Zika Virus Update

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

En Español

MENU | CDC A-Z | SEARCH

- What is it? (Microbiology/History)
- What does it do? (Clinical Implications/Microcephaly)
- What should we do? (Testing/Diagnosis)
- Prevention
- What's next?

Microbiology & History

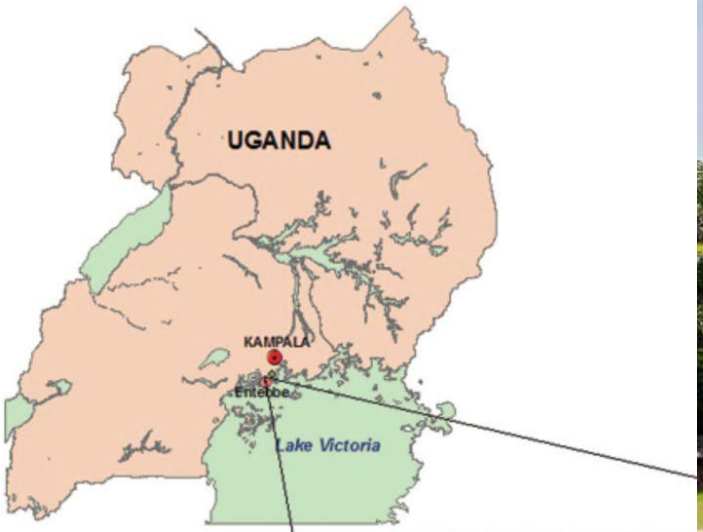
What is it and where did it come from?

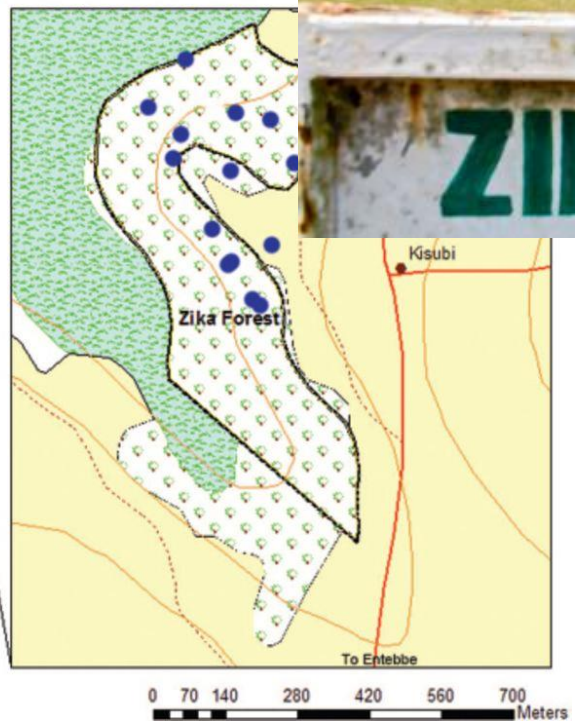
Microbiology

- "Arbovirus" (**AR**thropod-**BO**rne virus) is a descriptive term applied to hundreds of predominantly RNA viruses that are transmitted by arthropods, notably mosquitoes and ticks.
  - Four families of viruses: Bunyaviridae, Flaviviridae, Reoviridae, Togaviridae
- Until recently, only a few had caused clinically significant human diseases, the most historically important of these is yellow fever virus.
- Two lineages of Zika: African and Asian with current outbreak (& French Polynesian outbreak) most similar to Asian strain

History-Viral Family

- These viruses started to emerge millennia ago, when North African villagers began to store water in their dwellings
- Connection between arthropods and disease first postulated in 1881 by Cuban doctor Carlos Finlay who hypothesized that Yellow fever may be transmitted by mosquitos
- Confirmed by Major Walter Reed in 1901
- Primary vector, Aedes aegypti, spread globally from 15^{th}-19^{th} centuries
- Four unexpected arrivals of important arthropod-borne viral diseases in the Western Hemisphere over the past 20 years
  - dengue, which entered this hemisphere stealthily over decades and then more aggressively in the 1990s;
  - West Nile virus, which emerged in 1999; and
  - chikungunya, which emerged in 2013



