Zika Virus: A Primer

Grand Rounds
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, former CDC Director

Fortune, April 13, 2016
Today’s Presentation

- Zika Virus: The Basics
- CDC Guidance
  - Pregnancy Planning and Contraception
  - Zika and Pregnancy
    - Infants with Possible Congenital Zika Virus Infection
- Preventing Zika Virus Infection
- Preventing the Spread of Zika Virus During Healthcare Delivery
- What is CDC Doing?
- What Can You Do?
Zika Virus: 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 (mother to fetus)
  • Periconceptional
  • Sexual
  • Laboratory exposure
  • Probable: Blood transfusion
Zika Virus and Breastfeeding

• There are no reports of transmission of Zika virus infection through breastfeeding.

• Benefits of breastfeeding outweigh theoretical risk of possible 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 with risk of Zika, should be fed according to usual infant feeding guidelines
Areas with Risk of Zika

As of May 16, 2017

Clinical Presentation

• Clinical illness usually mild
• Most common symptoms
  • Conjunctivitis (red eyes)
  • Fever
  • Joint pain
  • Headache
  • Rash
  • Muscle pain
• Symptoms last several days to a week
• Severe disease uncommon
• Fatalities are rare
• Once infected, a person may 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 Virus 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.


CDC Lab Confirms Zika Virus In Body Fluids

- Evidence of Zika virus identified in
  - Blood
  - Semen
  - Vaginal fluids
  - Urine
  - Saliva
  - Breast milk
## Zika Virus Duration of Detection in Infected People

<table>
<thead>
<tr>
<th>Body Fluid and Population</th>
<th>Maximum Duration of Detection</th>
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<tbody>
<tr>
<td>Zika virus RNA in serum of non-pregnant people</td>
<td>11-13 days after symptom onset</td>
</tr>
<tr>
<td>Zika virus RNA in serum of pregnant women</td>
<td>80 days after symptom onset</td>
</tr>
<tr>
<td>Zika virus RNA in whole blood of non-pregnant person</td>
<td>58 days (could not be cultured)</td>
</tr>
<tr>
<td>Zika virus RNA in semen</td>
<td>&gt;120 days after symptom onset</td>
</tr>
<tr>
<td><em>Cultured virus from semen</em></td>
<td><em>69 days after symptom onset</em></td>
</tr>
</tbody>
</table>

- What does prolonged detection of Zika virus RNA mean?
  - Correlation of RNA detection and infectious risk is not known; antibody response may mitigate risk of infectivity and transmission
  - Possible predictor of fetal infection or adverse outcomes
  - Difficult to determine timing of infection

- Most data are individual case reports or small case series and it is unclear how representative they are of population-level risk

- CDC conducting several studies in the continental United States and Puerto Rico

Petersen et al. MMWR 2016. [https://www.cdc.gov/mmwr/volumes/65/ww/pdfs/mm6539e1.pdf](https://www.cdc.gov/mmwr/volumes/65/ww/pdfs/mm6539e1.pdf)

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 virus infection might present risk to fetus
- If infected during pregnancy
  - Zika virus 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 highly variable by place and time
- 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

Zika Virus Infection is a Cause of Microcephaly

**SPECIAL REPORT**

**Zika Virus and Birth Defects — Reviewing the Evidence for Causality**

Sonja A. Rasmussen, M.D., Denise J. Jamieson, M.D., M.P.H.,
Margaret A. Honein, Ph.D., M.P.H., and Lyle R. Petersen, M.D., M.P.H.

**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 during pregnancy was responsible for clusters of infants with microcephaly in Brazil...

**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 number of infants with microcephaly in Brazil...
Congenital Zika Syndrome (CZS)

- 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, such as clubfoot
  - 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

Emily E. Petersen, MD1; Dana Meaney-Delman, MD1; Robyn Neblett-Fanfair, MD1; Fiona Havers, MD1; Titilope Oduyebo, MD1; Susan L. Hills, MBBS1; Ingrid B. Rabe, MBChB1; Amy Lambert, PhD1; Julia Abercrombie, MPH1; Stacey W. Martin, MSc1; Carolyn V. Gould, MD1; Nadia Oussayef, JD1; Kara N.D. Polen, MPH1; Matthew J. Kuehnert, MD1; Satish K. Pillai, MD1; Lyle R. Petersen, MD1; Margaret A. Honein, PhD1; Denise J. Jamieson, MD1; John T. Brooks, MD1

https://www.cdc.gov/mmwr/volumes/65/wr/pdfs/mm6539e1.pdf
US Zika Pregnancy Registry: First Report

