



Zika Virus: A Primer

Grand Rounds



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

First time in history...

“Never before in history has there been a situation where a bite from a mosquito could result in a devastating malformation.”

– Dr. Tom Frieden, CDC Director
Fortune, April 13, 2016

“...the last time an infectious pathogen (rubella virus) caused an epidemic of congenital defects was more than 50 years ago...”

– *New England Journal of Medicine*, April 13, 2016



Today's Presentation

- Zika: The Basics
- CDC Guidance
 - Conception and Contraception
 - Pregnancy
 - Diagnosing and Testing for Zika
 - Infant with Possible Congenital Zika Virus Infection
- Preventing Zika
- Preventing the Spread of Zika Virus During Healthcare Delivery
- What is CDC Doing?
- What Can You Do?

Zika: The Basics

What is Zika Virus?

- Single-stranded RNA virus
- Closely related to dengue, yellow fever, Japanese encephalitis, and West Nile viruses
- Primarily transmitted by two *Aedes* species mosquitoes
 - *Aedes aegypti* and *Aedes albopictus* mosquitoes
- Additional modes of transmission
 - Intrauterine and perinatal transmission (mother to fetus)
 - Sexual transmission
 - Laboratory exposure
 - Probable: Blood transfusion



Aedes aegypti mosquito



Aedes albopictus mosquito

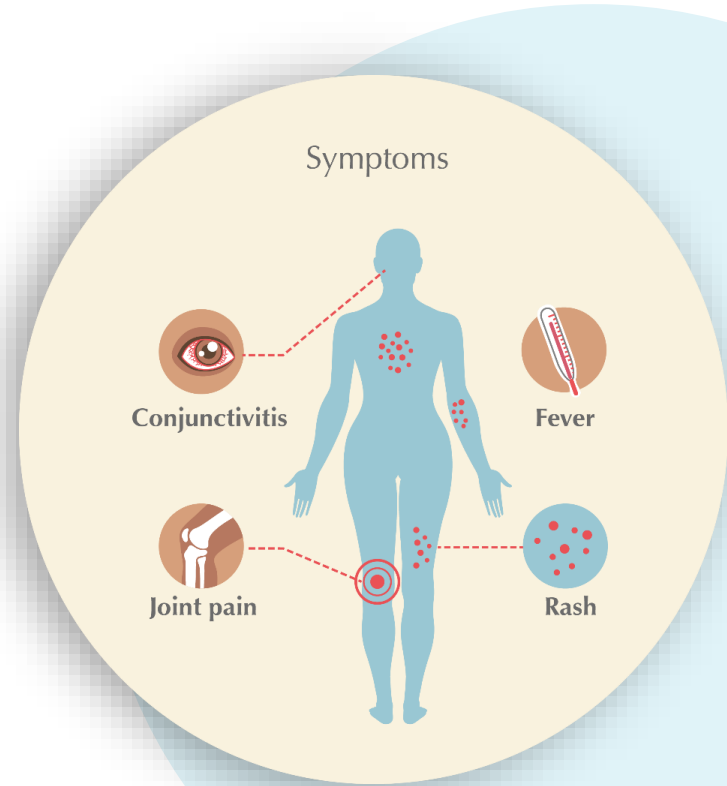
Where is Zika Now?

As of December 14, 2016



Clinical Presentation

- Clinical illness usually mild
- Most common symptoms
 - Fever
 - Rash
 - Joint pain
 - Conjunctivitis
- Symptoms last several days to a week
- Severe disease uncommon
- Fatalities are rare
- Once infected, a person is likely to be protected from future infections



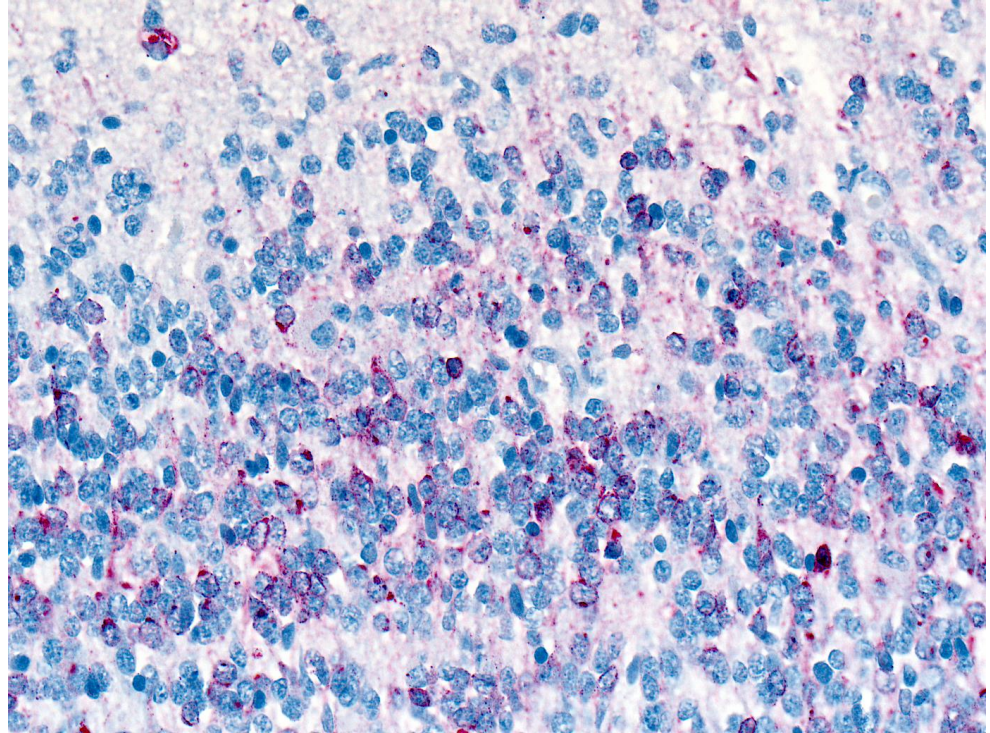
Clinical Management

- No vaccine or specific antiviral treatment
- Treat the symptoms
 - Rest
 - Drink fluids to prevent dehydration
 - Take medicine such as acetaminophen to reduce fever and pain
 - Avoid aspirin and other non-steroidal anti-inflammatory drugs (NSAIDs) until dengue can be ruled out to reduce the risk of bleeding



CDC Lab Confirms Zika In Fetal Tissues

- Zika virus has been shown to be present in fetal tissue
- Evidence of Zika virus has been detected in
 - Amniotic fluid
 - Placenta
 - Fetal brain tissue
 - Products of conception
- Zika virus has been found to continue to replicate in infants' brains after birth (Bhatnagar et.al., 2017)



Immunohistochemical staining of Zika virus antigen (red stain) in fetal brain tissue. This staining is present in the same areas where neuronal cell death/necrosis was identified by microscopic review of tissue morphology.

Bhatnagar J, Rabeneck DB, Martines RB, Reagan-Steiner S, Ermias Y, Estetter LBC, et al. Zika virus RNA replication and persistence in brain and placental tissue. *Emerg Infect Dis.* 2017 Mar [Epub ahead of print].

Reference/attribution for image: Ritter JM, Martines RB, Zaki SR. Zika Virus: Pathology From the Pandemic. *Arch Pathol Lab Med.* 2016 Oct 5. [Epub ahead of print]

CDC Lab Confirms Zika In Body Fluids

- Evidence of Zika virus identified in
 - Blood
 - Semen
 - Vaginal fluids
 - Urine
 - Saliva
 - Breast milk



Zika Virus Infection in Pregnant Women

- Pregnant women can be infected
 - Through the bite of an infected mosquito
 - Through sex without a condom with an infected partner
- If a woman is infected around conception
 - Zika might present risk to fetus
- If infected during pregnancy
 - Zika can be passed to the fetus during pregnancy or around the time of birth



Zika Virus in Pregnant Women



- Incidence of Zika virus infection in pregnant women is not known
- Infection can occur in any trimester
- No evidence of increased susceptibility
- No evidence of more severe disease compared with non-pregnant people
- Does not appear to be a higher incidence of Guillain–Barré syndrome

Centers for Disease Control and Prevention, *CDC Health Advisory: Recognizing, Managing, and Reporting Zika Virus Infections in Travelers Returning from Central America, South America, the Caribbean and Mexico*, 2016.