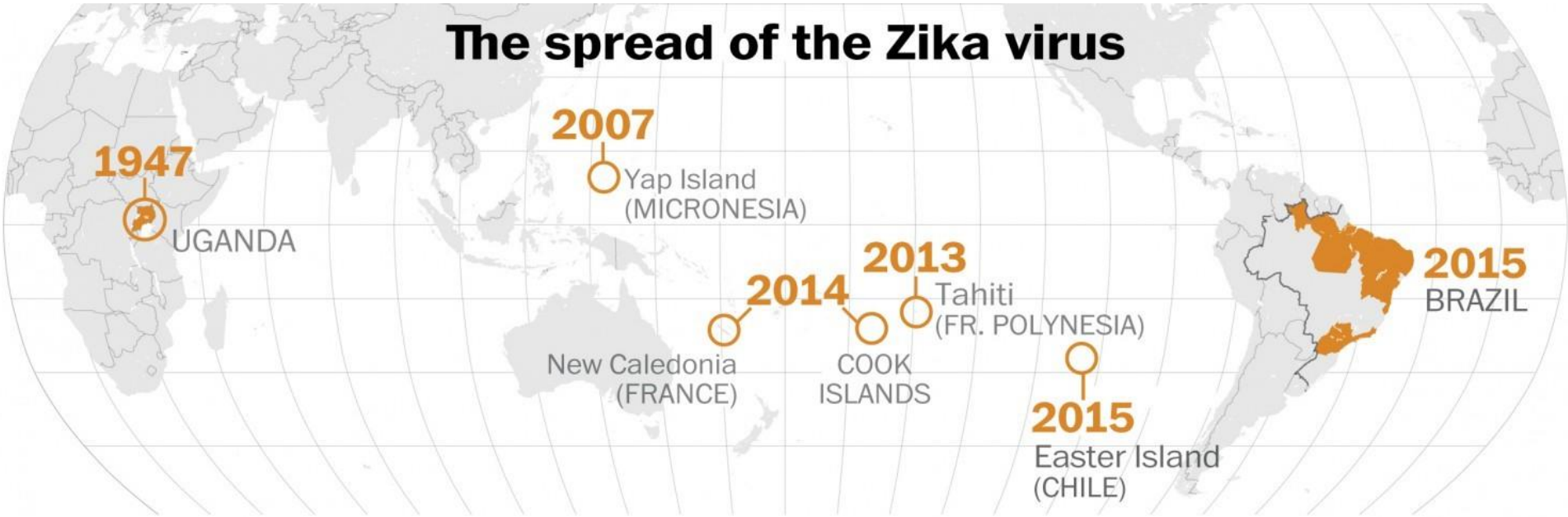


Legend

- Sampling Sites
- Contours
- Tarmac road
- Motorable Track
- Zika Forest
- Forest
- Wetland
- Subsistance Farming

Source:Digtized from Series Y633 Protected Area of Uganda Forest Department Sheet No 71/3

0 70 140 280 420 560 700 Meters



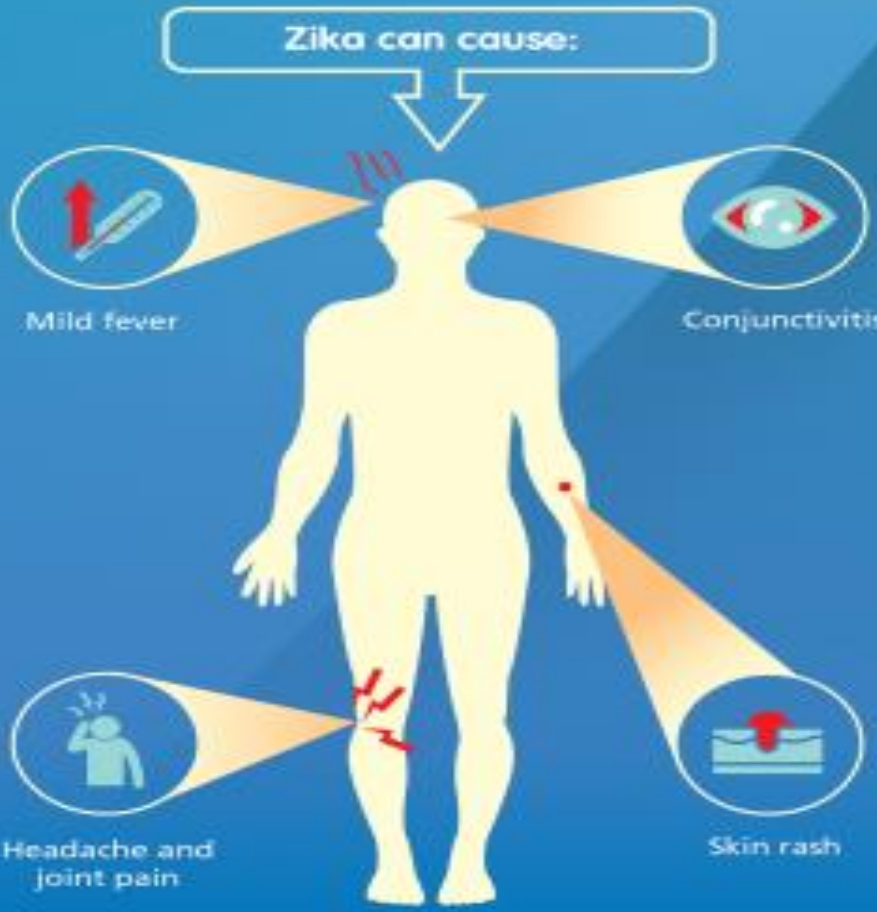
LARIS KARKLIS/THE WASHINGTON POST

CLINICAL CONSIDERATIONS/PREGNANCY IMPLICATIONS

What does it do?

What is Zika?

Zika is a virus transmitted by the *Aedes* mosquito, which also transmits dengue and chikungunya.



