MOSQUITO BORNE DISEASES IN MAINE

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Mosquito borne viral diseases

- Potentially acquired in Maine
  - West Nile Virus
  - Eastern Equine Encephalitis
- Acquired by travelers
  - Zika
  - Dengue
  - Chikungunya

West Nile Virus

- Consider in any person with a febrile or acute neurologic illness who has had recent exposure to mosquitos, blood transfusion, or organ transplant, especially in area where mosquito activity has been reported

Clinical signs and symptoms

- Incubation period 2-6 days, can be longer if immunocompromised host
- 70-80% of infections subclinical/ asymptomatic
- Usual symptoms: headache, weakness, myalgia, or arthralgia; gastrointestinal symptoms and a transient maculopapular rash also are commonly reported

Clinical signs and symptoms

- Neuroinvasive disease in less than 1%
  - WNV meningitis
    - Clinically the same as other causes of viral menigitis
  - WNV encephalitis
    - More severe
    - Presents with fever and altered mental status, seizures, focal neurologic deficits, or movement disorders such as tremor or parkinsonism.
    - Cranial nerve VII has been reported to be affected in up to 20%
  - WNV acute flaccid paralysis
    - often presents as isolated limb paresis or paralysis and can occur without fever or apparent viral prodrome

West Nile Virus

- Treatment
  - Supportive
  - ? Interferon, IVIG
  - Ribavirin in vitro only
  - Vaccine has not made it to phase 3 trials, some promising candidates
  - Case fatality rate 10%
- Prognosis
  - Only 37% of patients in the 1999 NYC outbreak achieved full recovery at 1 year
  - 53% of patients in Idaho reported symptoms lasting at least 6 months, mostly fatigue, muscle aches, and difficulties with memory and concentration

JID 2013

Eastern Equine Encephalitis

- Clinical features
  - Incubation period 4-10 days after mosquito bite
  - Several day prodrome of fever, headache, nausea, vomiting
  - 2% of infected adults and 6% of infected children develop encephalitis
  - Rapid progression of symptoms: 90% become comatosed
  - Brain stem involvement common: gaze palsies, nystagmus, pupillary abnormalities

Eastern Equine Encephalitis

- Treatment: supportive
  - Anti convulsants and steroids worsened outcomes in one series
  - IVIG may have helped in one case
  - No commercially available vaccine for humans
- Prognosis:
  - case-fatality rate is 50 to 70%
  - Death can occur with 3-5 days of symptoms onset
  - Residual damage found in 30 to 50% of patients with convulsions, paralysis, and mental retardation

Zika: Origins

- Zika Forest, Uganda, discovered 1947:
  - RNA virus/flavivirus (like YF, dengue, WNV, SL encephalitis)
- 1952—first human cases detected in Uganda, Tanzania
- 1960s-80s-Detected in mosquitos/monkeys- Africa
- 1969-83—Detection and spread in Asia
- Spread to South Pacific—Yap Island (Micronesia, 2007) and then across French Polynesian archipelagos (2013)
- Detected in Bahia Brazil, March/April 2015
- Now in >20 countries in Central and South America, Caribbean, Florida

Active Zika transmission

CDC

Zika cases in the US

- October 19,2016:

Clinical Illness

- Similar to other arboviruses in tropics, like dengue, chikungunya
- Mild fever, headache, myalgias, nonpurulent conjunctivitis, maculopapular rash
- Most infections are asymptomatic; illness tends to be relatively mild—lasts <1 week
- Viremia lasts 7-10d
- Less severe than dengue; persisting sx unusual, unlike chikungunya

Zika transmission

- Bite of an infected mosquito
- Maternal-fetal transmission
- Sex (including vaginal, anal, and oral sex)
- Blood product transfusion
- Organ transplantation
- Laboratory exposure
- A case of possible secondary nonsexual transmission

Vectors of Most Concern

- Aedes aegypti is well adapted to urban settings and is widely distributed in urban areas of the tropics and subtropics.
- Aedes albopictus (Asian tiger mosquito) is competent to transmit a number of arboviruses in the laboratory (including yellow fever, West Nile, Japanese encephalitis, and eastern equine encephalitis viruses). Widely dispersed beyond Asia and now established in many parts of the Americas, Europe, Africa, and the Pacific Islands.

Aedes in the United States

CDC

Zika complications: Microcephaly

- Greatest risk after first trimester infection
- Symptoms: microcephaly, facial disproportion, hypertonia/ spasticity, hyperreflexia, irritability, seizures, arthrogryposis, ocular abnormalities, and sensorineural hearing loss
- Care is supportive
- Goal to prevent infection during pregnancy

Zika and pregnancy

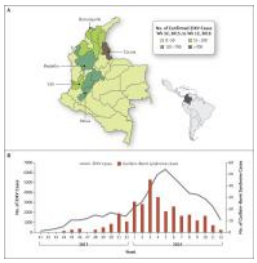
- Pregnant women should:
  - Avoid travel to an area of transmission, if possible
  - Adhere to mosquito protective measures
  - Protect against sexual transmission from a partner

Zika and pregnancy

- Women planning pregnancy should:
  - Advice similar to that for pregnant women
  - If men or women who live in an area with Zika have symptoms should be tested
    - Men if positive: wait 6 months
    - Women if positive: wait 8 weeks
  - Travelers to an area with Zika:
    - Men wait 6 months before attempting conception
    - Women wait 8 weeks before attempting conception
    - Above regardless of symptoms; no testing needed

Zika complications: Guillain-Barré Syndrome

- Colombia study:
  - 68 with GBS, 97% with symptoms of Zika
  - 37 tested with serology, 86% with recent flavivirus infection
- French Polynesia outbreak
  - Incidence 2.4 cases per 10,000 Zika infections



Parra B et al. N Engl J Med 2016;375:1513-1523.
Lancet. 2016;387(10027):1531

Dengue: history of *ka-dingo pepo*

- Originated in monkeys and independently jumped to humans in Africa or Southeast Asia 100-800 years ago.
- Some spread in the setting of slave trading, rum runners
- Dr. Benjamin Rush in Philadelphia coined “break bone fever”
- Dengue was minor, geographically restricted disease until the middle of the 20th century.