Besnard, M., et al., Evidence of Perinatal Transmission of Zika Virus, French Polynesia, December 2013 and February 2014. *Euro Surveill*, 2014. 19(14): p. 1-5.

Oliveira Melo, A., et al., Zika Virus Intrauterine Infection Causes Fetal Brain Abnormality and Microcephaly: Tip of the Iceberg? *Ultrasound in Obstetrics & Gynecology*, 2016. 47(1): p. 6-7.

Zika is a Cause of Microcephaly

The NEW ENGLAND JOURNAL of MEDICINE

SPECIAL REPORT

Zika Virus and Birth Defects — Reviewing the Evidence for Causality

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SUMMARY

The Zika virus has spread rapidly in the Americas since its first identification in Brazil in early 2015. Prenatal Zika virus infection has been linked to adverse pregnancy and birth outcomes, most notably microcephaly and other serious brain anomalies. To determine whether Zika virus infection

POTENTIAL RELATIONSHIP BETWEEN ZIKA VIRUS INFECTION AND BIRTH DEFECTS

Since the identification of the Zika virus in Brazil in early 2015, the virus has spread rapidly throughout the Americas (www.cdc.gov/zika/geo/active-countries.html). An increase in the

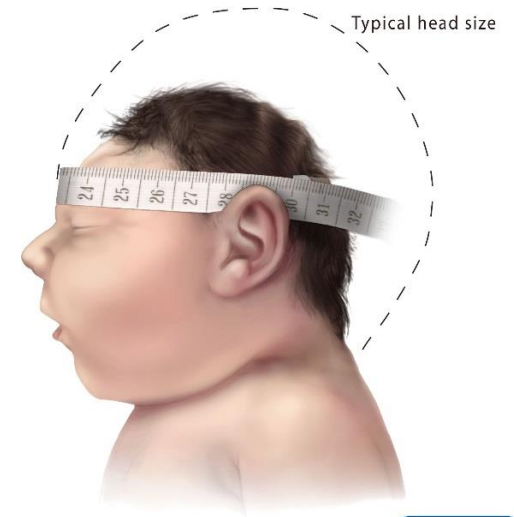
Potential Risk of Birth Defects Related to Zika

- Among pregnant women in the United States with laboratory evidence of possible Zika virus infection
 - Overall about **6%** of fetuses or infants had birth defects potentially related to Zika virus
 - The proportion of pregnancies with birth defects was similar (around **6%**) among symptomatic and asymptomatic pregnant women
 - Among women with infection in the 1st trimester of pregnancy, birth defects were reported in **11%** of fetuses or infants



Congenital Zika Syndrome

- Pattern of congenital anomalies associated with Zika virus infection during pregnancy that includes
 - Severe microcephaly (small head size) resulting in a partially collapsed skull
 - Thin cerebral cortices with subcortical calcifications
 - Eye anomalies, including macular scarring and focal pigmentary retinal mottling
 - Congenital contractures or limited range of joint motion
 - Marked early hypertonia, or too much muscle tone, and symptoms of extrapyramidal involvement
- Infants with normal head circumference at birth may
 - Have brain abnormalities consistent with congenital Zika syndrome
 - Develop microcephaly after birth



Baby with Severe Microcephaly



Potential Risk of Microcephaly

- **1 - 13%** estimated risk of microcephaly due to Zika virus infection in 1st trimester
 - Modeling based on current outbreak in Bahia, Brazil
 - Not enough data to estimate 2nd or 3rd trimester risk
- *Important to remember*
 - Data are limited (infection rates unknown; microcephaly cases still being reported)
 - Microcephaly is difficult to detect prenatally
 - Microcephaly is only one of a range of possible adverse outcomes



Zika Virus (ZIKV) Duration of Detection in Infected People

Centers for Disease Control and Prevention

MMWR

Morbidity and Mortality Weekly Report

Early Release / Vol. 65

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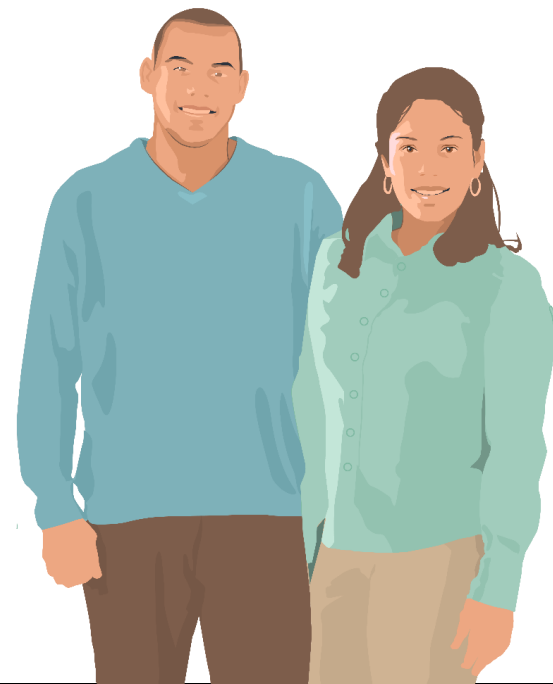
Update: Interim Guidance for Preconception Counseling and Prevention of Sexual Transmission of Zika Virus for Persons with Possible Zika Virus Exposure — United States, September 2016

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CDC Guidance: Pregnancy Planning and Contraception

Zika and Sexual Transmission

- Zika can be passed through sex from a person who has the virus
 - Even if the infected person does not have symptoms at the time.
 - Before their symptoms start, while they have symptoms, and after their symptoms end.
 - Even if the infected person never develops symptoms.
- Sex includes vaginal, anal, oral sex, and the sharing of sex toys
- Sexual exposure includes sex without a condom with a person who traveled to or lives in an area with Zika.



Women and Their Partners Thinking about Pregnancy

Possible exposure via recent travel or sex without a condom with a partner infected with Zika	
Women	Men
Wait <i>at least</i> 8 weeks after symptoms start or last possible exposure	Wait <i>at least</i> 6 months after symptoms start or last possible exposure

People living in or frequently traveling to areas with Zika		
	Women	Men
Positive Zika test	Wait <i>at least</i> 8 weeks after symptoms start	Wait <i>at least</i> 6 months after symptoms start
No testing performed or negative test	Talk with doctor or healthcare provider	Talk with doctor or healthcare provider

Pregnancy Planning and Access to Contraception

- Preventing Zika infections during pregnancy
 - Includes supporting women who want to delay or avoid pregnancy to reduce Zika-related pregnancy complications
- If couples decide to wait to conceive, HCPs should discuss
 - Strategies to prevent unintended pregnancy
 - Use of the most effective contraceptive methods (including long-acting reversible contraception) that can be used correctly and consistently
 - Role of correct and consistent use of condoms, in addition to other birth control method used, in reducing the risk for STIs, including Zika