Onset is usually 2-7 days after the mosquito bite

1 in 4 people with Zika infection develops symptoms

PAHO

Zika virus infection during pregnancy can cause microcephaly and other severe fetal brain defects. Infection during pregnancy has also been linked to adverse outcomes including pregnancy loss, and eye defects, hearing loss, and impaired growth in infants.

– CDC

At A Glance - Zika in the U.S. (as of June 30, 2016)

- **Pregnant Women with Any Lab Evidence of Zika Virus Infection***
  - US States and DC: 320
    - LB with birth defects: 7
    - SB with birth defects: 5 (actually includes SAB, SB, TAB)
  - US Territories: 279
    - LB with birth defects: 0
    - SB with birth defects: 1
- *Updated weekly on CDC website from Zika registry through HDs/CDC
- * Includes microcephaly, calcium deposits in the brain, ventriculomegaly, absent or poorly formed brain structures, abnormal eye development, or other problems resulting from damage to the brain that affects nerves, muscles and bones, such as clubfoot or inflexible joints

What we don't know

- **If a pregnant woman is exposed**
  - We don't know how likely she is to get Zika.
- **If a pregnant women is infected**
  - how likely it is that Zika will pass to her fetus.
  - if the fetus is infected, how likely are birth defects or pregnancy loss
  - when in pregnancy the infection might cause harm to the fetus (studies are suggesting that earlier exposure may be more severe than later exposure)
  - whether her baby will have birth defects or long term sequealae
  - if sexual transmission of Zika virus poses a different risk of birth defects than mosquito-borne transmission.

- one study utilizing modeling based on the ZIKV outbreak in French Polynesia suggested microcephaly would occur in 1% of babies born to mothers infected in the first trimester, and a recent cohort study from Brazil found abnormal outcomes including stillbirth, growth restriction, and microcephaly and other sonographic abnormalities in 29% of fetuses of Zika-infected mothers in all trimesters (Cauchemez, 2016, Brasil, 2016)

Microcephaly-SMFM

- **Isolated Fetal Microcephaly**
  - >=3SD below the mean for GA
  - Case series suggest mostly normal outcome
- **Pathologic Microcephaly**
  - >=5SD below the mean or other findings
- If 2SD below the mean, detailed intracranial assessment is indicated
  - Echogenic foci, ventriculomegaly, cerebellar hypoplasia
- Profile assessment
- Reference charts available on CDC website , SMFM website

