

# Zika:

## Resources at Your Fingertips

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This document provides Zika virus disease resources and an overview of public health and healthcare system considerations and implications that are applicable to professionals in those systems, emergency management stakeholders, and other audiences. **Appendix A** contains resources from the U.S. Department of Health and Human Services (HHS) Office of the Assistant Secretary for Preparedness and Response (ASPR) and relevant contact links. **Appendix B** includes citations with annotations for additional relevant resources and Zika Guidance. Finally, individuals can review ASPR TRACIE (Technical Resources, Assistance Center, and Information Exchange) [Topic Collections](#), which provide a wide array of materials and resources for further research.

This document and its hyperlinks/guidance references are current as of **May 9, 2016**. Changes since the last update are indicated in RED FONT and all changes or additions since the original publication include the date of inclusion or update. Information on Zika is constantly evolving, therefore if you are a clinician treating a patient, please check the Centers for Disease Control and Prevention (CDC) [Zika site](#) for the most current information and clinical guidance.

### What is Zika Virus?

Zika virus is transmitted through the bite of an infected *Aedes* species mosquito. It is a single-stranded RNA virus of the genus Flavivirus (the same family as dengue). Illness is usually mild – current data show that most people infected will not become symptomatic. Symptoms (fever, rash, joint pain and conjunctivitis) typically resolve in a few days to a week without any medical intervention. The illness is rarely severe though Zika illness has been linked to rare cases of Guillain-Barré syndrome (ascending paralysis).

More concerning is the confirmed linkage between [Zika virus infection in pregnant women and microcephaly and other severe fetal brain defects](#). (Updated May 9, 2016) This linkage and the spectrum of potential Zika-mediated neurologic syndromes is being actively investigated. Women who contract Zika virus during pregnancy are at risk, though the timing and magnitude of the risk are not well defined. [Microcephaly](#) is a birth defect where a baby's head is smaller than expected when compared to babies of the same sex and age. Babies with microcephaly

typically have smaller brains that might not have developed properly. Zika virus' effects on neurological function may result in a spectrum of neurological disorders, not simply causing brain damage leading to microcephaly in utero or Guillain-Barre in pediatric and adult patients. Due to the clusters of microcephaly and other neurological syndromes potentially linked to the spread of Zika virus, the World Health Organization (WHO) declared the situation a [Public Health Emergency of International Concern](#) February 1, 2016. Zika virus is a [Nationally Notifiable Condition](#), so healthcare providers must notify their local/State health departments according to the laws or regulations for reportable diseases in their jurisdiction. (Updated May 9, 2016)

Access the [Patient Care](#) section of this document for information on Prevention, Transmission, Presentation, and Treatment.

### Where is Zika Virus Found?

Zika virus was first discovered in the Zika forest in Uganda in 1947. Prior to 2015, Zika virus was found in Africa, Southeast Asia, and the Pacific Islands. The largest outbreak to date occurred in French Polynesia during 2013-2014. A recent retrospective analysis of this outbreak conducted by French Polynesian health authorities after cases of microcephaly were identified in Brazil, found increases of cases of microcephaly.

In May 2015, the Pan American Health Organization (PAHO) issued an alert for the first confirmed patient in Brazil. A significant increase in reported cases of microcephaly has occurred simultaneous to spread of the virus in Brazil. Many countries in Central and South America, the Caribbean, West Africa, Pacific Islands, and U.S. Territories report local transmission of the virus. (Updated May 9, 2016) Zika virus is not currently being transmitted by mosquitoes in the continental U.S., but there have been cases reported in travelers who visited affected countries and there is active transmission in American Samoa, Puerto Rico and the U.S. Virgin Islands (CDC, 2016). Though we cannot predict how widespread cases of Zika virus may be in the continental United States, recent chikungunya and dengue outbreaks indicate that we are not likely to experience the same type of rapid spread Zika virus infection currently occurring elsewhere. Local transmission of the virus is anticipated to be small and focal.



Figure 1. [Zika virus spread worldwide and in the Americas](#). Centers for Disease Control and Prevention, May 9, 2016.