CDC Guidance: Zika and Pregnancy

CDC Recommendations: Who Should Be Tested

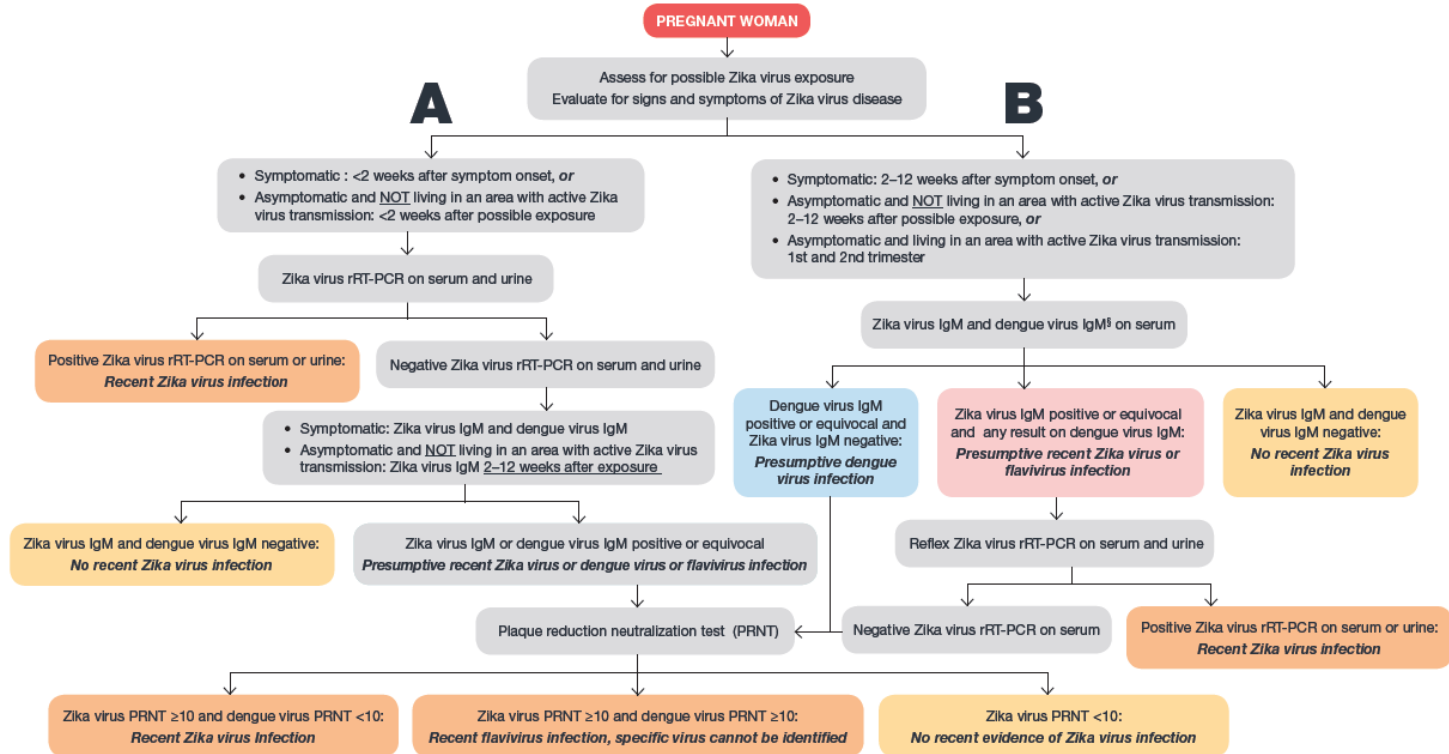


Pregnant women with possible exposure to Zika virus and signs or symptoms should be tested for Zika virus infection

Pregnant women with possible exposure to Zika virus who do not report symptoms should be offered testing

Pregnant women with ongoing risk of Zika virus exposure and who do not report symptoms should be tested in the 1st and 2nd trimesters of pregnancy

Testing and interpretation recommendations for a pregnant woman with possible exposure to Zika virus” — United States (including U.S. territories)



Link: <http://www.cdc.gov/mmwr/volumes/65/wr/mm6521e1.htm>

Updated Guidance: Symptomatic Pregnant Women

- Evaluated <2 weeks after symptom onset
 - Should receive Zika virus NAT testing of serum and urine
 - Positive NAT result confirms diagnosis: *recent maternal Zika virus infection*
 - Negative NAT result does not rule out Zika virus infection
 - Zika IgM and dengue IgM antibody testing should be performed immediately on the same specimen or a subsequently collected specimen
- Evaluated 2–12 weeks after symptom onset
 - Should first have a Zika virus immunoglobulin (IgM) test
 - If positive or equivocal, serum and urine NAT should be performed

Updated Guidance: Asymptomatic Pregnant Women

- Living in areas without Zika, evaluated <2 weeks after last possible exposure
 - RNA NAT testing should be performed on serum and urine
 - If the RNA NAT test is negative, Zika IgM test should be performed 2–12 weeks after exposure
- Living in areas without Zika, evaluated 2–12 weeks after last possible exposure
 - Should receive a Zika virus IgM antibody test
 - If positive or equivocal, serum and urine RNA NAT should be performed
- Living in areas with Zika
 - Asymptomatic pregnant women who live in an area with Zika should receive Zika IgM testing at the start of prenatal care and again during the 2nd-trimester.

Updated Guidance: Testing Pregnant Women After 12 Weeks

For symptomatic and asymptomatic pregnant women with possible Zika virus exposure who seek care >12 weeks after symptom onset or possible exposure

- IgM antibody testing might be considered
 - A negative IgM antibody test or RNA NAT result >12 weeks after symptom onset or possible exposure does not rule out recent Zika virus infection because IgM antibody and viral RNA levels decline over time.
- Given the limitations of testing beyond 12 weeks after symptom onset or possible exposure, serial fetal ultrasounds should be considered.

Clinical management of a pregnant woman with suspected Zika virus infection

Interpretation of Laboratory Results*	Prenatal Management	Postnatal Management
<u>Recent Zika virus infection</u>	<ul style="list-style-type: none"> Consider serial ultrasounds every 3–4 weeks to assess fetal anatomy and growth[†] Decisions regarding amniocentesis should be individualized for each clinical circumstance[§] 	<p>LIVE BIRTHS:</p> <ul style="list-style-type: none"> Infant serum should be tested for Zika virus rRT-PCR, Zika IgM, and dengue virus IgM antibodies. If CSF is obtained for other reasons, it can also be tested. Zika virus rRT-PCR and IHC staining of umbilical cord and placenta is recommended.[¶] <p>FETAL LOSSES:</p> <ul style="list-style-type: none"> Zika virus rRT-PCR and IHC staining of fetal tissues is recommended.[¶]
<u>Recent flavivirus infection; specific virus cannot be identified</u>		
<u>Presumptive recent Zika virus infection**</u>	<ul style="list-style-type: none"> Consider serial ultrasounds every 3–4 weeks to assess fetal anatomy and growth[†] Amniocentesis might be considered; decision should be individualized for each clinical circumstance[§] 	<p>LIVE BIRTHS:</p> <ul style="list-style-type: none"> Infant serum and urine should be tested for Zika virus rRT-PCR, Zika IgM, and dengue virus IgM antibodies. If CSF is obtained for other reasons, it can also be tested. Zika virus rRT-PCR and IHC staining of umbilical cord and placenta should be considered.[¶] <p>FETAL LOSSES:</p> <ul style="list-style-type: none"> Zika virus rRT-PCR and IHC staining of fetal tissues should be considered.[¶]
<u>Presumptive recent flavivirus infection**</u>		
<u>Recent dengue virus infection</u>	<ul style="list-style-type: none"> Clinical management in accordance with existing guidelines (http://apps.who.int/iris/bitstream/10665/44188/1/9789241547871_eng.pdf). 	
<u>No evidence of Zika virus or dengue virus infection</u>	<ul style="list-style-type: none"> Prenatal ultrasound to evaluate for fetal abnormalities consistent with congenital Zika virus syndrome.[†] Fetal abnormalities present: repeat Zika virus rRT-PCR and IgM test; base clinical management on corresponding laboratory results. Fetal abnormalities absent: base obstetric care on the ongoing risk of Zika virus exposure to the pregnant woman. 	

Prenatal Management: Confirmed or Presumptive Recent Zika Virus or Flavivirus Infection

- Serial ultrasounds every 3-4 weeks to assess fetal anatomy and growth
- Amniocentesis
 - Individualized for pregnant women with confirmed recent Zika virus or flavivirus infection
 - Can be considered for pregnant women with presumptive recent Zika virus or flavivirus infection

CDC Materials for Pregnant Women with Suspected Zika Infection

CDC's Response to Zika WHAT YOU SHOULD KNOW ABOUT ZIKA VIRUS TESTING

For Pregnant Women Who May Have Been Exposed to Zika within the Past Two Weeks

If you or your sex partner live in or recently traveled to an area with Zika, you may have been exposed to Zika and how to find out if you've been infected. Keep reading to learn more about Zika virus testing.

Zika testing is complex.

- You may need more than one Zika test: You may find out if you have Zika after one or more tests. Zika can require up to three different tests, because the result of one test may not be definitive. You may also need to be retested if you recently had a Zika virus infection. You may wait different amounts of time for results.
- Understanding test results can be challenging: Zika virus is similar to other viruses. Testing for Zika may also detect these other mosquito-borne viruses. Sometimes even when you have been infected with Zika, the test may not detect it. Each test result is important, because it helps your doctor understand what they are being told.

I traveled to an area with Zika within the past two weeks. What's the testing process?

My husband traveled to an area with Zika and got some mosquito bites. I'm 3 months pregnant, and we had sex without a condom a week ago. Can I be tested? What's the testing process?