- 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

Researchers estimate a 20-fold increase in Zika-related birth defects in pregnancies with possible Zika virus infection compared with pre-Zika outbreak years.
Vital Signs Report
Zika Virus: Protecting Pregnant Women and Babies

44 States reported pregnant women with evidence of Zika virus infection in 2016

about 1 in 10 Pregnant women with confirmed Zika virus infection had a fetus or baby with birth defects

only 1 in 4 Babies with possible congenital Zika infection were reported to have received brain imaging after birth

CDC Guidance: Pregnancy Planning and Contraception
Zika Virus and Sexual Transmission

- Zika virus 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 risk of Zika.
## Women and Their Partners Thinking about Pregnancy

<table>
<thead>
<tr>
<th>Length of time to wait to conceive after travel to areas with a CDC Zika travel notice</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Female Traveler</strong></td>
<td><strong>Male Traveler</strong></td>
</tr>
<tr>
<td>Use condoms or do not have sex for <strong>at least 8 weeks</strong> after travel to an area with risk of Zika (if she doesn’t have symptoms) or for <strong>at least 8 weeks</strong> from the start of her symptoms (or Zika virus infection diagnosis)</td>
<td>Use condoms or do not have sex for <strong>at least 6 months</strong> after travel to an area with risk of Zika (if he doesn’t have symptoms) or for <strong>at least 6 months</strong> from the start of his symptoms (or Zika virus infection diagnosis)</td>
</tr>
</tbody>
</table>

Areas with a CDC Zika travel notice

Areas with risk of Zika but no CDC Zika travel notice

United States
## Women and Their Partners Thinking About Pregnancy

<table>
<thead>
<tr>
<th>Length of time to wait after travel to areas with a risk of Zika but no CDC travel notice</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Positive Zika test or Zika virus infection symptoms</strong></td>
<td>Wait <em>at least</em> 8 weeks after positive result or symptoms start</td>
<td>Wait <em>at least</em> 6 months after positive result or symptoms start</td>
</tr>
<tr>
<td><strong>No testing performed or negative test</strong></td>
<td>Talk with doctor or healthcare provider</td>
<td>Talk with doctor or healthcare provider</td>
</tr>
</tbody>
</table>

![Map showing areas with a risk of Zika and areas with a CDC Zika travel notice](image)

- **Areas with a CDC Zika travel notice**
- **Areas with risk of Zika but no CDC Zika travel notice**
- **United States**
## Women and Their Partners Thinking About Pregnancy

### People who live in areas with a risk of Zika, with or without a CDC travel notice

- Take steps to [prevent mosquito bites](#).
- Talk with a healthcare provider about pregnancy plans, their risk of Zika virus infection, the possible health effects of Zika virus infection on a baby, and ways to prevent Zika.
- If they develop symptoms of Zika virus infection and test positive for the virus, they should follow the suggested timeframes mentioned previously before trying to conceive.

![World Map showing areas with and without Zika risk](#)

- **Areas with a CDC Zika travel notice**
- **Areas with risk of Zika but no CDC Zika travel notice**
- **United States**
Pregnancy Planning and Access to Contraception

• Preventing Zika virus infections during pregnancy includes supporting women who want to delay or avoid pregnancy to reduce risk of Zika-related pregnancy complications

• If a woman decides 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 virus infection
CDC Guidance: Zika Virus Infection and Pregnancy
Areas with a CDC Zika travel notice: Pregnant women should be tested for Zika virus infection, regardless of whether or not they have symptoms.

United States: See domestic testing guidance.

Areas with risk of Zika but no CDC Zika travel notice: Pregnant women should be tested if symptomatic or if their fetus has abnormalities on an ultrasound that may be related to Zika infection. Because the level of risk of Zika virus infection is unknown in these areas, routine testing is not recommended for pregnant women who have traveled to those areas but who do not have symptoms. However, testing may be offered on a case-by-case basis.
Updated Guidance: Testing of Asymptomatic Pregnant Women Living in or Frequently Traveling to Areas with a CDC Zika Travel Notice

“Prolonged IgM Antibody Response in People Infected with Zika Virus: Implications for Interpreting Serologic Testing Results for Pregnant Women” May 5, 2017

1. Screen pregnant women for risk of Zika virus exposure and symptoms of Zika virus infection. Promptly test pregnant women with NAT if they become symptomatic during their pregnancy or if a sexual partner tests positive for Zika virus infection.