## Zika Virus Mosquito Vectors and Where They are Found

Figure 1 shows countries that have reported local transmission of Zika virus. Figure 2 shows locations within the continental U.S., where *Aedes aegypti* and *Ae. albopictus* mosquitoes, the primary vectors of Zika, dengue, and chikungunya viruses, are found. These *Aedes* mosquitoes have been found in 30 states and the District of Columbia, including the southeastern U.S., up the east coast to New York, and west to Indiana, Ohio, and Kentucky. These are areas at potential risk of local transmission of Zika virus (and also areas of potential transmission of dengue, chikungunya, and other diseases spread by *Aedes* mosquitoes). *Aedes* mosquitoes that spread Zika virus are aggressive daytime biters, but they can also bite at night. *Aedes* mosquitoes breed in small collections of water and seldom venture far from where they were born, making control particularly difficult. Outside of the continental U.S., *Aedes* mosquitoes have been found in the following states and territories: Hawaii, Puerto Rico, American Samoa, Guam, Northern Mariana Islands, and the U.S. Virgin Islands. Zika is spread from an infected mosquito-person-mosquito. The virus can spread to new areas where *Aedes* mosquitoes are known to exist when an infected, viremic traveler from an endemic area is bitten by a mosquito and that person transmits the virus to the mosquito, causing a new transmission chain to begin. Sustainment of that transmission depends on many variables, however, and does not assure that local transmission will continue. Once a mosquito is infected with Zika virus, it will remain infected for life. A mosquito lifespan is up to 30 days. (Updated May 9, 2016)

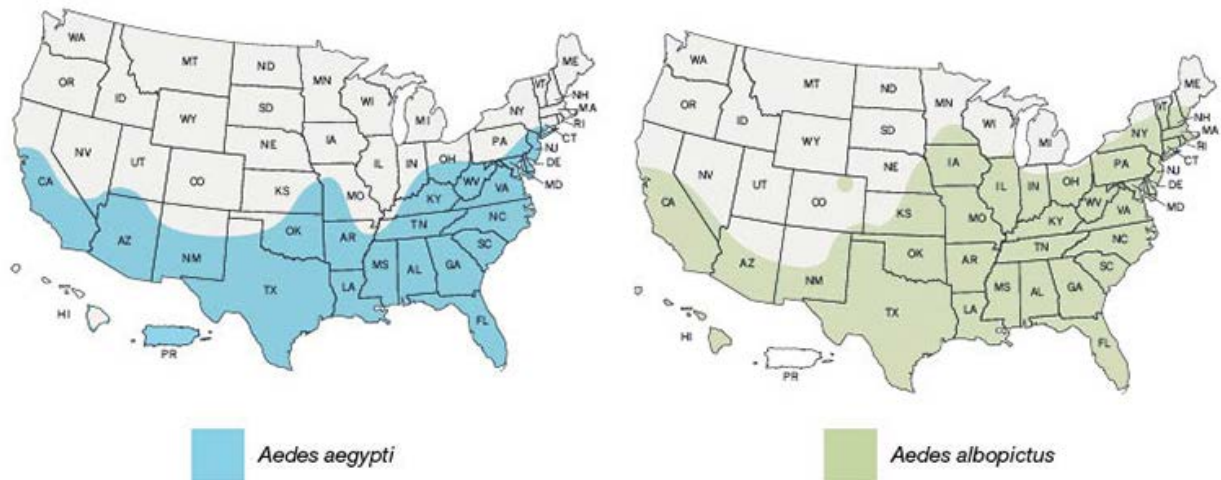


Figure 2. Estimated CONUS Aedes mosquito distribution. Graphic Courtesy of CDC. Updated May 9, 2016.

### Can Zika Virus be Transmitted Person to Person?

Although there is evidence that Zika virus can be [sexually transmitted \(male to female \[updated April 8, 2016\] and male to male \[updated May 9, 2016\]\)](#), and transmitted from a mother to her fetus during pregnancy, there is no evidence it can be transmitted through casual contact or through air. There are indications that it is possible to transmit Zika through a [blood transfusion \(updated April 8, 2016\)](#), so providers should, as always, use standard precautions for personal protection when dealing with blood and blood products.

[Current guidelines for prevention of sexual transmission](#) are as follows [\(updated May 9, 2016\)](#):

- Couples, who include a man who has been diagnosed with Zika or had symptoms of Zika, should consider using condoms or not having sex for at least 6 months after symptoms begin. This includes men who live in and men who traveled to areas with Zika.
- Couples, who include a man who traveled to an area with Zika but did not develop symptoms of Zika, should consider using condoms or not having sex for at least 8 weeks after their return.
- Couples, who include a man who lives in an area with Zika but has not developed symptoms of Zika, should consider using condoms or not having sex while there is Zika in the area.

Zika virus has been [detected in semen](#) up to eight weeks after the onset of febrile illness and [very high concentrations of live virus have been detected in semen at 2 weeks.](#) [\(Updated May 9, 2016\)](#)

## How do Clinicians [Test for Zika Virus Disease?](#)

Molecular diagnosis, via polymerase chain reaction (PCR) testing, is available for Zika virus disease through CDC and select public health laboratories; however, the test is only positive during acute infection, approximately the first 7 days after onset of symptoms. Serologic diagnosis, through IgM testing, is often difficult to interpret in people who have been previously infected with another flavivirus (like dengue) due to antibody cross-reaction. In addition, because there is currently a limited number of laboratories capable of Zika testing, laboratory capacity cannot support widespread testing of the general population. Serologic testing for IgM antibodies should be offered to asymptomatic pregnant women who have traveled to locations with active Zika virus disease transmission within 2-12 weeks of return. Pregnant women with sexual partners who have traveled to areas with active Zika virus disease transmission should consult with their healthcare providers. A positive serologic test will require additional assays to determine the exact virus, but a negative test effectively rules out Zika virus exposure. Contact your local/state health department for local testing policies and procedures. The U.S. Food and Drug Administration has issued an [Emergency Use Authorization to authorize the use of Focus Diagnostics, Inc.'s Zika Virus RNA Qualitative Real-Time RT-PCR test by qualified laboratories](#). This is the first commercially available test to be authorized for emergency use (updated May 9, 2016).