PRETESTING COUNSELING CONVERSATION GUIDE FOR HEALTHCARE PROVIDERS For Pregnant Women with Possible Exposure to Zika or Symptom Onset within the Past Two Weeks

This guide describes recommendations for conducting pretesting counseling for pregnant women if they or their sex partner live in or recently traveled to an area with Zika and how to find out if you've been infected. Keep reading to learn more about Zika virus testing.

Pregnant women coming in for Zika testing may feel worried or anxious. Support them by providing them with clear information, using plain language, and avoiding technical terms, and expressing empathy by acknowledging their concerns and feelings during pretesting counseling.

Recommendation	Sample Script
<p>Provide the patient with information on the complexity of Zika testing.</p> <p>Patients should be informed that more than one Zika test may be required before a final result is determined.</p> <p>Patients should be informed that it can be challenging to understand test results.</p>	<p>Use one or both of the two following sentences to begin the discussion depending on the clinical scenario:</p> <p>1) You may be at risk of having Zika since you or your sex partner recently traveled to (replace "recently" with "less if" as appropriate) a Zika affected area. (For those without symptoms: "You could be at risk even if you have symptoms.")</p> <p>OR/AND</p> <p>2) You may be at risk of having Zika because within the past two weeks you had sex without a condom with (replace "with" as appropriate) a Zika affected area. (For those without symptoms: "You could be at risk even if you have symptoms.")</p> <p>Based on what you've told me, I think it's best to move forward with testing you for Zika. Before we begin, I want to make sure you understand what the testing process is like. It may be frustrating. As your healthcare provider I am here to answer any questions you may have.</p> <ul style="list-style-type: none"> Reassure the patient that this method of testing is normal. Consider providing the fact sheet "What You Should Know about Zika Virus Testing for Pregnant Women" to the patient within the Past Two Weeks. <p>It can be hard to understand Zika test results for a number of reasons. Mosquitoes can carry many viruses, and sometimes even when you have been infected with these other viruses, in the past, it may be difficult to know which virus is the one that caused your symptoms.</p> <p>It is possible that the test will:</p> <ol style="list-style-type: none"> detect signs that your body cleared one of these viruses, other than Zika, from your system, detect signs that your body recently cleared Zika virus from your system, or detect that you currently have Zika. <p>Therefore, we may need to do additional testing to figure out whether you actually had Zika or not. Once we know how best to care for you during your pregnancy.</p> <p>Ask the patient if she has any questions before you move forward with providing information on the test results.</p>

CDC's Response to Zika For Pregnant Women: A Positive Zika Virus Test Result What does it mean for me?

CDC understands that pregnant women may be worried and have questions about Zika virus. A positive test result might cause concerns, but it doesn't mean your baby will have birth defects. Learn more about what you might expect for your pregnancy if you get a positive test result for Zika.

I tested positive. What happens next?

If you get a positive test result for Zika during pregnancy, it signals to your doctor or other healthcare provider that you should watch your pregnancy more carefully. CDC recommends steps your doctor can take to help you watch your pregnancy more carefully. Your doctor or other healthcare provider might do more ultrasounds to check the growth and development of your fetus and to look for signs of Zika virus related problems.

What are ultrasounds?

Ultrasounds are a safe and routine way for doctors or other healthcare providers to see the fetus during pregnancy. An ultrasound is usually done between 18-20 weeks of pregnancy as part of a routine prenatal visit. Ultrasounds are sometimes done later in pregnancy when doctors need more information about the fetus.

Does Zika virus cause microcephaly or other problems for the fetus?
Recently, researchers concluded that Zika virus infection during pregnancy can cause microcephaly and other problems. They are working quickly to study the full range of other potential health problems that Zika virus infection during pregnancy may cause.

Does a positive Zika virus test mean my baby will have birth defects?
Studies reported that some, but not all, babies born to women with positive Zika test results were born with microcephaly and other problems. At this time, we don't know how often a fetus will be born with microcephaly or other problems if a woman is infected with Zika while she is pregnant. Your healthcare provider will watch your pregnancy more closely if you have a positive Zika virus test result.

How will my doctor or other healthcare provider know if my baby has microcephaly?

Your doctor or other healthcare provider will use ultrasound screening to look for microcephaly and other problems during your pregnancy. Ultrasounds can show some, but not all, problems with development during pregnancy. For example, microcephaly can sometimes be seen on the ultrasound but is more commonly detected later in the second trimester or early in the third trimester. Your doctor or other healthcare provider will perform a careful physical exam of your baby after birth, and follow up with more exams and tests as needed.

www.cdc.gov/zika



CDC's Response to Zika WHAT HAPPENS WHEN I AM TESTED FOR ZIKA AND WHEN WILL I GET MY RESULTS?

Getting tested for Zika virus is different from a flu, strep, or pregnancy test, which can be done in a doctor's office. Only a few laboratories (labs) in the U.S. are certified to test for Zika. As a result, specimens often have to be shipped to a lab for testing. Several state and local health departments are certified to perform Zika testing. If your health department doesn't currently perform Zika testing, it will coordinate testing with CDC. CDC is receiving hundreds of samples each week. Depending on the lab workload, processing and reporting times may take 1 to 4 weeks. Reporting times may take longer during summer months or when other viruses spread by mosquitoes increase. Here's how testing occurs:

- Need for testing determined**
 - When you visit your doctor, you'll discuss any recent travel and symptoms. Tell your doctor if you are pregnant or planning to become pregnant.
 - Your doctor may decide to test for Zika and other viruses like dengue or chikungunya.
- Health department contacted**
 - If Zika testing is needed, your doctor will get approval from the health department before collecting samples (blood, urine, saliva).
- Samples collected**
 - Your doctor will send you to a laboratory that will collect samples for testing.
 - Your doctor will select the test(s) that need to be performed and complete paperwork for the health department.
- Samples shipped**
 - After samples are collected, the laboratory ships them to the health department.
 - The health department logs receipt of the samples.
- Samples tested**
 - If your health department has been certified to perform Zika testing, then your samples will be tested there.
 - If your health department is not able to perform testing, your samples will be shipped to CDC and tested.
- Results reported**
 - If your health department performed testing, it will send the results to your doctor.
 - If CDC performed testing, CDC will report results to your health department, which will report the results to your doctor. Your doctor will then report lab test results to you.

CS26746A July 28, 2016



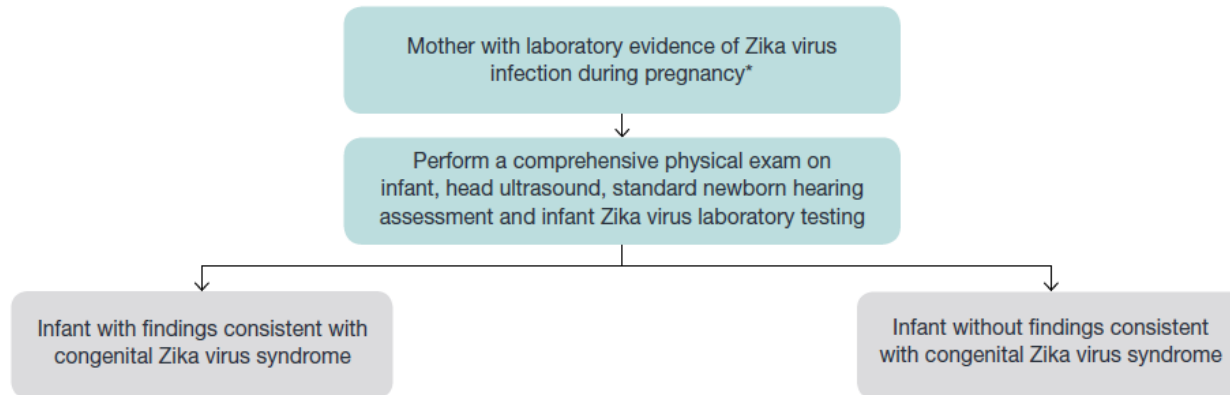
U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

