in a physical manner
    - Maybe this includes copulative transmission?
  - Biological Transmission
    - ingested parasite either develops and/or reproduces within the arthopod
    - example is Malaria - parasite undergoes changes inside the mosquito
      - Changes from infective to the mosquito into infective to the vertebrate host
      - Infected female does not transmit to offspring
    - vector picks up a low titre of particles, viruses reproduce inside the mosquito into numbers so that it infects the salivary glands inside the mosquito
    - most successful form of transmission
    - trophic transmission (S. Solidus) can be considered a subset of biological transmission (but not everything in biology fits into boxes)
  - Horizontal Transmission (includes mechanical and biological)
    - transmission between hosts
    - dengue: mosquito $\rightarrow$ human $\rightarrow$ mosquito $\rightarrow$ human $\rightarrow \ldots$
  - Vertical Transmission
    - pretty common, but not east for parasite to cross from female to egg
    - female ticks pass lyme disease to their offspring
- Incubation
  - Intrinsic Incubation Period
    - Typical period within vertebrate host between infection and onset of disease
    - Very important from and epidemiological (and even legal) standpoint
    - Recredescence
      - parasite becomes sequestered
      - if the immune system gets compromise, you get old or sick, have a transplant, then the parasite emerges
      - Record is 75 years.. the Greek woman who moved to Minnesota had Malaria
  - Extrinsic Incubation Period
    - Period within vector between infection and transmission
    - Mechanical transmission: EIP$= 0$.
    - Biological transmission: EIP$\neq 0$.. must infect the salivary glands
- Blood Feeding
  - Blood feeding has evolved independently at least 21 times in arthropods
  - Since they've evolved independently, they have created different methods of blood meal acquisition
  - Types of mouthparts
    - No penetration (houseflies) - sponging mouthparts, can only suck up liquid, can't create a surface wound.
    - Creates surface wound
      - rasping, chewing, sponging mouthparts
      - heavily armored mouthparts
      - blade-like parts create the wound, then use sponge-like parts to suck up blood.
    - Penetrate epidermis to find blood vessels
      - Mouthparts are seringe-like and enter a blood vessel
      - Bed bugs, "kissing" bugs, and true bugs have evolved anesthetic so the victim doesn't feel the bite