## How is Zika Virus Disease Treated?

There is no specific treatment for Zika virus disease. Supportive care and symptom management are the best options. No vaccination currently exists. It is important to note that Zika virus disease is transmitted by the same mosquitoes that spread chikungunya and dengue viruses, therefore all three diseases should be considered in any patient with consistent signs and symptoms. The mainstay of disease management is prevention. Pregnant women should be referred to their provider for further evaluation and treatment.

For more information about Zika virus disease and the current outbreak, including guidance for clinicians, visit the [CDC Zika virus website](#).

## Why is Zika Virus Disease a Public Health and Healthcare Systems Concern?

Zika virus is an emerging pathogen and our understanding of it is still evolving. The major reason that Zika virus disease is a public health concern is due to the implications for women in endemic areas or traveling to endemic areas who are pregnant or considering pregnancy and the potential neurological sequela that may present in some patients (updated May 9, 2016). Zika virus disease has been identified in [fetal and placental tissues](#) of fetuses with severe congenital abnormalities although little is known about the specific rates of transmission nor the risks and timing of [congenital malformations](#) (updated May 9, 2016). Though the brain damage and associated microcephaly have attracted the most attention, it is likely that Zika

causes a broader spectrum of neurologic disease which is still being investigated. As there is no specific treatment or “cure” for Zika virus disease and symptoms of acute infection are usually mild and self-resolving, the most important steps for public health emergency managers relate to prevention, mitigation, and risk communication. Healthcare providers should familiarize themselves with the signs and symptoms of Zika virus, take travel histories of their patients and the sexual partners of pregnant women, and follow CDC guidance on diagnostic testing for Zika virus in pregnant women and monitoring of pregnant women with evidence of Zika virus infection. Women in endemic areas face difficult choices about conceiving with no clear endpoint aside from vaccine availability or the end of the epidemic, and those who have visited or have a partner that have visited an endemic area may have to carefully consider their options, test, and take precautions for months afterwards.

## Key Points for Consideration and Resources by Profession/Facility

### Clinicians/Healthcare Providers

#### Preparedness

- Monitor outbreak information and changes or updates to [CDC medical management guidance](#) and from public health departments or healthcare coalitions.
- In the U.S., Zika testing is limited, although the CDC is working to expand capacity ([updated May 9, 2016](#)). Contact the state health department to facilitate testing. Ensure a plan is in place for transporting laboratory samples to designated labs for confirmatory testing.
- Familiarize yourself with [CDC testing criteria](#) (updated April 8, 2016) for Zika virus in pregnant women and children, patients with Guillain-Barré, and those with a history of travel to an area with local Zika virus transmission.
- Continue to collect travel histories during healthcare assessments for: (1) symptoms suggestive of mosquito-borne illness, and (2) all pregnant patients and their sexual partners. ([Updated May 9, 2016](#))

#### Patient Care

- Prevention
  - There is currently no vaccine.
  - Healthcare providers should discuss Zika infection with [women of reproductive age](#), residing in or planning travel to areas with active Zika virus transmission. (Updated April 8, 2016) Currently, both ACOG and the Society for Maternal – Fetal Medicine recommend that asymptomatic women and men with possible exposure to Zika virus wait at least eight weeks after exposure before attempting

pregnancy. Women of reproductive age who are diagnosed with Zika disease should also wait at least eight weeks, while viremic men should wait at least six months after symptom onset to attempt pregnancy ([ACOG-SMFM Practice Advisory 3-31-16](#)). (Updated May 9, 2016)