<http://www.cdc.gov/zika>

CDC Guidance: Infants with Possible Congenital Zika Virus Infection

Infants with Possible Congenital Zika Virus Infection

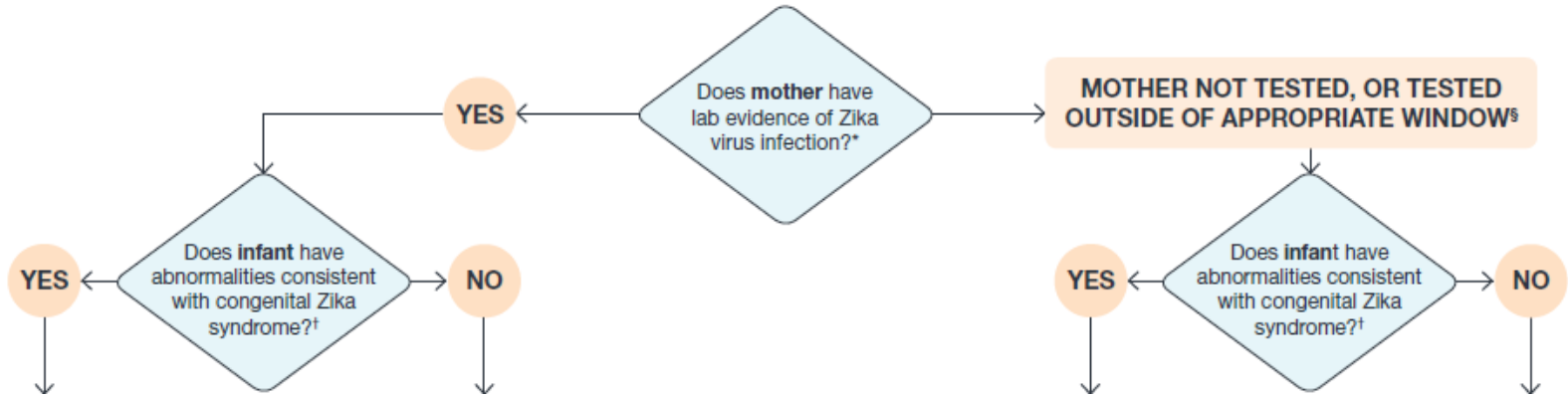
- Testing of infants with possible congenital Zika virus infection should be guided by
 - Whether the infant has abnormalities consistent with congenital Zika syndrome
 - The mother's Zika virus testing results
- Congenital Zika virus infection can be diagnosed by RNA NAT and through serologic testing
- All infants should have a comprehensive physical exam and head ultrasound before discharge from the hospital regardless of the presence or not of abnormalities and prenatal ultrasound results



Link: http://www.cdc.gov/zika/pdfs/zika_peds.pdf

Infants with Possible Congenital Zika Virus Infection

Recommendations for follow up depend on whether these infants have abnormalities consistent with congenital Zika syndrome



Initial
Evaluation

Initial Evaluation

Infants with abnormalities consistent with congenital Zika syndrome born to a mother with lab evidence of Zika

- Before hospital discharge:
 - ✓ Routine newborn care: physical exam, including occipitofrontal (head) circumference, weight, length, a neurologic exam, and universal hearing screen
 - ✓ Head ultrasound
 - ✓ Testing for congenital Zika virus infection
 - ✓ Complete blood count, metabolic panel and liver enzyme testing
 - ✓ Consult with multiple subspecialists
 - ✓ Referral for comprehensive eye exam by an ophthalmologist
 - ✓ Referral for auditory brainstem response (ABR) hearing evaluation
 - ✓ Consider advanced cranial imaging (e.g., MRI)
 - ✓ Consider transfer to hospital with specialty care
- Refer for a comprehensive ophthalmologic exam and evaluation of hearing by ABR testing before 1 month of age

Consult with Specialists

Infants with abnormalities consistent with congenital Zika syndrome and lab evidence of Zika

- **Neurologist** to determine appropriate neuroimaging and additional evaluation
- **Infectious disease specialist** to evaluate other congenital infections
- **Ophthalmologist** to examine the eye and evaluate for possible cortical visual impairment prior to discharge from hospital or within 1 month of birth
- **Endocrinologist** to evaluate for hypothalamic or pituitary dysfunction
- **Clinical geneticist** to evaluate for other causes of microcephaly or other anomalies if present

Consult with Specialists

Infants with abnormalities consistent with congenital Zika syndrome and lab evidence of Zika

Consultation with the following should also be considered:

- **Orthopedist, physiatrist, physical medicine, rehabilitation physician, and physical therapist** to manage hypertonia, club foot, or arthrogryptic-like conditions
- **Pulmonologist or otolaryngologist** to consult about aspiration
- **Lactation specialist, nutritionist, gastroenterologist, or speech or occupational therapist** to manage feeding issues

Outpatient Management

Infants with abnormalities consistent with congenital Zika syndrome and lab evidence of Zika

- Establish a medical home to facilitate coordination of care
- Provide routine preventive pediatric health care, including immunizations and monthly primary care visits for at least the first 6 months
- Conduct developmental monitoring at each routine visit
- Complete neurologic exam at age 1 and 2 months, then as needed
- Refer patients to developmental specialist and early intervention services
- Repeat ophthalmology exam with retinal assessment at 3 months
- Repeat ABR hearing assessment at age 4–6 months
- Conduct thyroid screening at age 2 weeks and age 3 months
- Provide family support services
- Provide appropriate referrals

Initial Evaluation & Outpatient Management

Infants with lab evidence of Zika and without abnormalities consistent with congenital Zika syndrome

- Before hospital discharge infants should receive
 - Routine care including monitoring of occipitofrontal circumference, length, and weight
- Outpatient management includes routine follow up and
 - Establish medical home
 - Perform vision screening at every well child visit
 - Evaluate hearing: consider repeat ABR testing at 4–6 months or perform behavioral diagnostic testing at age 9 months if ABR is not done at 4-6 months
 - Provide referrals: Any children with identified or suspected delays should be referred to a developmental specialist or early intervention programs
 - Provide family support services, such as counseling, as needed

Initial Evaluation & Outpatient Management

Infants with abnormalities consistent with congenital Zika syndrome born to a mother without lab evidence of Zika

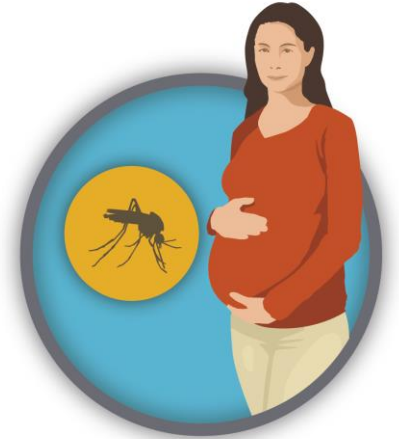
- Maternal and infant Zika virus testing
- Infants should receive
 - Routine newborn care including monitoring of occipitofrontal circumference, length, and weight
 - Head ultrasound
 - Age-appropriate standardized validated developmental screening at 9 months
 - CBC, metabolic panel, LFTs
 - Vision screening and assessment of visual regard
 - ABR Testing
- Any children identified with or suspected of delays should be referred to early intervention programs
- Consider
 - Testing placenta for Zika virus
 - Further neuroimaging
 - Transfer to hospital with subspecialty care

Family and Psychosocial Support

- Families and caregivers of infants with congenital Zika virus infection may require ongoing psychosocial support.
- Families should be empowered to be active participants in their child's monitoring and care.
- Healthcare providers should work closely with parents to ensure that the care plan is consistent with the infant's needs and the family's wishes.
- Families with already limited access to medical care might be affected with a disproportionate burden of Zika virus infection.
- Barriers to care for all affected infants and their families should be addressed by linking them with national, state, and local health programs as well as social services.
- Additional resources for families can be found at:
<http://www.cdc.gov/zika/parents/families-of-newborns-affected-zika.html>

Special Nursing Care Considerations for Newborns with Suspected Congenital Zika Syndrome

- Ensure that recommended screening is received
- Follow up with lab results and counseling of family
- Follow standard precautions in nursery
- Assist with reporting to the US Zika Pregnancy Registry



Pediatric Evaluation and Follow-up Tools

Initial Evaluation and Outpatient Management During the First 12 Months of Life for Infants with Possible Congenital Zika Virus Infection

CDC's Response to Zika

Interpretation of results of laboratory test results*

RT-PCR

Positive

Negative

Negative

Abnormalities (RT-PCR or real-time reverse transcriptase PCR):

