Zika Virus: The New Ophthalmic Teratogen

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I have no conflict of interest
**Teratology:** Study of abnormal development: (similar to dysmorphology)

- **Teratogen:** environment agent that has a permanent morphologic or functional change in development — shows vertical transmission from mother to fetus
Examples of Teratogens that Affect Ocular Structures

- Alcohol
- Thalidomide
- Misoprostol
- Infections eg. rubella, toxoplasmosis, Zika virus (ZITV)
Susceptibility to a teratogen depends on genotype of fetus and the interaction with environmental factors.
Dizygotic Twins With FAS But Different Genotypes
CHARACTERISTICS

Most teratogens have a defined group of congenital malformations

- e.g., cataracts, retinopathy, deafness, heart from rubella
- e.g., retina and CNS from toxo
- e.g., Microcephaly, retina, optic nerve, ? Others in Zitka
Question: Why do only some pregnant women with presumed Zika infection have affected children?

- Exposure not in sensitive period?
- Genetic factors?
- Virus load not sufficient?
- Placenta factors?
- ...
The Zika Virus (ZIKV) Story
The Villain: Zika Virus

- Genus Flavivirus; family Flaviviridae
- Closely linked in family—Dengue, Yellow Fever, West Nile …
- Arthropod-Borne (ie “Arbor Virus”): virus transmitted by arthropods (eg. Insects)
- Single strand RNA virus
- Neurotropic virus often affecting progenitor cells
Zika Virus (ZIKV)

- Became serious health problem in Brazil in 2015 when it was suspected of having a teratogenic property causing microcephaly
Transmission of ZIKV

• Primarily thru mosquito vectors Aedes aegypti, and A. albopictus although many others possible
• But human to human possible—by semen (rare for this group arboviruses)
• ? Female to male/female
Why all the fuss?

- Two types of ZIKV Infections:
  1) Zika fever (primary)—not very serious
  2) Zika congenital infection—associated with severe malformations in fetus—serious
Zika Fever

- Asymptomatic 80%
- Usually self-limiting febrile disease with fever, maculopapular rash, conjunctivitis, headache, retro-orbital pain, arthritis and sometimes
- Symptoms similar to other arbovirus diseases
Zika Fever

• Small percentage associated with Guillan-Barré syndrome (20x more frequent)
Suspected Cases of Microcephaly in Brazil 2010-2015

Source: Brazil Ministry of Health
Zika Virus Epidemic

• Became major health problem in Brazil 2015→
• So many cases a group of anomalies characteristic to Zika began to emerge, “Congenital Zika Syndrome” (CZS)
• Now a world wide problem
Congenital Zika Syndrome (CZS)

- Severe microcephaly with partially collapsed skull
- Subcortical calcification within cerebral cortex
- Macular scaring and areas of pigmentary mottling in the retina
- Congenital contractures
- Severe hypertonia and symptoms of extra pyramidal involvement
Life-long need of support and rehabilitation

Associated Press
News Headlines

• Range from “false news” to media overkill to useful to humanistic
Why Killer Viruses Are On The Rise
All Things Considered [NPR] (USA) - February 14, 2017

Beware of zika virus: Deadly aedes waiting in the wings
Times of India, The (Mumbai, India) - November 9, 2016
Author/Byline: Syed Intishab Ali  Section: Jaipur

Whew, we’re not all going to die
Tribune, The (Elkin, NC) - December 12, 2016
Author/Byline: Stephen Harris For The Tribune  Edition: Final  Section: opinion_columns
Brazil warns women not to get pregnant as Zika virus is linked to rare birth defect

Health authorities examine link between rise in number of babies born with microcephaly and epidemic of mosquito-borne disease in country’s north-east

More than half of women in Brazil avoiding pregnancy due to Zika virus.

Zika virus still terrifies women

Evansville Courier & Press (IN) - January 24, 2017

Author/Byline: Carmen Heredia Rodriguez, Kaiser Health News  Edition: 1, CourierPress  Section: Opinion
ZIKV Infection: Eye and Systemic Malformations
ZITV

- A neurotropic virus and affects many progenitor cells
- Dx on Reverse-transcription polymerase chain reaction (RT-PCR) and IgM; r/o other causes
Recent Observations

• Infants may have normal head size, may develop microcephaly later with neurologic symptoms—question on how to monitor
ZIKV

- Detected in brain tissue and CSF of infant, amniotic fluid
- In infected individual in semen, urine, blood....
Colobomatous chorioretinal atrophy: macular region
Other Findings

Strabismus

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Other Findings

Limb anomalies

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Emerging Infectious Diseases

• An infectious disease that has newly appeared in a population or that has been known for some time but is rapidly in incidence or geographic range
• Eg. Ebola virus, hepatitis C
• Zika........
Emerging Infectious Diseases

• WHO warned that the rate of increase of these diseases much faster than previously
• Since 1970 about 40 infectious diseases have been reported including SARS, Ebola, chikungunya, swine flu and Zika
SUMMARY

• The older known teratogens still exist (FAS, thalidomide, other drugs) although progress has been made in prevention of some

• Newer teratogens e.g.. Misoprostol, Zika may be increasing

• Weaker teratogens difficult to prove
Thank you for your attention