Dengue fever

- World War II—in particular the coincidental transport of Aedes mosquitoes around the world in cargo— thought to have played a crucial role in the dissemination
- First documented in the 1950s during epidemics in Philippines and Thailand.
- 1981 - large number of DHF cases began to appear in the Caribbean and Latin America

Dengue fever

- Transmitted between people by mosquitoes *Aedes aegypti* and *A albopictus*.
- Symptoms usually begin 4-7 days after mosquito bite and last 3 to 10 days
- Rarely transmitted by organ transplants or blood transfusions, and there is evidence of vertical transmission

Dengue fever

- Epidemics occur when there is a concurrence of large number of vector mosquitoes, a large number of people with no immunity to 1 of the 4 virus types (DENV 1-4) and the opportunity for contact.

Epidemiology

- Over 40% of the world's population at risk from dengue.
- WHO currently estimates may be 50–100 million dengue infections worldwide every year.
- Before 1970, only nine countries had experienced severe dengue epidemics.
- The disease is now endemic in more than 100 countries in Africa, the Americas, the Eastern Mediterranean, South-east Asia and the Western Pacific. The American, South-east Asia and the Western Pacific regions are the most seriously affected

http://www.who.int/mediacentre/factsheets/fs117/en/index.html

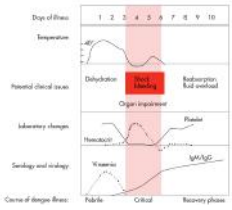
Clinical features

- Incubation 3-14 days
- Majority asymptomatic or fever plus rash
- Classic dengue: fever, retro-orbital headache, musculoskeletal pain, rash
- Leukopenia, thrombocytopenia
- Diagnosis clinical; also serology, PCR

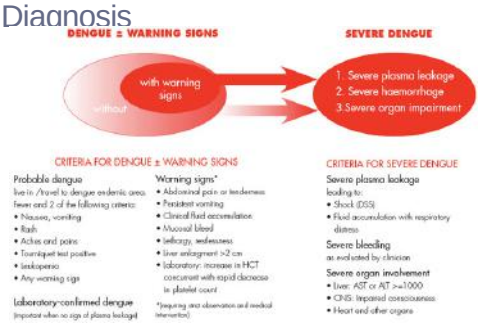
Clinical features

Dengue Hemorrhagic Fever (DHF) Dengue Shock Syndrome (DSS)

- Acute immunopathologic disease that is usually seen in secondary infection, in 90% of cases, after exposure to heterologous DENV serotype
- DHF: fever, positive tourniquet test, platelets < 100, hemoconcentration (>20% above normal)
- Period of defervescence correlates with onset of hemorrhagic complications
- DSS: DHF plus shock

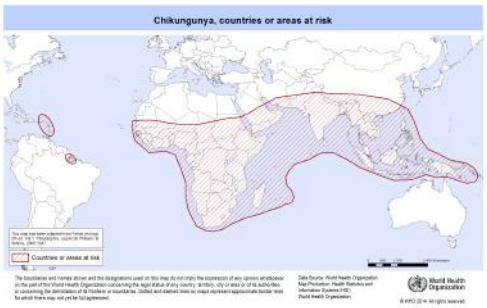


Diagnosis



Chikungunya fever

- "Chikungunya": derived from local language in Tanzania – "that which bends up" or "stooped walk"
- First isolated in Tanzania in 1953.



Clinical manifestations – acute

- Abrupt onset fever and malaise after an incubation period of 2-4 days (range 1 to 14).
- Fever may be high grade (40ºC); usually lasts 3-5 days.
- Polyarthralgias begin 2-5 days after onset of fever and commonly involves multiple joints (often 10 or more joint groups). Joints affected include hands, wrists, ankles; usually symmetric; distal > proximal joints.

Clinical manifestations – acute

- Skin manifestations seen in 40 to 75 percent of patients – usually macular or maculopapular rash (appears > 3 days after onset, lasts 3-7 days). Usually on limbs and trunk (and spares the face, palms and soles)
- Headache, myalgia, and GI symptoms can be seen.
- On physical examination, can see periarticular edema or swelling, peripheral lymphadenopathy, conjunctivitis may be observed.
- Lymphopenia, thrombocytopenia, elevated liver enzymes may be seen.

Clinical manifestations - chronic

- Can have persistent rheumatologic signs and symptoms including arthritis/arthralgia, edematous polyarthritis of fingers and toes, morning pain and stiffness and severe tenosynovitis (especially of wrists, hands and ankles).
- Occasionally, unusual joints (such as sternoclavicular or temperomandibular joints) involved.

Chikungunya vs. Dengue

- Chikungunya and dengue virus infections have some common clinical symptoms and areas of geographic distribution
- Can be difficult to distinguish in the setting of acute febrile illness with rash.
- Polyarthralgia occurs in virtually all cases of chikungunya fever but is not typical of dengue fever (though dengue fever patients commonly have myalgias).
- Leukopenia, neutropenia and thrombocytopenia significantly more common in patients diagnosed with dengue than chikungunya.