2. Consider NAT testing at least once per trimester, unless a previous test has been positive.

3. Consider NAT testing of amniocentesis specimens if amniocentesis is performed for other reasons.

4. Counsel pregnant women each trimester on the limitations of IgM and NAT testing.

https://emergency.cdc.gov/han/han00402.asp
Updated Guidance: Testing as Part of Preconception Counseling for Women Living in or Frequently Traveling to Areas with a CDC Zika Travel Notice

“Prolonged IgM Antibody Response in People Infected with Zika Virus: Implications for Interpreting Serologic Testing Results for Pregnant Women” - May 5, 2017

- Consider IgM testing to determine baseline Zika virus IgM levels as part of preconception counseling
  - Testing before pregnancy can provide information that may help interpret test results in the future.
  - Antibody test results before pregnancy should not be used to determine whether or not it is safe for a woman to become pregnant.

https://emergency.cdc.gov/han/han00402.asp
Pregnancy Testing Algorithm

**Link:** [http://www.cdc.gov/mmwr/volumes/65/wr/mm6521e1.htm](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 IgM test
  • If positive or equivocal, serum and urine NAT should be performed
Updated Guidance: Asymptomatic Pregnant Women

- Living in areas without risk of 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 risk of 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 risk of 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.
    - Consider NAT testing at least once per trimester, unless a previous test has been positive

https://www.cdc.gov/mmwr/volumes/65/wr/mm6529e1.htm?s_cid=mm6529e1_w
https://emergency.cdc.gov/han/han00402.asp
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.

Updated Guidance: Testing Pregnant Women After 12 Weeks

https://www.cdc.gov/mmwr/volumes/65/wr/mm6529e1.htm?s_cid=mm6529e1_w
https://emergency.cdc.gov/han/han00402.asp
## Clinical management of a pregnant woman with suspected Zika virus infection

<table>
<thead>
<tr>
<th>Interpretation of Laboratory Results*</th>
<th>Prenatal Management</th>
<th>Postnatal Management</th>
</tr>
</thead>
</table>
| **Recent Zika virus infection**      | Consider serial ultrasounds every 3–4 weeks to assess fetal anatomy and growth1  
Decision regarding amniocentesis should be individualized for each clinical circumstance2 | **LIVE BIRTHS:**  
Infant serum should be tested for RNA NAT. Infant serum should be tested for Zika IgM. If CSF is obtained for other reasons, it can also be tested.**  
Zika RNA NAT and IHC staining of umbilical cord and placenta is recommended.5  
**FETAL LOSSES:**  
Zika RNA NAT and IHC staining of fetal tissues is recommended.6 | |
| **Recent flavivirus infection; specific virus cannot be identified** | Consider serial ultrasounds every 3–4 weeks to assess fetal anatomy and growth1  
Amniocentesis might be considered; decision should be individualized for each clinical circumstance4 | **LIVE BIRTHS:**  
Infant serum and urine should be tested for RNA NAT. Infant serum should be tested for Zika IgM. If CSF is obtained for other reasons, it can also be tested.**  
Zika RNA NAT and IHC staining of umbilical cord and placenta should be considered.1  
**FETAL LOSSES:**  
Zika RNA NAT and IHC staining of fetal tissues should be considered.9 | |
| **Presumptive recent Zika virus infection*** |  |  |
| **Presumptive recent flavivirus infection*** |  |  |
| **Recent dengue virus infection** | Clinical management in accordance with existing guidelines (http://apps.who.int/iris/bitstream/10665/44188/1/9789241547871_eng.pdf). |  |
| **No evidence of Zika virus or dengue virus infection** | Prenatal ultrasound to evaluate for fetal abnormalities consistent with congenital Zika virus syndrome.7  
Fetal abnormalities present: repeat Zika RNA NAT 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
• Prevent mosquito bites
  • Remind women who have confirmed or presumptive recent Zika virus infection to protect themselves from mosquito bites to prevent passing Zika virus to others

http://www.cdc.gov/mmwr/volumes/65/wr/mm6529e1.htm?s_cid=mm6529e1_e
CDC Materials for Pregnant Women with Suspected Zika Virus Infection

CDC's Response to Zika

What You Should Know About Zika Virus Testing

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

Focus on your current pregnancy and specifically to stay safe from Zika, as many have been asked about Zika and how to find out if you have been infected. Keep in mind that many different viruses can cause problems in pregnancy.