- Access to barrier contraception should be assured for patients and partners at potential risk. (Updated May 9, 2016)
- This [Preconception Guide](#) can be used to frame the discussion. (Updated April 8, 2016)
- Because Zika infection is a cause of severe congenital disease, pregnant women (and those anticipating becoming pregnant in the next few months) who cannot avoid travel to endemic areas should strictly follow steps to [prevent mosquito bites](#) (updated May 9, 2016). Providers should counsel pregnant women in [mosquito avoidance](#).
- Serologic testing should be offered for *all* pregnant women regardless of symptoms who have traveled to areas with ongoing Zika virus transmission within 2-12 weeks of return from travel.
- If a pregnant woman has a male sex partner who lives in or has traveled to an area with Zika virus transmission, he or she should use a condom every time they have sexual intercourse or should not have sexual intercourse with that male partner during the pregnancy. (Updated May 9, 2016)
- Transmission
  - Primary mode of transmission of Zika virus is a bite from an infected mosquito.
  - Perinatal and sexual transmission, as well as transmission via blood transfusion have been reported, including new research on [male to male sexual transmission](#). (Updated May 9, 2016)
  - Incubation period is 2-7 days, but other arboviral diseases, like dengue and chikungunya can take up to two weeks.
- Presentation
  - Most people infected with Zika virus will not become symptomatic (updated May 9, 2016).
  - Illness is usually mild, lasting several days to a week.
  - Acute onset of fever with maculopapular rash (flat, red area on skin covered by small bumps), arthralgia (joint pain), and/or conjunctivitis (inflammation of the inner surface of the eyelid and outermost layer of the eye) may occur.
  - Myalgia (muscle pain) and headache are also reported.
  - Hospitalization for acute Zika infection is uncommon. Deaths are rare.

- A marked increase in the number of babies born with congenital neurologic damage has been reported in areas experiencing Zika virus disease outbreaks and a causal link from Zika virus infection to neurological syndromes including microcephaly and [Guillain-Barré syndrome](#) has been confirmed (updated May 9, 2016). Pregnant women presenting with Zika virus disease symptoms should be evaluated according to the [Interim Guidelines for Health Care Providers Caring for Women of Reproductive Age with Possible Zika Virus Exposure— United States, 2016](#). (Updated April 8, 2016)
- The CDC Zika Pregnancy Hotline for Health Care Providers (770-488-7100) provides 24/7 consultative services for questions and concerns related to clinical management. (Updated May 9, 2016)
- Practitioners evaluating infants for congenital neurologic changes should use this [case definition](#). (Updated April 8, 2016) Because it is difficult to predict at birth what problems babies will have, babies with specific findings or likely in utero exposure need close follow-up through regular check-ups with a doctor or other healthcare provider to track their growth and development. (Updated May 9, 2016)
- Cases of [Guillain-Barré](#) have been reported, which could result in the need for intensive care and mechanical ventilation – unlikely to reach levels of significant impact on the healthcare system, but localized surges requiring specialized care could be possible. In endemic areas, intensive care may not be available. (Updated May 9, 2016)
- Treatment
  - There is no “cure” or treatment specific to Zika virus disease.
  - Symptoms of acute Zika virus infection can be treated with supportive care.
  - Do **not** give NSAIDS—for example acetyl- salicylic acid (aspirin) and ibuprofen— until dengue infection can be ruled out. These drugs thin the blood and can increase the risk of bleeding. Fever and pain can be addressed with acetaminophen. (Updated May 9, 2016)
  - Be prepared for a possible increase in demand for specialized care for patients with Guillain-Barré syndrome— while unlikely to result in a surge in demand for critical care resources, the potential for Guillain-Barré syndrome and other neurologic sequelae should be prepared for in a diligent and determined manner. The potential for a cluster of cases certainly exists, while the availability of clinicians with expertise in the management of Guillain-Barré syndrome may be limited, especially in certain geographic locations. (Updated May 9, 2016)



- Be prepared to strengthen antenatal care and ensure availability of fetal ultrasound capability as well as antenatal counseling and support.
- Confirmatory [laboratory testing](#) is recommended for pregnant women with recent travel history to areas with local Zika virus transmission, [microcephalic](#) (Updated April 8, 2016) infants born to mothers with relevant travel history and positive or inconclusive Zika virus diagnostic test results, and patients presenting with Guillain-Barré or other neurologic syndromes and a travel history to areas with ongoing transmission of Zika virus.
  - Currently, Zika serologic tests are cross-reactive if the patient has been previously infected with other flaviviruses (e.g., yellow fever and dengue). In these cases, positive Zika IgM tests need further testing to attempt to rule out the possibility of a false positive.
- Little is known about Zika virus disease behavior in immunocompromised patients. We do not currently have data on risk factors for severe Zika virus disease. We do know that for West Nile virus, a related flavivirus, immunosuppression does appear to be a risk factor for more severe disease. Similarly, serious adverse events are more likely following administration of live yellow fever vaccine, which is also a related flavivirus. However, we do not know whether Zika virus would pose a similar risk in immunosuppressed patients. The CDC has provided additional information on [HIV infection and Zika virus](#). (Updated May 9, 2016)
- To help prevent others from getting sick from local mosquito transmission, patients should be advised to strictly [follow steps to prevent mosquito bites during the first week of illness](#). (Updated May 9, 2016)