- Interpretation: sites on serological test
- Laboratory results should be interpreted in the context of the clinical presentation of congenital Zika syndrome, and

Checklist 1

Initial clinical evaluation & management of infants with laboratory evidence of Zika virus infection and abnormalities consistent with congenital Zika syndrome†

Consideration with:

- Neurologist for determination of appropriate neuroimaging and additional evaluation
- Infectious disease specialist for diagnostic evaluation of congenital infections (ie, syphilis, toxoplasmosis, cytomegalovirus infection, lymphocytic choriomeningitis, and herpes simplex virus infection)
- Ophthalmologist for comprehensive eye exams for possible cortical visual impairment prior to discharge or within 1 month of birth
- Endocrinologist for evaluation for hypothyroidism
- Clinical geneticist to evaluate for other causes of neurodevelopmental or other anomalies present

Consider consultation with:

- Orthopedic, physical and physical therapist for management of hypotonia, distal or wristed, or other conditions
- Neurologist or ophthalmologist for concerns about visual impairment
- Laboratory specialist, ophthalmologist, geneticist, occupational therapist for the management of the infant
- Perform ABR to assess hearing
- Perform complete blood count and metabolic panel; liver function tests
- Provide family and supportive services

CDC's Response to Zika

INITIAL EVALUATION AND OUTPATIENT MANAGEMENT DURING THE FIRST 12 MONTHS OF LIFE FOR INFANTS WITH POSSIBLE CONGENITAL ZIKA VIRUS INFECTION

Initial Evaluation

Before hospital discharge

- Routine newborn care: physical exam, including head circumference, weight, length and neuro exam
- Head ultrasound
- Infant testing for congenital Zika virus infection (See Table 1)

Consider transfer to hospital with subspecialty care

- CBC, metabolic panel, LFTs
- Ophthalmology exam
- ABR
- Consider further neuroimaging
- Consult with multiple specialists

(See Page 3, Checklist 1)

Follow management and follow-up recommendations indicated in Outpatient Management Checklist

Download at:
<http://www.cdc.gov/zika/pdfs/pediatric-evaluation-follow-up-tool.pdf>

Preventing Zika

Do Not Travel to Areas with Zika

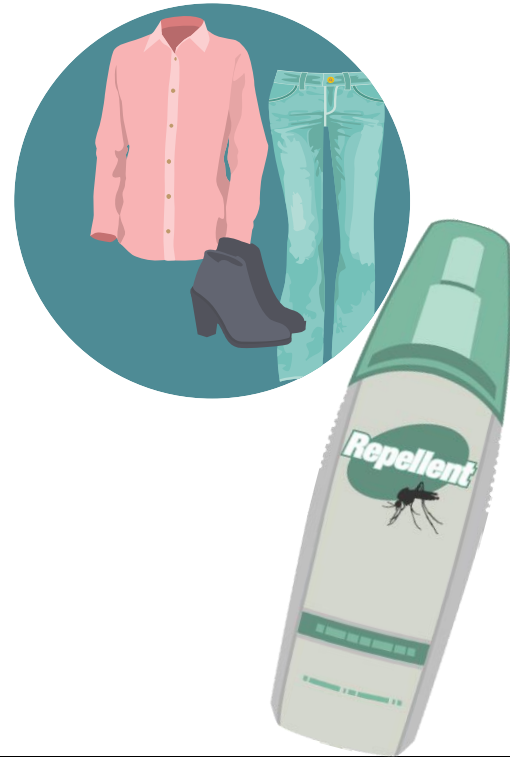
- Pregnant women should not travel to areas with Zika
- If a pregnant woman *must* travel, she should
 - Talk with her healthcare provider before she goes
 - Strictly follow steps to prevent mosquito bites during the trip
 - Take steps to prevent sexual transmission
 - Talk with her healthcare provider after she returns, even if she doesn't feel sick



Prevent Mosquito Bites

People who live in or travel to an area with Zika should

- Wear long-sleeved shirts and long pants
- Stay and sleep in places with air conditioning or that use window and door screens
- Use insect repellents with one of the following EPA-registered active ingredients:
 - DEET, picaridin, IR3535, oil of lemon eucalyptus, para-menthane-diol, or 2-undecanone
- Once a week, empty and scrub, turn over, cover, or throw out items that hold water, such as trash containers, tires, buckets, toys, planters, flowerpots, birdbaths or pools



Prevent Sexual Transmission of Zika Virus

A pregnant woman whose partner lives in or has traveled to an area with Zika should

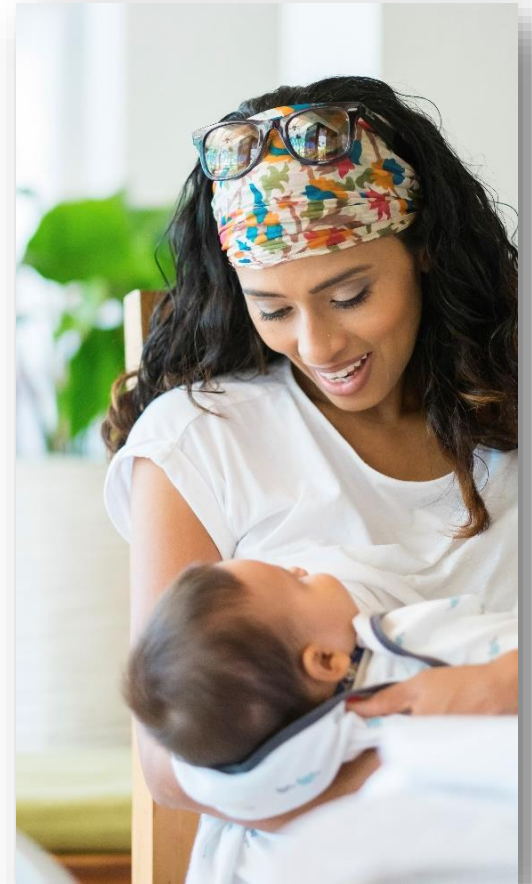
- Use condoms correctly every time they have sex, or
- Not have sex

For the duration of the pregnancy, even if the pregnant woman's partner does not have symptoms or feel sick.



Zika and Breastfeeding

- Transmission of Zika virus through breast milk has not been documented
- Benefits of breastfeeding outweigh theoretical risk of Zika virus transmission through breast milk
- CDC and the World Health Organization recommend that infants born to women with suspected, probable, or confirmed Zika virus infection, or who live in or have traveled to areas of Zika, should be fed according to usual infant feeding guidelines



Tips for Parents and Caregivers

For babies and children

- Dress children in clothing that covers arms and legs.
- For children older than 2 months, use insect repellent on exposed skin.
 - Do not use insect repellent on babies younger than 2 months old.
- Cover crib, stroller, and baby carrier with mosquito netting.



Tips for Parents and Caregivers

Applying insect repellent for babies and children

- Do not apply repellent onto hands, eyes, mouth, and cut or irritated skin.
- Adults: Spray onto your hands and then apply to a child's face.
- Do not use insect repellent on babies younger than 2 months old.
- Do not use products containing oil of lemon eucalyptus or para-menthane-diol on children younger than 3 years old.



Standard Precautions to Prevent the Spread of Zika Virus and Other Infectious Agents During Healthcare Settings

Zika Virus Disease in Healthcare Settings

- No reports to date of transmission of Zika virus from infected patients to healthcare personnel or other patients in healthcare settings
- Zika virus has been detected in blood, amniotic fluid, urine, saliva, and genital fluids (including semen and vaginal fluids)



Standard Precautions

- Basic measures to prevent infections that apply to all patient care
- Based on principle that all blood, body fluids, secretions, excretions (except sweat), non-intact skin, and mucous membranes may contain transmissible infectious agents
- Goals
 - Prevent direct contact between a patient's body fluids and HCP mucous membranes or broken skin
 - Protect HCP and prevent them from transmitting potentially infectious material from one patient to another
 - Avoid percutaneous exposure to contaminated sharp implements

Standard Precautions: Personal Protective Equipment (PPE)

- Healthcare personnel education and training in the use of PPE is an Occupational Safety and Health Administration (OSHA) requirement
- Gloves, gowns, face masks, face shields, goggles
- Facilities should assure availability and accessibility of PPE to HCP
- Educate all HCP on proper selection and correct use of PPE
 - HCPs must assess their risk for exposure and select appropriate PPE
- Examples of obstetric procedures that require increasing amount of PPE
 - Vaginal exam particularly during amniotomy
 - Vaginal delivery including manual removal of placenta
 - Operative procedures

What is CDC Doing?