Zika testing is complex

- You need to visit a clinic that can test for Zika, and patients who have been tested for Zika may have been infected. You may need to request several tests for the Zika virus.
- Understanding how tests work: Zika is a virus that is similar to other viruses. For example, if you have influenza or the common cold, you may have been misdiagnosed. Sometimes you may not be tested for Zika, and this is important. It is important to know that you may not be tested for Zika.

Pretest counseling: how to talk about Zika testing

For Pregnant Women with Possible Exposure to Zika and Symptoms onset within the Past Two Weeks

This guide describes recommendations for counseling pregnant patients about Zika virus infection and for pregnant women who may have been exposed to Zika virus whether or not they have tested positive. The text includes: estimated cost of Zika testing and obtaining information and obtaining information on how to obtain the information you need.

Sample of what to discuss

- Risk of transmitting Zika: Presumptive Zika infection is confirmed by viral culture, and testing is performed on serum or plasma samples from pregnant women. Sometimes, these samples are not received in time for testing. Zika may also be diagnosed by molecular tests if required. Sometimes, these samples are not received in time for testing.

What happens when I am tested for Zika and when will I get my results?

If you test positive, what does it mean?

If you test positive and you are pregnant, it means that you are infected with the Zika virus. If you test negative, it means that you are not infected with the Zika virus. If you test positive, it means that you are likely infected with the Zika virus. If you test negative, it means that you are not infected with the Zika virus. If you test positive,

1. What happens next?
   - If you test positive, your doctor may refer you for additional testing. Your doctor may want to contact your Zika virus testing laboratory and provide you with information on how to obtain the information you need.

2. What are the symptoms of Zika virus infection?
   - Zika virus infection is characterized by fever, rash, joint pain, and sometimes other symptoms. These symptoms are typically mild and self-limiting. Zika virus infection is most often diagnosed by a combination of symptoms and testing. If you have symptoms, you should contact your doctor or healthcare provider.

3. How can I protect myself from Zika virus infection?
   - To protect yourself from Zika virus infection, it is important to take certain steps. These steps include:
     - Avoiding travel to Zika-affected areas
     - Using insect repellent
     - Wearing long-sleeved shirts and long pants
     - Staying indoors at night
     - Using air conditioning
     - Covering windows with screens

4. How can I prevent Zika virus infection?
   - To prevent Zika virus infection, it is important to take certain steps. These steps include:
     - Avoiding travel to Zika-affected areas
     - Using insect repellent
     - Wearing long-sleeved shirts and long pants
     - Staying indoors at night
     - Using air conditioning
     - Covering windows with screens

5. What are the signs and symptoms of Zika virus infection?
   - The signs and symptoms of Zika virus infection can include:
     - Fever
     - Rash
     - Joint pain
     - Headache
     - Nausea or vomiting
     - Photophobia

6. How can I prevent Zika virus infection?
   - To prevent Zika virus infection, it is important to take certain steps. These steps include:
     - Avoiding travel to Zika-affected areas
     - Using insect repellent
     - Wearing long-sleeved shirts and long pants
     - Staying indoors at night
     - Using air conditioning
     - Covering windows with screens

For more information, please visit the CDC website: http://www.cdc.gov/zika/hc-providers/index.html
CDC Guidance: Infants with Possible Congenital Zika Virus Infection
Update Posted April 2017: New Considerations

- **Evaluation and Testing: Congenital Zika Virus Infection**
  
  - New considerations and clarifying information to update the [August 2016 MMWR](https://www.cdc.gov/zika/pdfs/placental-testing-guidance.pdf)
  

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
  • Test without waiting for maternal test results when infant has clinical or
    neuroimaging findings suggestive of CZS
  » The mother’s Zika virus testing results
  • All infants born to mothers with laboratory evidence of Zika virus infection should
    receive:
    • A comprehensive physical exam
    • Neurologic assessment
    • Head ultrasound
    • Zika virus testing
    • Hearing screen
• Test infant before hospital discharge if concerns of loss to follow-up

Infants with Possible Congenital Zika Virus Infection

- Congenital Zika virus infection can be diagnosed by NAT and through serologic testing
- Collect specimens within 2 days of birth when possible
  » Specimens collected outside this period may still be useful

Mother with laboratory evidence of Zika virus infection during pregnancy*

Perform a comprehensive physical exam on infant, head ultrasound, standard newborn hearing assessment and infant Zika virus laboratory testing