### Key Resources for Clinicians/Healthcare Providers

- [CDC Health Care Provider Guidance](#). (Updated April 8, 2016)
- [Interim Guidance for Healthcare Providers Caring for Women of Reproductive Age with Possible Zika Virus Exposure](#). (Updated April 8, 2016)
- [ACOG Practice Advisory](#). (Updated May 9, 2016)
- [Interim Guidance for Prevention of Sexual Transmission of Zika Virus](#). (Updated April 8, 2016)
- [Interim Guidelines for the Evaluation and Testing of Infants with Possible Congenital Zika Virus Infection](#).
- [CDC Symptoms, Diagnosis, & Treatment](#). (Updated April 8, 2016)
- [Fact Sheets and Posters](#). (Updated April 8, 2016)
- [Tools for Healthcare Providers](#). (Updated April 8, 2016)

- Memorandum: Revised diagnostic testing for Zika, chikungunya, and dengue viruses in US Public Health Laboratories.
- Zika Virus: Collection and Submission of Fetal Tissues for Zika Virus Testing. (Updated April 8, 2016)
- Estimating Contraceptive Needs and Increasing Access to Contraception in Response to the Zika Virus Disease Outbreak. (Updated April 8, 2016)
- US Zika Pregnancy Registry. (Updated April 8, 2016)
- Guidance for Organ Donation and Transplantation Professionals Regarding the Zika Virus. (Updated April 8, 2016)
- Surveillance and Services for Babies Affected by Zika. (Updated April 8, 2016)
- Worker Health and Safety Resources
  - Preventing Transmission of Zika virus in Labor and Delivery Settings Through Implementation of Standard Precautions. (Updated April 8, 2016)
  - Biosafety Guidance for Transportation of Specimens and for Work with Zika Virus in the Laboratory. (Updated April 8, 2016)
  - Interim Guidance for Protecting Workers from Occupational Exposure to Zika Virus. (Updated May 9, 2016)
  - WHO: Protecting the Health and Safety of Workers in Emergency
  - Vector Control of Aedes Mosquitoes. (Updated May 9, 2016)
  - NIOSH: Mosquito-Borne Diseases. (Updated May 9, 2016)
  - Society for Human Resource Management: The Zika Virus: What Employers Should Not Do. (Updated May 9, 2016)
  - EHS Today: The Zika Virus: Answers to Employers' FAQs. (Updated May 9, 2016)

## Emergency Manager/ Public Health Preparedness/ Healthcare System Emergency Management Professionals

### Prevention/Mitigation

- Community-based vector control/ bite prevention education in collaboration with environmental health entities
  - Community/Facility
    - Eliminate standing water and maintain brush.
    - Apply insecticide spray to outdoor areas as feasible.
    - Making netting and other prevention items available as appropriate.
  - Individuals

- Use insect repellent (as appropriate) and advise to follow label instructions.
  - Place netting over sleeping areas (e.g., beds, cribs) when screens are not available.
  - Avoidance of exposure is best and pregnant women/those considering pregnancy should delay travel to endemic areas when possible.
  - Refer to CDC guidance on [Prevention](#) for more specific steps. (Updated April 8, 2016)
- Risk communication
  - Provide clear instructions to the community about mosquito abatement and avoiding mosquitoes, particularly during biting hours. Refer to guidance on [controlling mosquitoes at home](#). (Updated May 9, 2016)
  - The community should be educated to purchase and properly use EPA-registered insect repellents containing one of the following active ingredients: DEET, picaridin, IR3535, oil of lemon eucalyptus, permethrin, or para-menthane-diol.
    - When used as directed, EPA-registered [insect repellents are proven safe and effective](#), even for [pregnant and breastfeeding women](#). Insect repellent should not be used on [infants younger than 2 months of age](#). (Updated May 9, 2016)
  - Share information with the community about signs and symptoms of Zika virus disease and when to seek medical evaluation or treatment.
    - [CDC Zika Fact Sheets and Posters](#). (Updated April 8, 2016)
  - Publicize travel advisories, targeting travelers, especially women who are pregnant or considering pregnancy.
    - [Current CDC Travel Advisories](#). (Updated May 9, 2016)
- Establish or enhance surveillance (in people and mosquitoes).
  - Conduct regular surveillance of and testing for mosquitoes. The use of GIS mapping of mosquito locations and abatement programs can show effectiveness and impact. (Updated May 9, 2016)
  - Screen patients for travel history to an area with ongoing Zika transmission.
    - Zika virus disease affected patients
    - Birth defect surveillance
    - Neurologic and autoimmune syndrome surveillance
    - Border screening is not an effective method of controlling vector-borne diseases and is not recommended for Zika management.
- [Blood donation](#) – click links for new national guidance that has been issued by the U.S. Food and Drug Administration. (Updated May 9, 2016)

- [Recommendations for Donor Screening, Deferral, and Product Management to Reduce the Risk of Transfusion Transmission of Zika Virus.](#) (Updated April 8, 2016)
- [Donor Screening Recommendations to Reduce the Risk of Transmission of Zika Virus by Human Cells, Tissues, and Cellular and Tissue-Based Products.](#)
- [Investigational Test to Screen Blood Donations for Zika Virus.](#) (Updated April 8, 2016)
- [Review emergency authorities and statutes](#) for any relief necessary.
- Prepare for major national and international events in Zika affected areas.
  - Summer Olympics in Brazil in August 2016 and numerous other sporting events in the Americas (approximately 200,000 people from the U.S. are expected to attend).
  - Paralympics in Brazil in September 2016.

