Zika Virus – The Newest Teratogen

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I have no disclosures
Learning Objectives

• To review the epidemiology of Zika virus
• To counsel couples who are contemplating pregnancy if traveling to a location with Zika virus
• To manage a woman who is exposed to Zika virus during pregnancy
28 yo G 4 P 2 at 18 wks states she will travel to DR to visit family.

Your counseling includes:

A) Discussion that the risk in DR is over – almost all of population has been infected.

B) Recommendation to stay home.

C) Instruction on use of DEET containing bug repellant, bed nets, air conditioning.
Areas in Which Zika Virus Infections in Humans Have Been Noted in the Past Decade

As of March 2016

|-----------|-----------|----------------------|---------------|---------------|--------------|--------------|------------|
Epidemic 2015-2016

Reported active Zika virus transmission
No reported active Zika virus transmission

Data as of 31 August 2016

The Pacific Islands:
- Kosrae,
- Federated States of Micronesia
- American Samoa
- Fiji
- Marshall Islands
- New Caledonia
- Papua New Guinea
- Samoa
- Tonga

British Virgin Islands
US Virgin Islands
Saint Martin
Sint Maarten
Saint Barthélemy
Anguilla
Saba
Sint Eustatius

Puerto Rico
Antigua & Barbuda
Guadeloupe
Dominica
Martinique
Saint Lucia
St. Vincent and the Grenadines
Grenada
Trinidad and Tobago
Barbados
Centers for Disease Control
Jan 1, 2015- Apr 26, 2017

**US States**
5,264 Zika virus disease cases reported
- 4,963 cases in travelers returning from affected areas
- 224 cases acquired through presumed local mosquito-borne transmission in Florida (N=218) and Texas (N=6)
- 77 cases acquired through other routes, including sexual transmission (N=46), congenital infection (N=29), laboratory transmission (N=1), and person-to-person through an unknown route (N=1)

**US Territories**
36,575 Zika virus disease cases reported
- 143 cases in travelers returning from affected areas
- 36,432 cases acquired through presumed local mosquito-borne transmission
- 0 cases acquired through other routes
Not all mosquitoes are the same. Different mosquitoes spread different viruses and bite at different times of the day.

Aedes aegypti, Aedes albopictus
Viruses spread
Chikungunya, Dengue, Zika
Biting habits
Daytime

Culex species
West Nile
Dusk (evening) to dawn (morning)

Source: Centers for Disease Control and Prevention
Aedes aegypti and Aedes albopitrus

RANGE OF THE AEDES MOSQUITO

The map shows the range of the Aedes aegypti and Aedes albopictus mosquitoes, compiled from known occurrences between 1960 and 2014. These two mosquitoes have been implicated in outbreaks of Zika virus.

Each dot represents a known occurrence of an aegypti or albopictus mosquito.

Sources: U.S. Centers for Disease Control and Prevention; The global compendium of Aedes aegypti and Aedes albopictus occurrence - Kraemer MUG, Sinka ME, Duda KA; Dryad Digital Repository
Infection prevention

- Long sleeves and pants during day and dusk
- Bed nets if no screens or air conditioning
- DEET-containing repellents to skin and clothing
- Reduce standing water – barrels, tires, etc.
- Aerial spraying and larvicides

Source: paho.org
Modes of transmission of ZIKV

- Mosquito bites (*Aedes aegypti* and *Aedes albopictus*)
- Mother to child
- Blood transfusion
- Sexual intercourse
  - M-M
  - F-M
  - M-F (Asymptomatic)

A ZIKV case: LR

- She returned from her visit with family yesterday.
- She is 20 weeks and shows you this rash on her iPhone. It is now gone.
• **~1 in 5 people infected with Zika virus become ill**
  - Symptom onset: 3–12 days after exposure
  - Symptoms resolution: 2–7 days after onset
• Symptoms include:
  - Mild fever
  - Rash (mostly maculopapular)
  - Headaches
  - Arthralgia
  - Myalgia
  - Non-purulent conjunctivitis
• Presentation is similar to dengue and chikungunya infection
Clinical features of Zika Virus Infection in Pregnant Women
Symptomatic infection in the 1st trimester

At 29 weeks ultrasound showed microcephaly and calcifications in the fetal brain and placenta

Pregnancy termination
Prenatal Ultrasonographic Images and Photographs of Coronal Slices of Brain

Pregnancy Outcomes associated with ZIKV

- Fetal loss / miscarriage, stillbirth
- Fetal growth abnormalities
- Fetal brain abnormalities
- Eye abnormalities
- Neurologic abnormalities
- Arthrogryposis
- Behavioral abnormalities
- Intrauterine growth restriction
Is there a Congenital Zika Syndrome?

- **Two theories**: ZIKV causes severe placental vascular damage and reduction in fetal blood vessels/flow or ZIKV crosses placental barrier and preferentially infects neuro-progenitor cells.

- Causal relationship between ZIKV and neuro-disruption sequence exists.

- Timing of maternal infection and congenital zika syndrome is unclear.

- Subclinical maternal ZIKV as a cause of syndrome is unknown.

Hill’s 9-factor criteria: link bug & disease

- Strength of association
- Consistency
- Specificity
- Temporality
- Biological gradient
- Plausibility
- Coherence
- Experimental model
- Analogy

Moore et al, J Peds 1990
Prospective Cohort from Brazil

• **Cohort of 88 symptomatic pregnant women (9/15 – 2/16)**
  – 82% (72/88) positive ZIKV PCR in blood, urine, or both
  – Infection occurred at 5 – 38 weeks

• **Of 72 women with positive PCR**
  – 50% reported ill family member; 21% reported an ill partner
  – 2 women had early pregnancy losses

• **Of 42 (60%) who had ultrasounds, 12/42 (29%) abnormal**
  – No abnormalities seen in 16 ZIKV negative women
  – Growth restriction noted in 5/12 (42%) fetuses with or without microcephaly
  – Cerebral calcifications in 4/12
  – Other CNS abnormalities in 2 fetuses
  – 2 intrauterine fetal deaths at 30 and 38 weeks (ZIKV at 25 and 32 weeks)

Week of Gestation at the Time of ZIKV Infection and Abnormal Ultrasonographic and Doppler Findings

No. of Cases

Abnormal findings
Normal findings

Week of Gestation at the Time of Infection