Infant with findings consistent with congenital Zika virus syndrome

Infant without findings consistent with congenital Zika virus syndrome

Testing Babies for Zika Virus Infection: New Considerations

- **Testing of cerebrospinal fluid (CSF)**
  - Consider obtaining CSF for Zika virus RNA and IgM antibody testing in infants with clinical findings of possible CZS but whose initial laboratory tests are negative on serum and urine
  - **Placental Testing**
    - Consider [testing of the placenta](https://www.cdc.gov/zika/hc-providers/infants-children/evaluation-testing.html) for Zika virus PCR
Infants with Possible Congenital Zika Virus Infection

Recommendations for follow up depend on whether these infants have abnormalities consistent with CZS

Initial Evaluation

Infants with abnormalities consistent with CZS born to a mother with lab evidence of Zika virus infection

- Before hospital discharge:
  - Routine newborn care: physical exam, including occipitofrontal (head) circumference, weight, length
  - Neurologic exam
  - 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

https://www.cdc.gov/mmwr/volumes/65/wr/mm6533e2.htm?s_cid=mm6533e2_w
Consult with Specialists

Infants with abnormalities consistent with CZS and lab evidence of Zika virus infection

• 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 CZS and lab evidence of Zika virus infection

Consultation with the following should also be considered:

- Orthopedist, physiatrist, physical medicine, rehabilitation physician, and physical therapist to manage hypertonia, club foot, or arthrogrypotic-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 CZR and lab evidence of Zika virus infection

- 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
- Refer to appropriate specialists
- Provide information about family support services
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
  - Conduct developmental monitoring, encourage caregivers to monitor child’s development.
  - Emphasize anticipatory guidance for families.
  - Perform developmental screening at 9 months, or earlier if parental or provider concerns.
  - Refer to ophthalmology within one month of birth. Perform vision screening at every 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
  - Refer to appropriate specialists
  - Provide information about family support services
Pediatric Evaluation and Follow-Up Care: New Considerations

- Imaging
  - Perform a head ultrasound before hospital discharge or within 1 month of birth for infants with possible Zika virus infection
  - For infants with a small or absent anterior fontanelle and poor visualization of the intracranial anatomy on ultrasound, other imaging (i.e., magnetic resonance imaging or computed tomography) should be considered
Initial Evaluation & Outpatient Management

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

- 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, liver function tests (LFTs)
  - Vision screening and assessment of visual regard
  - ABR testing
- Consider
  - Testing placenta for Zika virus
  - Further neuroimaging if available
  - Transfer to hospital with subspecialty care
- Any children identified with or suspected of delays should be referred to early intervention programs
Pediatric Evaluation and Follow Up: New Considerations

• Maintain a level of suspicion
  • For infants without laboratory evidence of Zika virus infection but for whom suspicion for congenital Zika virus infection remains, healthcare providers should
    » Evaluate for other causes of congenital infection
    » Consider an ophthalmology exam and auditory brainstem response hearing test before hospital discharge or within 1 month of birth
    » Consider performing other evaluation and follow up in accordance with CDC guidance
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

Preventing Zika Virus Infection
Do Not Travel to Areas with Risk of Zika

• Pregnant women should **not** travel to areas with risk of 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 and after 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 risk of 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
• Treat clothing and gear with permethrin
• 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 risk of 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 or her partner does not have symptoms or feel sick.
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 in 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 the healthcare provider’s (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 virus 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: (800-232-4636)

http://www.cdc.gov/zika
Developing Tools for Healthcare Providers


*Free materials available in English, Spanish, and other languages
Resources for Families

For more resources to share with families visit http://www.cdc.gov/zika/fs-posters/index.html
Available in English, Spanish and other languages
Zika Care Connect: Improving Access to Clinical Services

1. Referral Network
   Identify specialty healthcare providers
   • Maternal-fetal medicine, mental health services, audiology, radiology, pediatric ophthalmology, pediatric neurology, developmental pediatrics, infectious disease, and endocrinology
   • Consider joining the network if you are a healthcare professional located within one of the 10 Zika Care Connect focus areas
   • Planned expansion to additional jurisdictions in mid-2017

2. Professional Resources
   Information for healthcare professionals caring for patients with Zika
   • Links to materials from AAP, ACOG, CDC, and March of Dimes
   • Contact information for the CDC Zika Pregnancy Hotline
   • Planned expansion to additional jurisdictions in mid-2017
   • Planned expansion to include laboratories that can test for Zika in mid-2017

HelpLine: 1-844-677-0447 (toll-free)
Website: www.zikacareconnect.org
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 Cases to US Zika Pregnancy Registry

• Healthcare providers are encouraged to report and actively monitor pregnancies and congenital outcomes among symptomatic and asymptomatic women with laboratory evidence of possible Zika virus infection

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

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

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)

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.