### Preparedness/Response

- Monitor outbreak information and changes or updates to CDC medical management guidance.
  - Key roles of healthcare coalitions include:
    - Sharing guidance that comes out from federal, state, and local authorities, including updates.
    - Identifying local/regional experts (specifically, neurology, maternal fetal medicine, neonatology) who can interpret guidance and serve as regional discussant/subject matter experts.
    - Coordinating with public health departments on testing indications and process.
    - Coordinating public information about Zika virus disease.
- If local cases are detected in endemic areas (such as U.S. territories) with open-air homes/hospitals, consider bed netting, insect spray, or other mosquito prevention equipment for facilities and workers.
- Ensure a plan is in place for transporting laboratory samples to designated labs for testing. Because only one commercial test exists and it is in limited supply, ensure healthcare facilities have plans and policies in place that state under what situations testing is indicated. Wide-spread testing is NOT recommended and testing is often best carried out in the primary care or obstetric clinic setting since the results are not rapidly available.

### Recovery

- Continue surveillance and mosquito abatement, as appropriate.
- Evaluate any long-term health impacts to the community.

### Key Resources for Emergency Managers/ Public Health Professionals:

- [Surveillance and Control of \*Aedes aegypti\* and \*Aedes albopictus\* in the United States.](#) (Updated May 9, 2016)
- [Interim CDC Recommendations for Zika Vector Control in the Continental United States.](#) (Updated April 8, 2016)
- [CDC State Public Health Laboratory Diagnostic Testing Guidance.](#)
- Use the [HHS Response and Recovery Resources Compendium](#) to search the repository of HHS products, services, and capabilities available to state, tribal, territorial, and local agencies before, during, and after public health and medical incidents.
- [Insect Repellent Use and Safety.](#)
- [Insect Repellent Use During Pregnancy and DEET Use While Pregnant.](#)
- [Executive Orders and Emergency Declarations for the West Nile Virus: Applying Lessons from Past Outbreaks to Zika.](#) (Included March 9, 2016.)
- [Zika Communication Planning Guide for States](#) (Updated April 8, 2016)
- [Zika Virus Risk-Based Preparedness and Response Guidance for States.](#) (Updated April 8, 2016)
- [Top 10 Zika Response Planning Tips: Brief Information for State, Tribal, Local, and Territorial Health Officials.](#) (Updated April 8, 2016)
- [Zika Recommendations for State and Local Health Departments.](#) (Updated May 9, 2016)

### Veterinarians/ Animal Care Professionals

- At this time, animals do not appear to be involved in the spread of Zika virus. Zika virus was first discovered in a monkey with a mild fever in the Zika Forest of Uganda in the 1940s. However the prevalence of Zika virus in monkeys and other nonhuman primates is currently unknown. At this time there have been no reports of other animals becoming sick with Zika or of being able to spread Zika to people or other animals.
- For more information:
  - [Questions and Answers: Zika Virus and Animals.](#)

### Research / Development Agenda

- Development of a vaccine and pharmaceutical countermeasure or antiviral treatment.
- Develop laboratory tests (including point-of-care, real-time) to specifically diagnose Zika, Chikungunya, and Dengue fever.
- Define effective risk communication and behavior change methodologies for the U.S. public. (Updated May 9, 2016)

- Define transmissibility risks and duration, especially non-vector transmission via sexual and other means.
- Further define linkage to Guillain-Barré syndrome, microcephaly, and other potential effects.
- Efficacy and environmental impact of [genetically engineered mosquitoes](#). (Updated May 9, 2016)
- Define period of viremia and establish “safe period” of waiting prior to becoming pregnant after visiting endemic areas.

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## Appendix A: ASPR Resources

PHE.Gov serves as the key one-stop website for all federal public health and medical information sources and assets. The site is searchable for multiple resources.

<http://www.phe.gov>

The Technical Resources, Assistance Center, and Information Exchange (TRACIE) is a healthcare emergency information gateway that supports timely access to resources and promising practices, identifies and remedies knowledge gaps, and provides users with responses to a range of requests for technical assistance. <https://asprtracie.hhs.gov/>

The HHS Response and Recovery Resources Compendium is an easy to navigate, comprehensive web-based repository of HHS resources and capabilities available to federal, state, local, territorial and tribal stakeholders before, during, and after public health and medical incidents. <http://www.phe.gov/emergency/hhscapabilities/Pages/default.aspx>

## Appendix B: Full References with Annotations

American College of Obstetricians and Gynecologists. (2016). [Practice Advisory: Interim Guidance for Care of Obstetric Patients During a Zika Virus Outbreak](#).

