PMI 214 Notes - "West Nile virus: Epidemiology and Ecology"

Sam Fleischer - Speaker: Aaron C. Brault (Centers for Disease Control and Prevention - Fort Collins, CO)

October 4, 2016

1 Key Concepts

- Basic epi (transmission cycles and surveillance)
- ...

2 types

- Febrile w/ Arthalgia
  - WNV
  - DEN
  -
- ...
- CA as multiple flaviviruses interacting
- Enzootic (maintenance/amplification)
  - mosquitoes feed on birds, which perpetuate the cycle
- epidemic if mosquito bites a person
  - but people don't necessarily contribute to the cycle.. they are dead end hosts but can become symptomatic
- epizootic
  - dead crows (early sentinel warning system.. people notice when a bunch of birds drop out of the sky) as well as horses
- lots of genetic diversity among WNV
- only 1/5 (VERY approximate) cases of human infections are symptomatic
  - acute systemic febrile illness
  - headache, myalgia, arthralgia, rash, GI symptoms
- ¡1% neuroinvasive disease
  - encephalitis, meningitis, acute flaccid paralysis (polio-like syndrome)
  - incidence highest among persons ≥ 60 years
  - case fatality $\approx 10\%$
- west nile activity is focused in cities or counties
- number of WNV in blood donors matches overall data
- transmission picks up in summer (probably in july/august) but humans report in august/september
- older populations are more susceptible to WNV
- risk factors:

  - being male because
    - more exposure risk because of hobbies/vocation?
    - men have underlying health conditions which make them more susceptible to contracting the disease
  - diabetes, hypertension, and other co-morbidities
  - immune suppression
- virus moved east coast to west from 1999 to 2005
- areas with wet springs and above-average summer temps are prone to WNV transmission.. ex:
  - dallas in 2012
  - chiacgo in 2002
- virus moves through mosquito faster in hotter temps
- three phases of WNV
  - indentified infected mosquitoes or identify dead birds
  - next year, big blow up in human cases, sentinel system goes crazy.. lots of dead birds
  - third year, subsidence period - maybe high rates in birds, fewer infected mosquitoes (probably due to herd immunity in birds), lower rates in humans
- american crows highly sensitive to infection (nearly 100% lethal if infected)
  - very high viral titres
- other birds
  - american crows
  - blue jays
  - western scrub jays (16%)
  - yellow billed magpies
  - house sparrow
- Davis in particular is a hybrid zone for both north and south # 1 mosquito for WNV

3 WNV Infection in horses

- big spread in 2002 - followed same basic outbreak pattern as in humans
- horses are dead-end hosts (like humans)
- viremia - brief and low magnitude
- 1/20 horses develop viremia
- fatality is 25-40% of sick hroses
- WNV therapy for horses.. not too effective
  - best is mosquito control and vaccinations
- decrease of WNV in horses in 2003 presumably largely due to vaccine effort
- viremia is proportional to likelihood of succombing to infection
- cost of being a non-vector-borne disease is higher than being a vector-borne disease. This is because people sick with influenze stay home
- but benefit of a vector-borne disease is lower than benefit of a non-vector-borne disease
- both these slides show that vector-borne diseases evolve higher virulence than non-vector-borne diseases

- slow but steady upward trend of higher viremia in birds, which implies higher virulence (response to herd-immunity?)
- birds adapting as well - birds steadily evolving resistant phenotype
- genetics ARMS RACE keeps the number of virus about steady

contact

- abrault@cdc.gov
- 970-266-3517