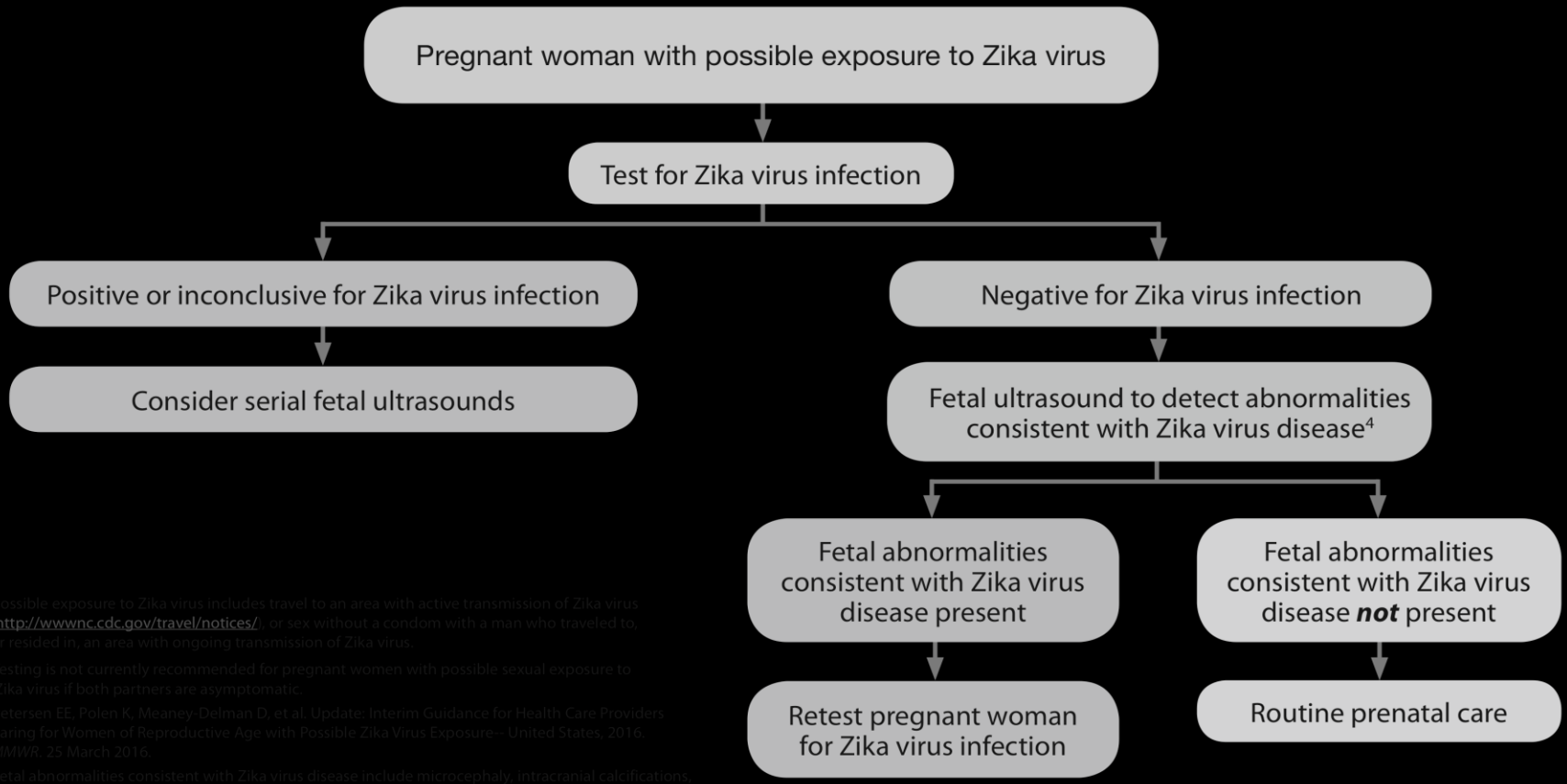
TESTING/DIAGNOSIS

What do we do?

CDC's Response to **Zika**

Updated Interim Guidance:

Testing Algorithm for a Pregnant Woman with Possible Exposure to Zika Virus[1,2], Not Residing in an Area with Active Zika Virus Transmission[3]



[1]Possible exposure to Zika virus includes travel to an area with active transmission of Zika virus (http://wwwnc.cdc.gov/travel/notices/), or sex without a condom with a man who traveled to, or resided in, an area with ongoing transmission of Zika virus.

[2]Testing is not currently recommended for pregnant women with possible sexual exposure to Zika virus if both partners are asymptomatic.

[3]Petersen EE, Polen K, Meaney-Delman D, et al. Update: Interim Guidance for Health Care Providers Caring for Women of Reproductive Age with Possible Zika Virus Exposure -- United States, 2016. *MMWR*. 25 March 2016.

[4]Fetal abnormalities consistent with Zika virus disease include microcephaly, intracranial calcifications, and brain and eye abnormalities. Fetal ultrasounds might not detect abnormalities until late second or early third trimester of pregnancy.

Updated Interim Guidelines and other resources for healthcare providers available at http://www.cdc.gov/zika/hc-providers/index.html