Many Questions Remain

- What is the level of risk from a Zika virus infection during pregnancy?
- When during pregnancy does Zika virus infection pose the highest risk to the fetus?
- What is the full range of potential health problems that Zika virus infection may cause?
- What other factors (e.g., co-occurring infection, nutrition, symptomatic vs. asymptomatic) might affect the risk for birth defects?
- What is the risk for later health problems in an infant who is infected or who has had exposure to Zika virus but is born without abnormalities?



Collecting Data for Action

Surveillance of Zika and its effects on pregnant women, infants, & children

US Zika Pregnancy Registry



Zika Active Pregnancy Surveillance System (Puerto Rico)



Proyecto Vigilancia de Embarazadas con Zika (Colombia)



US Zika-Related Birth Defects Surveillance



ArboNET Surveillance of Children with Postnatal Zika



Sharing Up-to-Date Information

- Providing updated clinical guidance
- Responding to your inquiries:
 - Email: ZikaMCH@cdc.gov
 - Zika Pregnancy Hotline: 770-488-7100
 - [CDC-INFO](http://www.cdc.gov/zika): (800-232-4636)



<http://www.cdc.gov/zika>

Centers for Disease Control and Prevention

MMWR

Morbidity and Mortality Weekly Report

Early Release / Vol. 65

July 25, 2016

Update: Interim Guidance for Health Care Providers Caring for Pregnant Women with Possible Zika Virus Exposure — United States, July 2016

Titilope Oduyebode, MD¹; Iroque Igbinosa, MD²; Emily E. Petersen, MD¹; Kara N.D. Polen, MPH²; Satish K. Pillai, MD³; Elizabeth C. Ailes, PhD²; Julie M. Villanueva, PhD²; Kim Newsome, MPH²; Marc Fischer, MD⁴; Priya M. Gupta, MPH²; Ann M. Powers, PhD⁴; Margaret Lampe, MPH⁵; Susan Hills, MBBS⁴; Kathryn E. Arnold, MD²; Laura E. Rose, MTS³; Carrie K. Shapiro-Mendoza, PhD¹; Charles B. Beard, PhD⁴; Jorge L. Muñoz, PhD⁴; Carol Y. Rao, ScD⁷; Dana Meaney-Delman, MD⁸; Denise J. Jamieson, MD¹; Margaret A. Honein, PhD²

Developing Tools for Healthcare Providers

Pregnancy & Zika Testing

Restart

Select your profession:

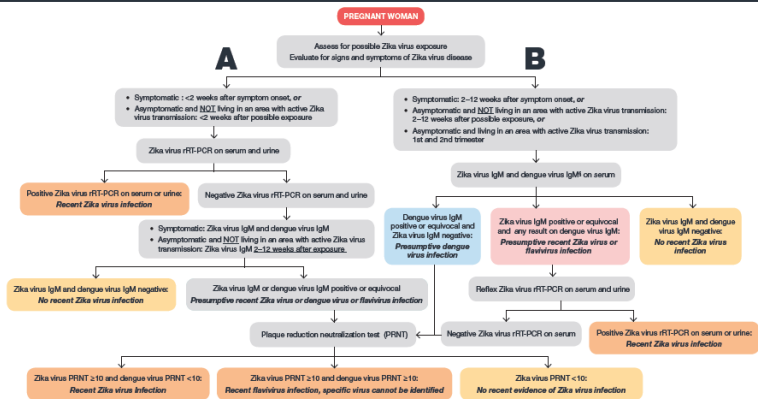
- Obstetrician/Gynecologist
- Family Physician
- Nurse
- Nurse-midwife
- Other healthcare provider
- State health department official
- Local health department official
- Other

◀ Back

CDC's Response to Zika

UPDATED INTERIM PREGNANCY GUIDANCE:

Testing and interpretation recommendations^{1,4,5,6,7} for a pregnant woman with possible exposure to Zika virus* – United States (including U.S. territories)



Abbreviations: IgM = immunoglobulin M; PRNT = plaque reduction neutralization test; rRT-PCR = real-time reverse transcription-polymerase chain reaction.

* A pregnant woman is considered symptomatic if one or more signs or symptoms (fever, rash, arthralgia, or conjunctivitis) consistent with Zika virus disease is reported whenever a pregnant woman is considered symptomatic if symptoms are NOT reported.

¹ Testing includes Zika virus rRT-PCR on serum and urine samples, Zika virus and dengue virus immunoglobulin M (IgM), and plaque reduction neutralization test (PRNT) on serum samples. PRNT results that indicate recent flavivirus infection should be interpreted in the context of the currently circulating flaviviruses. Refer to the laboratory guidance for updated testing recommendations (<http://www.cdc.gov/zika/laboratories/files/updates-11-15-16>). Because of the overlap of symptoms in areas where other virus diseases are endemic, consult for possible dengue or chikungunya virus infection.

² Dengue IgM antibody testing is recommended only for symptomatic pregnant women.

³ Zika virus rRT-PCR testing is requested from laboratories without qPCR antibody testing capacity or a process to forward specimens to another testing laboratory, sorting of additional serum samples is recommended for IgM antibody testing in the event of a rRT-PCR negative result.

⁴ Possible exposures to Zika virus include travel to or residence in an area with active Zika virus transmission (<http://www.cdc.gov/zika/faq>), or sex (vaginal sex, genital-to-genital sex, and sex genital-to-anus sex, oral sex, mouth-to-mouth sex or mouth-to-vaginal sex), and the sharing of sex toys without a barrier method to prevent infection (male or female condoms for vaginal or anal sex, male condoms for oral sex (mouth-to-mouth), and male condoms cut to create a flat barrier or dental dams for oral sex (mouth-to-vaginal) with a partner who traveled to, or lives in an area with active Zika virus transmission).

CDC's Response to Zika

KEY ZIKA CONSIDERATIONS FOR HEALTHCARE SETTINGS

...ore disease that is currently spreading throughout many countries and a small area in the continental United States. CDC recommends that including urgent care, hospitals, physician offices, etc.) prepare for patients and/or symptom management.

...stimates cases of Zika in the United States and US territories and updates (what time becomes available. For more information, visit CDC's Zika website (www.cdc.gov/zika).



...or Zika patients coming to your clinics, offices, healthcare systems leaders following:

...iders should know the clinical Zika virus infection and how to access areas with active transmission. Clinicians assess for risk factors and exposures¹ in evaluating patients. It is important aware that people with Zika virus asymptomatic or mildly symptomatic, viders should consider Zika virus disease diagnosis for patients with appropriate

...iders should assess all pregnant women virus exposure² and evaluate for signs and a virus disease at every clinical encounter. dicated. (Updated Interim Pregnancy Algorithm: www.cdc.gov/zika/docs/testing-zika-pregnancy-hotline can be accessed questions; call 770-488-7100 and ask for the a.

...iders should advise pregnant women vent sexual transmission of Zika during www.cdc.gov/zika/prevention/protect-yourself.

...ive measures with patients and families. with information about risk factors to e of mosquito bite prevention actions. protect themselves from mosquito bites exposure to prevent further spread of

...the virus. Emphasize risks to families and household contacts as these are at the greatest risk for human-mosquito-human transmission.

...5. All healthcare personnel should follow Standard Precautions for all patient care (www.cdc.gov/nccp/pdf/isolation/isolation007.pdf).

...6. Healthcare providers caring for pregnant women should be aware of the requirement for Standard Precautions to be used for labor and delivery care. (www.cdc.gov/mmwr/volumes/65/wr/mm6511a3.htm).

...7. Internal and external hospital websites should include a link to www.cdc.gov/zika/index.htm. CDC's Zika website to ensure that all staff have access to the most up-to-date guidance and other training and clinical resources.

...8. Appropriate healthcare staff should report suspected cases to state or local health departments to facilitate diagnosis.

...9. Healthcare personnel should report all pregnant women with laboratory evidence of possible Zika virus infection, with or without symptoms, as well as infants born to these women, to state, tribal, territorial, or local health department officials for enrollment in the US Zika Pregnancy Registry (www.cdc.gov/zika/hc-providers/registry.html).



