EMERGING MOSQUITO BORNE DISEASES

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INTRODUCTION

❖ What is an emerging disease?
❖ Causes
  □ International Travel
  □ Climate Change
  □ Introduction of new mosquito species
❖ Emerging Diseases
  □ Saint Louis Encephalitis
  □ Chikungunya
❖ Conclusions
EMERGING INFECTIOUS DISEASE

- Disease that has newly appeared in a population
- Rapidly increasing in incidence
- Rapidly increasing geographic range
CAUSES

- Movement of people
- Environment
  - Global warming
  - Introduced species
  - Changes in land use
- Mutations
  - Drug resistance
  - Antigenic drift and shift
CLIMATE CHANGE

- Changes in precipitation
- Temperatures affect
  - Warm weather increases virus replication
  - Behavior
  - Mortality
  - Rate of development
- Geographic Distribution - species are predicted to move northward
EXOTIC MOSQUITO SPECIES

Ae. albopictus
Arrived 1985

Oc. japonicus
Arrived 1998
Asian Tiger Mosquito

- Container breeder
- 1st identified at a tire dump in Houston, TX 1985
  - NJ 1995
- Most often transported in discarded tires
- Daytime Biter - Severe nuisance
- Limited flight range - 100m - 200m
- Good vector for many diseases
- Found in 3 places in MA
NEW BEDFORD COLLECTIONS

- 2000- 18
- 2009- 3
- 2010- 2
- 2011- 34
- 2012- 169

- Highest collections in August
  - 8/24- 50
CHIKUNGUNYA
COUNTRIES WITH REPORTED HUMAN CHIKUNGUNY VIRUS INFECTIONS AS OF MAY 2012
CHIKUNGUNYA

- Genus: Alphavirus
  - Family: Togaviridae
- Epidemics reported in 1770’s
- First isolated in Tanzania in 1952
- Makonde word means “that which bends”
- Infection rates 38 - 63% of population
- Incubation period 1-12 days (average 3-7 days)
- 3-28% of infected people are asymptomatic
- Death is uncommon
CHIKUNGUNYA

- Since 2004 Chikungunya has expanded its geographical range
- Travelers have spread it to 19 countries
- Unprecedented epidemics
- Number of imported cases to the US has increased
  - 2006-2010 - 106 cases
  - 1995-2005 - 3 cases
- Vectors have wide spread distribution
  - Aedes aegypti
  - Ae. albopictus
SYMPTOMS

- High fever
- Severe joint pain (hands and feet)
- Headache
- Diffuse back pain
- Muscle pain
- Nausea
- Vomiting
- Polyarthritis
- Rash
- Conjunctivitis
PERSISTENT SYMPTOMS

- Percentage of people with chronic disease varies substantially between studies
- Symptoms can last months to years after
- Inflammatory arthralgias
- Destructive arthritis (resembles rheumatoid arthritis)
- Fatigue
- Depression
- People over 45 at greater risk
LA RÉUNION ISLAND

- French island east of Madagascar
- 2005-2006
- Infected 35% of population 266,000 people
- 254 deaths
- 47% of people with persistent symptoms 2 years after
- Virus mutation made *Ae. albopictus* better able to transmit
SAINT LOUIS ENCEPHALITIS
St. Louis Encephalitis Virus Neuroinvasive Disease Cases* Reported by State, 1964-2010

* Neuroinvasive disease includes cases reported as encephalitis, meningoencephalitis, or meningitis.
St. Louis Encephalitis Virus Neuroinvasive Disease Average Annual Incidence by County, 1996-2010

*Neuroinvasive disease includes cases reported as encephalitis, meningoencephalitis, or meningitis*
SAINT LOUIS ENCEPHALITIS

- Genus: Flavivirus
  - Family: Flaviviridae
- First recognized in 1933 during an outbreak in St. Louis
  - 1,095 cases and 201 deaths
- Majority of human cases east of Mississippi
- Most human infections are asymptomatic
- Vectors are Culex mosquitoes
ST. LOUIS ENCEPHALITIS
SYMPTOMS

- Less than 1% of infected people will have symptoms
- Incubation period 5-15 days
- Headaches
- Flu-like illness
- Muscle aches and weakness
- Vomiting
- Encephalitis or Meningitis
- Confusion
- Coma
- Death
SAINT LOUIS ENCEPHALITIS
VIRUS CYCLE
St. Louis Encephalitis Virus Neuroinvasive Disease Cases* Reported by Year, 1964-2010

*Neuroinvasive disease includes cases reported as encephalitis, meningoencephalitis, or meningitis.
CONCLUSIONS

- Diseases constantly changing
- Introduced mosquitoes change what diseases we are susceptible to
- Chikungunya
- Saint Louis Encephalitis
THANKS

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