www.cdc.gov/zika

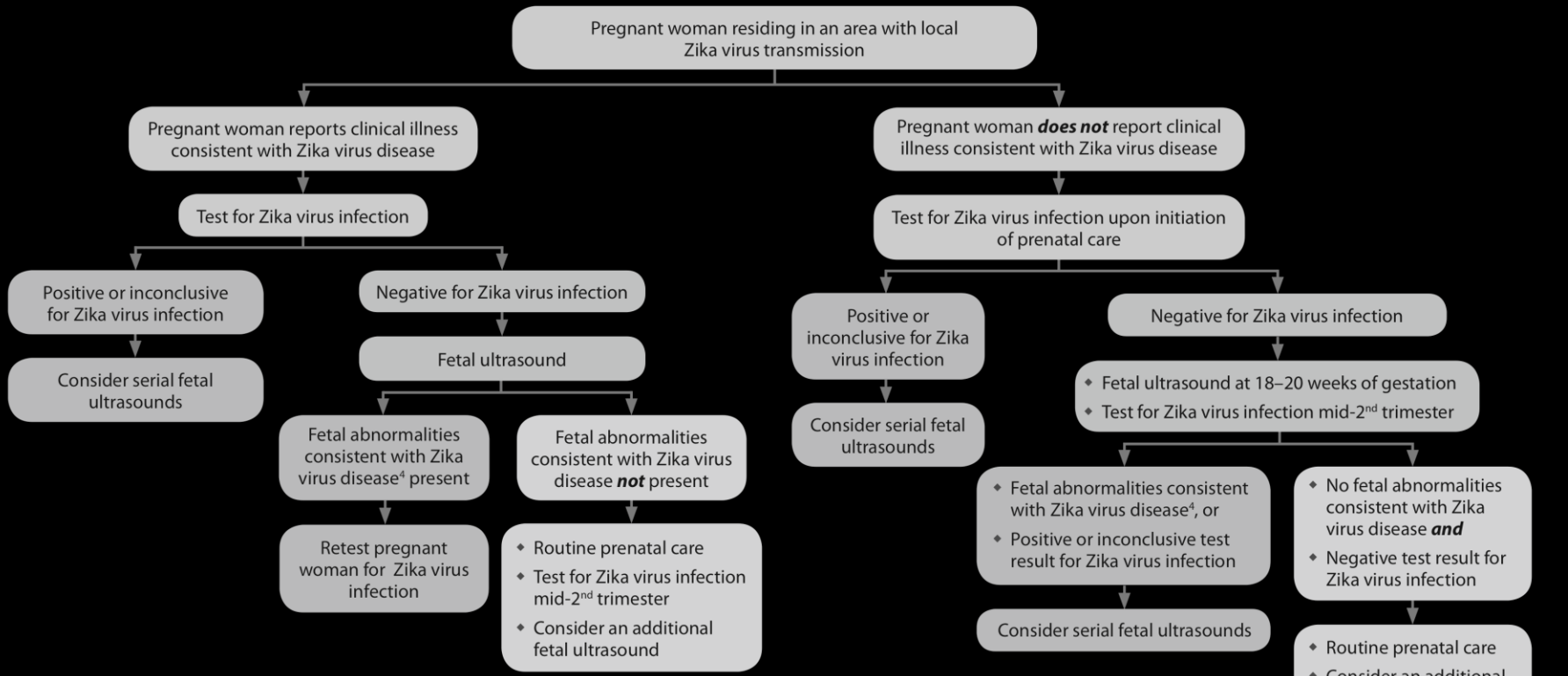
CS263584-A April 5, 2016

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

CDC's Response to **Zika**

Updated Interim Guidance:

Testing Algorithm for a Pregnant Woman Residing in an Area with Active Zika Virus Transmission[1], with or without Clinical Illness[2] Consistent with Zika Virus Disease[3]



[1]Local health officials determine when to implement testing of asymptomatic pregnant women based on information about levels of Zika virus transmission and laboratory capacity.

[2]Clinical illness is consistent with Zika virus disease if one or more signs/ symptoms (acute onset of fever, rash, arthralgia, or conjunctivitis) are present: http://www.cdc.gov/zika/symptoms/index.html

[3]Petersen EE, Polen K, Meaney-Delman D, et al. Update: Interim Guidance for Health Care Providers Caring for Women of Reproductive Age with Possible Zika Virus Exposure — United States, 2016. *MMWR*. 25 March 2016.

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www.cdc.gov/zika

CS263584-B April 5, 2016

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Clinical Management-Positive or Inconclusive Zika virus testing

Antepartum

Consider serial ultrasounds every 3-4 weeks.

Referral to maternal-fetal medicine specialist

Postpartum

Histopathologic examination of the placenta and umbilical cord.

Testing of frozen placental tissue and cord tissue for Zika virus RNA.

Testing of cord serum for Zika and dengue virus IgM and neutralizing antibodies.

- PCR
  - Serum: present during 1st week of illness
  - Urine: present during first 14days of illness
- Serology
  - IgM: typically develops at end of 1st week of illness, cross-reactivity with other flaviviruses
- Plaque-reduction neutralization (PRNT)
- Currently, the Utah Public Health Laboratory (UPHL) performs the Zika IgM MAC-ELISA and RT- PCR tests. Equivocal, inconclusive or positive test results must be sent to the CDC laboratory in Fort Collins, CO, for confirmation, including PRNT testing.

- Testing will be performed according to the following:
- a) If a pregnant woman is within seven days of onset of symptoms, the maternal serum will be tested for reverse transcription-polymerase chain reaction (RT-PCR).
- b) If a pregnant woman is asymptomatic and has specimen drawn after travel, her serum
- will be tested for anti-Zika IgM antibody.
- c) If Zika IgM antibody testing is positive, her serum will be additionally tested for dengue to rule out cross-reactive antibodies with this disease. Note: these tests will not be performed on Zika IgM-negative women.
- d) If the test results are either positive or inconclusive, fetal ultrasound(s) should be performed to detect microcephaly or intracranial calcifications.
- e) Zika virus testing is recommended for pregnant women with possible sexual transmission exposure to Zika virus if either she or her male partner developed
- symptoms consistent with Zika virus disease.
- f) Due to the limited understanding of the duration and pattern of shedding of Zika virus in the male genitourinary tract, neither serum nor semen testing for men for the purpose of assessing risk for sexual transmission is currently recommended. The preferred recommendation is that such men abstain from sexual activity or consistently use condoms during sex for the duration of pregnancy. This is because the persistence of Zika virus in semen is not known, but in one instance was shown to be >60 days.

Steps

- Dallin Perterson at UDOH Bureau of Epidemiology
  - 801-538-6191 (ph)
- Fill out clinical and state lab form (pre-checked boxes on requisition)
- Send Lab requisition with patient to lab
- Fax copies of both to Dallin
  - 801-538-9923 (f)

INFECTIOUS DISEASE TEST REQUEST FORM

UTAH PUBLIC HEALTH LABORATORY
4431 SOUTH 2700 WEST
TAYLORSVILLE, UTAH 84129
TELEPHONE: (801) 965-2400
FAX: (801) 965-2551
http://health.utah.gov/lab/infectious-diseases

FOR UPHL USE ONLY

LAB#

DATE STAMP

PLEASE PRINT CLEARLY FOR ACCURACY.