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www.cdc.gov/Zika

*Free materials available in English, Spanish and other languages

Resources for Families

CDC's Response to Zika
PREGNANT AND IN AN AREA WITH ZIKA?*
WARNING: ZIKA IS LINKED TO BIRTH DEFECTS

Prot From
From
CDC's Response to Zika
DOCTOR'S VISIT CHECKLIST:
For Pregnant Women Who Traveled to an Area with Zika*

If you are pregnant and have traveled to pregnancy or up to 8 weeks before see talk to your healthcare provider, even if bring this checklist to your visit to make discuss anything important.

Here are some topics and ques

INFORMATION TO SH

- ✓ When did you travel to an area with Zika?
- Where did you travel?
- How long did you stay?
- ✓ In what trimester was your pregnancy at an area with Zika?
- ✓ Did you have any symptoms of Zika dur within 2 weeks of returning?
- The most common symptoms of Zika (joint pain, and red eyes).
- ✓ Did your partner travel to an area with ZI
- When and where did your partner tr
- Did your partner have any signs or sy including fever, rash, joint pain, or ne
- Were you on the trip, or did returning?

*Check www.cdc.gov/t1

There
For more information: www.cdc.gov/zika


*Visit www.cdc.gov/zika/po/health

CH2018A August 14, 2016

CH2018A October 14, 2016

www.cdc.gov/zika

CH2018A May 3, 2014



U.S. Department of Health and Human Services
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CDC's Response to Zika
Ideas for Talking to your Children about Zika

For children of all ages, start the conversation by asking: What have you heard about Zika?

- Listen to see if your children have any fears about Zika.
- Learn what your children have heard and correct any misinformation.
- Let your children know that you are open to answering questions and talking about Zika.
- Limit your children's exposure to news reports and media on Zika. When they see a lot of information, it may seem like the risk is bigger than it really is.


Explain what you know about Zika, simply and directly. Here are some facts you can talk about with children.

- Zika is mostly spread by getting bitten by a certain type of mosquito.
- Any person that lives in an area where the type of mosquito that spreads Zika lives could catch Zika through a mosquito bite.
- A mosquito that bites a person who has Zika can get infected and spread it to another person through bites.
- They can only catch Zika if they live in or travel to an area where mosquitoes are spreading Zika and are bit by a mosquito carrying Zika.

Everyone can take steps to prevent mosquito bites to protect themselves and others. Children can help remind adults about taking steps to protect the family from mosquito bites.

- Most people infected with Zika will not get sick. The people who do get sick will probably only feel a little sick for a few days. They might not even know they have Zika.
- People who do get sick with Zika might get a fever, rash, joint pain (like in elbows or knees), or red eyes.
- There is no medicine or vaccine for Zika. If people get sick they will go to the doctor for some tests. People who get Zika can feel better by getting a lot of rest and drinking fluids and taking medicine for pain.

The government, doctors, health departments, and their community are taking steps to keep everyone healthy.



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

CDC's Response to Zika
FOR WOMEN: A POSITIVE ZIKA VIRUS TEST

CDC's Response to Zika
HOW TO PROTECT AGAINST MOSQUITO BITES

With the Zika outbreak, planning your pregnancy is more important than ever. There is no vaccine to prevent Zika virus infection.

If you are thinking about having a baby, your doctor or other healthcare provider can help you plan for a healthy and safe pregnancy. Talk with your doctor about:

- Your plans for having children
- The potential risk of getting Zika during pregnancy
- Your partner's potential exposures to Zika

If you decide that now is not the right time for you to have a baby, work with your doctor or other healthcare provider to find a birth control method that is safe, effective, and works for you and your lifestyle.

Protect yourselves from getting Zika from mosquito bites

Use insect repellent

- Protect yourself and your family from mosquito bites all day and night, whether you are inside or outside.
- Insect repellent is safe and it works! Read the label and follow the directions.

Cover your skin

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

Mosquito-proof your home

- Use screens on windows and doors.
- Use air conditioning when available.
- Empty containers with standing water.

Once you're pregnant, protect yourself from getting Zika from sex

Use a condom

- Use a condom every time you have sex during your pregnancy. To be effective, condoms must be used correctly from start to finish, every time you have sex. This includes vaginal, anal, and oral sex.

OR

Don't have sex

- Don't have sex during your pregnancy.

Talk to your healthcare provider

- If you think your partner may have or had Zika, let your healthcare provider if you had sex without a condom.

Find the insect repellent that's right for you by using EPA's search tool!



For more information: www.cdc.gov/zika



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


TO PROTECT THEMSELVES TO DO.

well probably be mild and only as drinking fluids to prevent a fever and pain. until dengue can be ruled out to reason, talk to your doctor or other

Zika to others?


mosquito bites. During the first 6 weeks, the virus can be passed from you to others. An infected mosquito can spread others from getting sick, during the first week of your illness. To protect yourself, avoid mosquito bites. If you have Zika, avoid mosquito bites with your partner's, 100% DEET, oil of lemon eucalyptus, and

stay indoors with air conditioning



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For more resources to share with families visit <http://www.cdc.gov/zika/fs-posters/index.html>
Available in English, Spanish and other languages

What Can You Do?

Report Cases

- Zika virus infection and disease are nationally notifiable conditions
- The following cases should be reported to your state health department
 - Symptomatic and asymptomatic cases with laboratory evidence of Zika virus infection
 - Babies born with or without abnormalities consistent with congenital Zika syndrome and laboratory evidence of Zika virus infection



Report Information to US Zika Pregnancy Registry

- **Purpose of registry**

- To monitor pregnancy and infant outcomes following Zika virus infection during pregnancy and to inform clinical guidance and public health response

- **More information**

- Available on the [US Zika Pregnancy Registry website](#)
- To contact CDC Registry staff, call the CDC Emergency Operations Center watch desk at 770-488-7100 and ask for the Zika Pregnancy Hotline or email ZIKApregnancy@cdc.gov
- For non-urgent requests, call 800-CDC-INFO (800-232-4636)



In Summary

- Stay up to date on Zika and where it is being spread
- Know the basics about Zika transmission in your community
- Know the basics about Zika transmission in healthcare settings
- Provide support to diagnose and test for Zika for those with symptoms in your community
- Understand the assessment and management of Zika among pregnant women and infants and how to protect them from exposure
- Counsel couples on how to avoid Zika infection as they plan for pregnancy
- Support access to effective contraception to those not planning pregnancy
- Provide support for families of newborns affected by Zika
- Inform your local or state health department and the US Zika Pregnancy Registry as indicated

More Information about Zika

More information on caring for pregnant women, infants, or children with Zika virus infection is available at [CDC's Zika website](http://www.cdc.gov/zika).

The screenshot shows the top portion of the CDC website. At the top left is the CDC logo with the text "Centers for Disease Control and Prevention" and "CDC 24/7: Saving Lives. Protecting People™". To the right is a search bar with the word "SEARCH" and a magnifying glass icon. Below the search bar is a "CDC A-Z INDEX" dropdown menu. A dark blue navigation bar contains the text "Zika Virus". Below this bar are social media icons for Facebook, Twitter, and a plus sign. To the right of the social media icons is a "Language:" dropdown menu set to "English". The main content area features a large slide with a world map highlighting South America and Africa, a mosquito illustration, and the text "ZIKA VIRUS UPDATE" and "Zika Cases in Florida". Below the slide are five small circular navigation dots. To the right of the slide is a "At-A-Glance" section with two sub-sections: "Pregnant Women with Any Lab Evidence of Zika Virus Infection*" and "Zika Virus Disease Cases Reported to ArboNET*".

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

SEARCH

CDC A-Z INDEX

Zika Virus

f t +

Language: English

ZIKA VIRUS UPDATE
Zika Cases in Florida

Zika Cases in Florida

At-A-Glance

Pregnant Women with Any Lab Evidence of Zika Virus Infection*

- US States and DC: 808
- US Territories: 1,490

*Source: Pregnancy Registries as of September 22, 2016

[More on Outcomes](#)

Zika Virus Disease Cases Reported to ArboNET*

- US States and DC: 3,625
- US Territories: 22,069

*Source: ArboNET as of September 28, 2016

www.cdc.gov/zika

Thank you!

More information on Zika: www.cdc.gov/zika

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