This joint message from the American College of Obstetricians and Gynecologists and the Society for Maternal Fetal Medicine mirrors the current Interim Guidance issued by the Centers for Disease Control and Prevention (CDC) for the management of pregnant women presenting with symptoms consistent with Zika Virus disease infection. This publication includes a visual algorithm for assessment, diagnosis, and treatment of a pregnant woman.

American Medical Association. (2016). [Zika Virus Resource Center](#).

This webpage provides a compilation of resources relate to Zika virus disease.

Bogoch, I., Brady, O.J., Kraemer, M., et al. (2016). [Anticipating the International Spread of Zika Virus from Brazil](#). The Lancet. Volume 387.

Through evaluation of travel patterns from current countries with Zika Virus disease spread and mosquito habitation patterns, the authors have predicted possible Zika Virus disease spread throughout the Americas, including the U.S. The authors have included a predictive map.

Brasil, Patricia, et al. (2016). [Zika Virus Infection in Pregnant Women in Rio de Janeiro – Preliminary Report](#). The New England Journal of Medicine.

Researchers in Rio de Janeiro enrolled 88 pregnant women in a prospective study, where they were tested for Zika virus and then followed throughout their pregnancies. 72 of the 88 women enrolled tested positive for Zika virus infection. The authors concluded that “despite mild clinical symptoms, Zika virus infection during pregnancy appears to be associated with grave outcomes, including fetal death, placental insufficiency, fetal growth restriction, and CNS injury.”

Center for Infectious Disease Research and Policy. (2016.) [Zika Resource Page](#).

This webpage offers a compilation of resources on Zika Virus disease including governmental publications, academic publications, research pieces, and popular media mentions. The compilation is updated regularly.



Centers for Disease Control and Prevention. (2016). [Executive Orders and Emergency Declarations for the West Nile Virus: Applying Lessons from Past Outbreaks to Zika.](#)

This document provides an overview of Executive Orders and Emergency Declarations issued by states and territories in the past, due to West Nile Virus, and how those authorities may be used to support prevention, response, and recovery actions for Zika virus.

Centers for Disease Control and Prevention. (2016). [Top 10 Zika Response Planning Tips: Brief Information for State, Tribal, Local, and Territorial Health Officials.](#)

This summary of key Zika virus resources is a ready reference and aid for response planning for state, local, and territorial public health officials.

Centers for Disease Control and Prevention. (2016). [Zika Virus.](#)

This website provides the Centers for Disease Control and Prevention resources related to Zika Virus disease including current transmission and spread information, current clinical recommendations, and prevention and mitigation information. This page is updated regularly.

Centers for Disease Control and Prevention. (2016). [Zika Virus Action Planning.](#)

This website includes links to the video and presentations from the day-long workshop “Zika Virus Action Planning” held April 1, 2016.

Centers for Disease Control and Prevention. (2016). [Zika Virus Risk-Based Preparedness and Response Guidance for States.](#)

This document is designed to provide public health officials with actions to consider in the first hours or days upon laboratory confirmation of the first locally acquired case of Zika virus infection.

Lima, A, Lovin, D.D., Hickner, P.V., et al. (2015). [Evidence for an Overwintering Population of \*Aedes aegypti\* in Capitol Hill Neighborhood, Washington, DC.](#) The American Journal of Tropical Medicine and Hygiene. 94(1):231-5.

This article describes a research study demonstrating that *Aedes aegypti* mosquitoes were present in samples taken in Capitol Hill, Washington, DC throughout 2011-2014.

These mosquitoes were not previously thought to travel further north than the average 10 degree Celsius isotherm.

Lucey, Daniel. (2016). [Will Zika Virus and Microcephaly Epidemics Emerge After Ebola in West Africa? The Need for Prospective Studies Now](#). Health Security.

The author discusses the emerging cases of Zika virus in Cape Verde, West Africa and the need to begin surveillance and mosquito control to prevent more transmission. The author also discusses the timeline of the epidemic, beginning in October 2015 and predicting an increase in cases of microcephaly in May/June 2016, from mothers infected with Zika virus who have not been properly screened and evaluated.

Lucey, D.R., and Gostin, L.O. (2016). [The Emerging Zika Pandemic: Enhancing Preparedness](#). Journal of the American Medical Association. 315(9):865-866.

This article discusses the current outbreak of Zika Virus disease and discusses why it is a concern for the U.S. public health and healthcare systems. The authors describe steps that should be taken now to prevent and mitigate spread and steps that should be taken to prepare. The article also outlines a Zika Virus disease research agenda.