PATIENT INFORMATION:

PATIENT STATE OF RESIDENCE: UT

PATIENT COUNTY OF RESIDENCE:

ZIP CODE:

DATE OF BIRTH (mm/dd/yyyy): ___/___/___

AGE:

SEX: M F

PATIENT NAME (Last, First):

Is Patient Insured? [ ] Yes [ ] No

STI TESTING ONLY: Is patient MSM? [ ] Yes [ ] No

PATIENT ID # (public health)

ETHNICITY
[ ] Hispanic
[ ] Non-Hispanic

RACE
[ ] White
[ ] Black or African American
[ ] American Indian or Alaska Native
[ ] Asian
[ ] Native Hawaiian or other Pacific Islander

PROVIDER INFORMATION
Provider Code:

Physician: _____
Provider Phone: _____
Provider Email: _____
Secure Fax #: _____

SPECIMEN COLLECTION DATE AND TIME
(mm/dd/yy) ___/___/___
Time: _____

SPECIMEN SOURCE/SITE (CHOOSE 1):

[ ] Blood
[ ] Body Fluid (specify): _____
[ ] Bronchoalveolar lavage
[ ] Bronchial aspirate/wash
[ ] Cerebrospinal Fluid
[ ] Cervix
[ ] (Endo)tracheal aspirate/wash
[ ] Environmental (specify): _____
[ ] Food (specify): _____
[ ] Isolate (source): _____
[ ] Lesion (site): _____
[ ] Liquid Pap
[ ] Nasal (aspirate /swab / wash)
[ ] Nasopharyngeal swab
[ ] Plasma
[ ] Rectum
[x] Serum
[ ] Sputum (natural / induced)
[ ] Stool
[ ] Throat swab
[ ] Tissue (specify): _____
[ ] Urethra
[ ] Urine
[ ] Vagina
[ ] Vomitus
[ ] Wound/Abcess
[ ] Other (specify): _____

BACTERIOLOGY/TUBERCULOSIS TESTS

Bacteriology Specimen
REQUIRED Shipping Temperature: _____
[ ] Bacterial Culture
[ ] Bacterial ID / Referral
Presumptive ID: _____
[ ] Mycobacterial culture
[ ] Mycobacterial referral
Presumptive ID: _____
[ ] Other (specify): _____

BIOTERRORISM TESTS
(Notify Lab before submitting)

[ ] Bacillus anthracis Detection/Identification
[ ] Brucella species Detection/Identification
[ ] Brucella antibody
[ ] Burkholderia mallei/pseudomallei Detection/ID
[ ] Clostridium botulinum culture & toxin
[ ] Coxiella burnetii Detection
[ ] Francisella tularensis Detection/Identification
[ ] F. tularensis antibody
[ ] Orthopox viruses Detection
Virus Suspected:
[ ] Vaccinia virus
[ ] Varicella zoster virus
[ ] Variola virus
[ ] Yersinia pestis Detection/Identification
[ ] Yersinia pestis antibody
[ ] Other (specify):

VIROLOGY / IMMUNOLOGY TESTS

[ ] C. trachomatis and N. gonorrhea by NAAT
[ ] Patient is a partner of a 15-24 year old female

[ ] Herpes/VZV PCR (HSV-1, HSV-2, VZV)

[x] Virus Identification
Virus suspected _____ ZIKA

[ ] Cytomegalovirus

[ ] Varicella zoster virus

[ ] Multi-Pathogen Respiratory Panel
(includes Adenovirus, Coronovirus, Human Metapneumovirus, Rhino/Enterovirus, Influenza A, Influenza B, Parainfluenza 1-4, RSV, Bordetella pertussis, C. pneumoniae, M. pneumoniae)

[ ] Influenza A & B virus PCR (with subtyping)
[ ] Hospitalized w/ influenza-like illness
[ ] Other (i.e., cluster investigation)
Cluster location: _____
Other reason for testing: _____

[ ] West Nile virus IgM (Human)

[ ] QuantiFERON-TB Gold
REQUIRED information:
Blood draw date/time: _____
Incubation at 37°C completed? [ ] Yes [ ] No
Signature: _____
Incubation starte date/time: _____
Incubation end date/time: _____

[ ] Syphilis IgG EIA (includes confirmatory testing)
[ ] RPR (suspect acute infection/previous positive)

[ ] HIV Antigen/Antibody (includes confirm. testing)
[ ] Previous positive

[ ] Hepatitis C Antibody
[ ] Add HCV RNA Testing if Positive

[ ] Hepatitis C RNA
(Qualitative; Antibody screen not included)

[ ] Hepatitis B Antibody

[ ] Hepatitis B Antigen

[ ] Hantavirus (Sin Nombre) IgG/IgM
[ ] Acute Serum (mm/dd/yy)___/___/___
[ ] Convalescent serum (mm/dd/yy)___/___/___

ADDITIONAL INFORMATION

[ ] Other Disease Suspected: _____

[ ] Referral Test to CDC (form **REQUIRED**) specify: _____
Contact UPHL for CDC form

COMMENTS:

Zika Virus Disease Case Investigation Form

Arboviral Diseases Branch

FOR ARBOVIRAL DISEASE BRANCH USE ONLY

CDC R-number_____ ZIKVID:_____

CDC staff:_____ Date form completed:____/____/____

Reporting Jurisdiction

Jurisdiction (state/territory):__UT__ Agency:_____

Contact Name:_____ Contact Phone:_____

Contact Position:_____ Contact Email:_____

Demographic Information

State ID number(for public health)_____ Age: _____ ☐ Years ☐ Months

Patient Initials: _____ Sex: ☐ Male ☐ Female

State of residence:_____ Pregnant: ☐ Yes ☐ No

If yes, gestational week at illness onset: _____

Travel History

Dates of travel: _____

Country(s) visited:_____

Vaccination History

Previously vaccinated for any of the following:

☐ Yellow Fever If yes, year of vaccination:_____

☐ Japanese Encephalitis If yes, year of vaccination:_____

☐ Tickborne Encephalitis If yes, year of vaccination:_____

Illness Information

Illness onset date: ____/____/____ ☐ Hospitalized ☐ Died

Clinical syndrome: ☐ Guillain-Barre syndrome /Acute flaccid paralysis ☐ Microcephaly

Fever ☐ Yes ☐ No

If yes: ☐ Subjective fever ☐ Measured fever (Maximum measured temperature: _____)

Rash ☐ Yes ☐ No

If yes: Type: ☐ Maculopapular ☐ Petechial ☐ Purpuric ☐ Other

Pruritic: ☐ Yes ☐ No

Distribution:_____

Additional clinical symptoms

☐ Arthralgia ☐ Headache ☐ Vomiting

☐ Conjunctivitis ☐ Myalgia ☐ Diarrhea

Specimen Information

Specimen 1 collected: ____/____/____ Type: ☐ Serum ☐ CSF ☐ Amniotic fluid ☐ Tissue

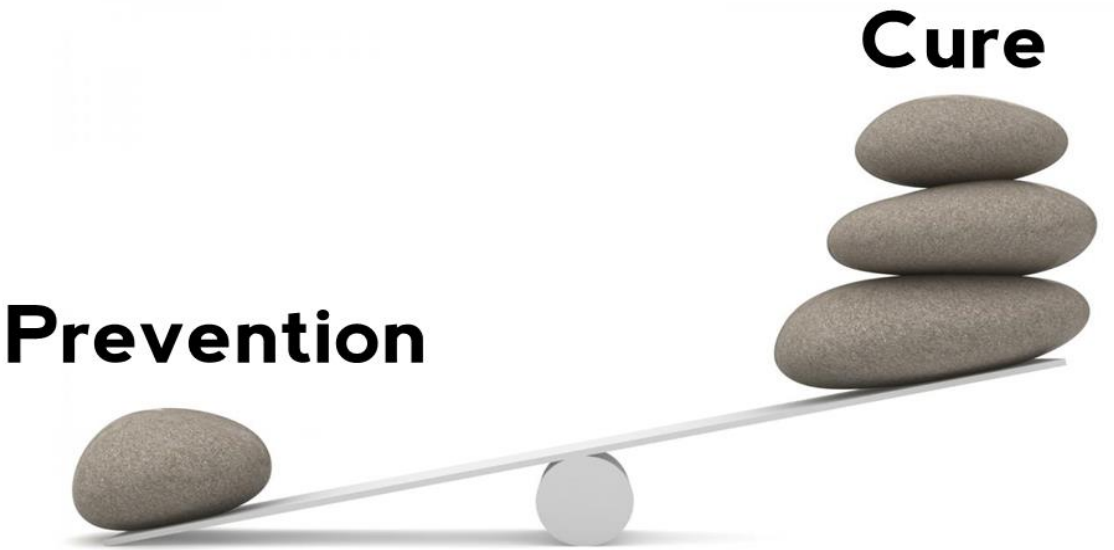
Specimen 2 collected: ____/____/____ Type: ☐ Serum ☐ CSF ☐ Amniotic fluid ☐ Tissue

Testing

- Refer to CDC website for details on collection of fetal /placental tissue
- Blood/urine usually takes about 3w (per CDC)

Prevention

- Travel Advisories
- Sexual Transmission
- Mosquito control and Avoidance



PROTECT YOUR FAMILY AND COMMUNITY:
HOW ZIKA SPREADS

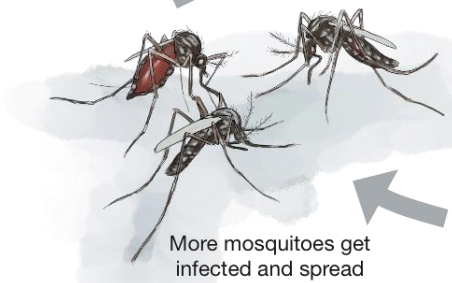
Most people get Zika from a mosquito bite

A mosquito bites a person infected with Zika virus

The mosquito becomes infected

A mosquito will often live in a single house during its lifetime

The infected mosquito bites a family member or neighbor and infects them



More mosquitoes get infected and spread the virus

More members in the community become infected

Other, less common ways, people get Zika:

During pregnancy
A pregnant woman can pass Zika virus to her fetus during pregnancy. Zika causes microcephaly, a severe birth defect that is a sign of incomplete brain development

Through sex
Zika virus can be sexually transmitted by a man to his partners

Through blood transfusion
There is a strong possibility that Zika virus can be spread through blood transfusions

Aedes Mosquitos

- Zika virus is transmitted to people primarily through the bite of an infected *Aedes* species mosquito (*Ae. aegypti* and *Ae. albopictus*). These are the same mosquitoes that spread dengue and chikungunya
- These mosquitoes typically lay eggs in and near standing water in things like buckets, bowls, animal dishes, flower pots and vases. They prefer to bite people, and live indoors and outdoors near people.
- Mosquitoes that spread chikungunya, dengue, and Zika are aggressive daytime biters, but they can also bite at night.

Aedes aegypti

Aedes albopictus

Pregnant?

Warning: Zika might be linked to birth defects

There is no vaccine to prevent Zika virus infection

Protect yourself from mosquito bites

Daytime is most dangerous

Mosquitoes that spread chikungunya, dengue, and Zika are aggressive daytime biters. They can also bite at night.

Use insect repellent

It works!

Look for the following active ingredients:

• DEET • PICARIDIN • IR3535

Wear protective clothes

Wear long-sleeved shirts and long pants and use insect repellent. For extra protection, treat clothing with permethrin.

Mosquito-proof your home

Use screens on windows and doors. Use air conditioning when available. Keep mosquitoes from laying eggs in and near standing water.

Mosquito Bite prevention

- Use Environmental Protection Agency (EPA)-registered insect repellents with one of the following active ingredients: DEET, picaridin, IR3535, oil of lemon eucalyptus, or para-menthane-diol.
- Do not spray repellent on the skin under clothing.
- If you are also using sunscreen, apply sunscreen before applying insect repellent.

Sexual Transmission

- ZIKV can also be transmitted through sex with a male partner.
- Patients should be advised to take the following steps to protect themselves from sexual transmission of ZIKV:
  - If a man develops symptoms of ZIKV disease, he should use a condom the right way, **every time** he has vaginal, anal, or oral or should not have sex **for 6 months** after illness starts.
  - If a man does not develop symptoms of ZIKV disease, he should still use condoms for **at least 8 weeks** after the last date of exposure (the last day he is in an area with active ZIKV transmission) to avoid sexual transmission to his partner. This is especially important if he has any plans to try to conceive with his partner after returning from travel.
  - Use condom for entire pregnancy

Preconception Exposure

- One or more symptoms of ZIKV disease (fever, rash, arthralgia or conjunctivitis)
  - Female traveler:8w
  - Male traveler:6m
- NO symptoms or + testing: 8w (m/f)

Geography

- US Territories
  - Local mosquito-borne transmission of Zika virus has been reported in the Commonwealth of Puerto Rico, the US Virgin Islands, and American Samoa
- US States
  - No local mosquito-borne Zika virus disease cases have been reported in US states, but lab tests have confirmed Zika virus in travelers returning to the United States. These travelers have gotten the virus from mosquito bites and some non-travelers got Zika through sex with a traveler


Reported active transmission
See inset map
Mexico
Belize
Guatemala
Honduras
Nicaragua
El Salvador
Panama
Costa Rica
Venezuela
Guyana
French Guiana
Suriname
Colombia
Ecuador
Peru
Brazil
Bolivia
Paraguay
Argentina
Cape Verde
Marshall Is.
Kosrae (Micronesia)
Papua New Guinea
Samoa
American Samoa
Fiji
Tonga
New Caledonia
Cuba
Haiti
Dominican Rep.
St. Martin
Puerto Rico
Sint Maarten
Jamaica
US Virgin Is.
St. Barthelemy
Guadeloupe
Dominica
St. Lucia
Martinique
Aruba
Curaçao
St. Vin. and Gren.
Bonaire
Barbados
Trinidad & Tobago
Venezuela

What Now?

Future Directions

- Vaccine—in investigation
- Mosquito control with usual measures
- Oxitec mosquito
  - May reduce mosquito population by 95%
  - Oxford University 1999
  - Inability to develop past the larval stage
- Study clinical implications
  - Obtain data for clinical counseling
  - CDC currently in Brazil conducting case-control study

Final Points

- Follow national/international guidelines
  - Check back frequently!
  - ACOG, SMFM, CDC, WHO, PAHO
  - State Health Departments can help with testing
- Remember that in our patient population (US), other public-health risks likely pose a much greater maternal-fetal threat and should continue to be emphasized
  - Vaccines (flu, tdap)
  - Seatbelt use
  - Substance use
  - Many others (CMV)

Resources-CDC Mother to Baby

- If families would like to speak to someone about a possible Zika virus infection or diagnosis during pregnancy and risk to the baby, please contact MotherToBaby. MotherToBaby experts are available to answer questions in English or Spanish by phone, text, or chat. The free and confidential service is available Monday - Friday from 8am - 5pm (local time). To reach MotherToBaby:
- Call 1-866-626-6847
- Text questions to 855-999-3525 (standard text messaging rates may apply)
- Chat live or send an email through the MotherToBaby website
- CDC maintains a 24/7 clinical consultation service for health care providers evaluating and caring for pregnant women and infants with possible ZIKV infection. Call CDC's Zika Pregnancy Hotline for Healthcare Providers at 770-488-7100 or e-mailzikamch@cdc.gov for any concerns related to clinical management.