Malakar, J., et al. (2016). [Zika Virus Associated with Microcephaly](#). New England Journal of Medicine. 374(10): 951-958. (Included May 9, 2016)

This article discusses a case report of an expectant mother infected with Zika during the end of her first trimester while in Brazil. Serial ultrasounds at 14 and 20 weeks showed normal fetal growth and anatomy. An ultrasound performed at 29 weeks confirmed intrauterine growth retardation and fetal anomalies. Medical termination of the pregnancy occurred at 32 weeks of gestation. Fetal autopsy findings detail the severe brain injury and placental damage associated with the infection. Genome sequence identity was also performed.

National Library of Medicine. (2016). [Zika Virus Health Information Resources](#).

This resource is a comprehensive collection of Zika Virus disease-related resources from the U.S. and abroad. It is compiled and updated regularly from the National Library of Medicine.

Network for Public Health Law, The. (2016). [Primer: Emergency Legal Preparedness Concerning Zika Virus](#).

This primer, presented in a PowerPoint format, outlines public health concerns from Zika Virus disease and discusses potential legal issues in the U.S. and abroad.

Pan American Health Organization. (2016). [Epidemiological Update: Neurological Syndrome, Congenital Anomalies, and Zika Virus Infection](#).

This document is the latest in a series of epidemiological updates provided by the Pan American Health Organization. It highlights the specific issues related to the correlation between Zika Virus disease outbreaks and the increase in neurological syndromes, including Guillain-Barre syndrome and congenital anomalies, specifically microcephaly. The document details recommendations for management, increased surveillance and other public health recommendations.

Pan American Health Organization. (2016). [Zika Virus Infection](#).

This website provides an outline of the disease and its progression specifically in the Americas. It provides information for the general public and health professionals on disease spread, identification, treatment and prevention.

Rasmussen, Sonja, et al. (2016). [Zika Virus and Birth Defects – Reviewing the Evidence for Causality](#). The New England Journal of Medicine. (Included May 9, 2016)

The authors evaluated available data to determine causality of Zika infection and birth defects, most notably microcephaly. This evidence included Zika virus infection during specific times in pregnancy, a specific rare phenotype involving microcephaly, and data that support biologic plausibility. The researchers concluded that the evidence supports a causal relationship between Zika virus infection and birth defects.

Schuchat, A. (2016). [Zika 101](#). Centers for Disease Control and Prevention.

Written by Dr. Anne Schuchat, Principal Deputy Director of the CDC, this blog provides a clear and easy-to-read question and answer format on Zika Virus disease. The blog describes Zika Virus disease, how it is spread, signs and symptoms, prevention and protective measures, spread in the U.S., and what the Department of Health and Human Services is doing to prepare for Zika Virus disease in the US.

Tang, Hengli, et al. (2016). [Zika Virus Infects Human Cortical Neural Progenitors and Attenuates Their Growth](#). Cell Stem Cell. 18, 1–4

Researchers working with Zika virus and human neural cells, showed that Zika virus does infect the neural cells and affects their ability to replicate and survive.

Vasquez, Amber, et al. (2016.) [Survey of Blood Collection Centers and Implementation of Guidance for Prevention of Transfusion-Transmitted Zika Virus Infection – Puerto Rico, 2016](#). Morbidity and Mortality Weekly Report. (Included May 9, 2016)

The authors have gathered information on blood collection operations in Puerto Rico to assess the impact restricting blood collection, due to Zika virus, is having and what would be needed to replace the products being impacted.

Vestin, Natalie. (2016). [Zika outbreak expands in West Africa, Americas](#). Center for Infectious Disease Research and Policy. (Included May 9, 2016)

This article highlights the Zika virus outbreak in Cape Verde, and includes information on the outbreak in Panama and Honduras.

World Health Organization. (2016). Zika App. [Android](#). [iOS](#).

The official World Health Organization (WHO) Zika App. Get the latest information for healthcare workers from WHO on the Zika virus disease by downloading this app.

World Health Organization. (2016). [Zika Virus and Complications: Questions and Answers](#). (Included May 9, 2016)

This webpage provides responses to commonly asked questions about Zika virus and mosquito protection and surveillance, sexual transmission, travel, neurological syndromes, pregnancy, and government response.

World Health Organization. (2016). [WHO Announces a Public Health Emergency of International Concern](#).

This link provides the official statement from the World Health Organization Director-General declaring Zika Virus disease a Public Health Emergency of International Concern. The declaration was made on February 1, 2016 after convening a meeting of the International Health Regulations (2005) Emergency Committee on Zika Virus disease.

World Health Organization. (2016). [Zika Virus](#).

This website provides an outline of the disease and its progression around the world. It provides information on signs and symptoms, transmission, diagnosis, treatment, and prevention from the World Health Organization. Situation Reports on the current outbreak can also be found [here](#).