Chikungunya Virus Disease Case Investigation, Diagnosis, and Response for Regional and Local Health Departments*

* Based on CDC guidance for State Health Departments distributed July 22, 2014

Scenarios

1. Patient with clinical illness but chikungunya virus testing not yet performed
2. Patient with positive chikungunya virus test results

Appendices

A. Diagnostic testing for chikungunya virus
B. Chikungunya case definitions and classifications
C. Environmental and Educational Response to Chikungunya Cases
D. Advisory for Churches and Other Faith-Based Organizations Concerning Mosquito-Borne Disease Risk During Travel

Attachments

CDC Chikungunya Information for Vector Control Programs
(http://www.cdc.gov/chikungunya/pdfs/CHIKV_VectorControl.pdf)
CDC Chikungunya Information for Healthcare Providers
(http://www.cdc.gov/chikungunya/pdfs/CHIKV_Clinicians.pdf)

Information and contacts

Arboviral diseases, including chikunkunya, should be reported to the local health department (LHD). If there is no local health jurisdiction, reports can be made to the DSHS Regional Zoonosis Control (ZC) office. Contact information for Regional ZC offices is available at: www.dshs.state.tx.us/idcu/health/zoonosis/contact/.

The DSHS Zoonosis Control Branch (ZCB) is responsible for reviewing chikungunya case investigations for accuracy, completeness and classification; reporting cases to the CDC; and providing guidance to LHDs and Regional ZC offices on appropriate testing for suspect cases, and on environmental and educational responses to chikungunya cases. For questions or reporting, please contact the ZCB epidemiologist or medical entomologist at 512-776-7255. More information is available at www.dshs.state.tx.us/idcu/disease/arboviral/chikv/.

The CDC Arboviral Diseases Branch in Fort Collins, Colorado is responsible for U.S. chikungunya surveillance, response, and diagnostic testing. More information is available at www.cdc.gov/chikungunya/.

Scenario 1: Patient with clinical illness but chikungunya virus testing not yet performed

1. Obtain or confirm initial clinical and epidemiologic data
   a. Demographics (age, sex, place of residence)
   b. Clinical symptoms
   c. Date of illness onset
   d. Hospitalization
   e. Travel history in 2 weeks prior to illness onset
2. Establish if the patient has a clinically compatible illness of fever and polyarthralgia or polyarthritis
   a. Clinically compatible illness: Continue investigation for possible chikungunya virus or other arboviral infections.
   b. No clinically compatible illness: Determine if there are other reasons to continue investigation for possible chikungunya virus or other arboviral infections.

3. Assess for possible travel-associated versus locally-acquired infection
   a. Recent travel: Determine the specific dates and location of travel in the 2 weeks prior to illness onset. If recent travel to area with no known local transmission, notify DSHS Zoonosis Control Branch.
   b. No recent travel: Determine if the local health department or healthcare provider is aware of other similar cases in the area or among contacts of the patient. If concern of local transmission in a new area, notify DSHS Zoonosis Control Branch.
4. Assess risk of being viremic while in Texas
   a. No travel outside the United States
   b. Onset of symptoms within the last 7 days, or
   c. Returned to Texas <7 days after illness onset
5. If risk of viremia, assess and mitigate risk of local transmission
   a. Recommend the case-patient stay in air conditioned or screened accommodations during the first week of illness and reduce mosquito breeding sites in and around the patient's home
   b. Work with local and Regional public health officials and healthcare personnel to perform enhanced surveillance for people with similar illnesses in the community
   c. Consult with local environmental health departments, vector control agencies, and/or DSHS Zoonosis Control Branch to assess whether *Aedes aegypti* or *Ae. albopictus* mosquitoes are likely present and active in the local area, and determine if vector control and mosquito trapping/testing should be considered in the area
6. Ensure laboratory testing is performed for chikungunya and dengue viruses [Appendix A] and obtain results
   a. Positive test results: Complete case investigation [Scenario 2]
   b. Negative test results: Determine if additional testing is needed

Rationale for testing for both dengue and chikungunya

- Viruses are transmitted by same mosquitoes
- Diseases have similar clinical features
- Viruses can circulate in same areas and cause co-infections
- Important to rule out dengue, as proper clinical management can improve outcome
- WHO dengue clinical management guidelines are available at: http://whqlibdoc.who.int/publications/2009/9789241547871_eng.pdf

Scenario 2: Patient with positive chikungunya virus test results

1. Perform standard case investigation to obtain or confirm clinical and epidemiologic data. Complete DSHS "Mosquito-borne Illness Case Investigation Form."
   a. Demographics (age, sex, race/ethnicity, place of residence)
   b. Clinical symptoms and syndrome
   c. Date of illness onset
   d. Hospitalization and outcome
   e. Travel history in 2 weeks prior to illness onset
   f. Organ, tissue, or blood donor or recipient
   g. Pregnant or breast feeding
   h. Contacts with similar illness
2. If the patient is a recent organ, tissue (e.g., corneas, skin), or blood donor or recipient
   a. Notify blood or tissue banks
   b. Quarantine remaining co-component blood or tissues
   c. Identify other possibly exposed patients
   d. Notify DSHS Zoonosis Control Branch
3. Assess for possible travel-associated versus locally-acquired infection
   a. Recent travel: Determine the specific dates and location of travel in the 2 weeks prior to illness onset. If recent travel to area with no known local transmission, notify DSHS Zoonosis Control Branch.

   b. No recent travel: Determine if the local health department or healthcare provider is aware of other similar cases in the area or among contacts of the patient. If concern of local transmission in a new area, notify DSHS Zoonosis Control Branch.
4. Assess evidence or risk of being viremic while in Texas
   a. Positive RT-PCR or viral culture
   b. No travel outside the United States
   c. Onset of symptoms within the last 7 days
   d. Returned to Texas <7 days after illness onset
5. If evidence or risk of viremia, assess and mitigate risk of local transmission
   a. Recommend the case-patient stay in air conditioned or screened accommodations during the first week of illness and reduce mosquito breeding sites in and around the patient's home
   b. Work with local public health officials and healthcare personnel to perform enhanced surveillance for people with similar illnesses in the community
   c. Consult with local environmental health departments, vector control agencies, and ZCB Zoonosis Control Branch to assess whether *Ae. aegypti* or *Ae. albopictus* mosquitoes are likely present and active in the local area, and determine if vector control and mosquito trapping/testing should be considered in the area
6. If there is evidence of local transmission
   a. Work with local health department and vector control agencies to determine vector control options
   b. Inform the public of the potential transmission risk and prevention measures
   c. Notify DSHS Zoonosis Control Branch
7. Determine chikungunya case classification [Appendix B]
   a. Confirmed or probable case: Submit completed DSHS "Mosquito-borne Illness Case Investigation Form," through Regional ZC to DSHS ZCB and enter investigation in NEDSS
   b. Indeterminate: Decide if additional testing is needed
   c. Not a case: Notify healthcare provider and relevant partners

Appendix A. Diagnostic testing for chikungunya virus

Laboratories that perform chikungunya diagnostic testing (as of September 2014)
- CDC Arboviral Diseases Branch, Fort Collins, CO (through the DSHS Laboratory; see below)
- Focus Diagnostics (Positive results are sent to DSHS ZCB for distribution)
- California, Florida, and New York State Departments of Health

Chikungunya virus diagnostic assays*
- Viral culture
- Reverse transcriptase-polymerase chain reaction (RT-PCR)
- Enzyme-linked immunosorbent assay (ELISA) or immunofluorescence assay (IFA) for immunoglobulin (Ig) M or IgG antibodies
- Plaque reduction neutralization test (PRNT)
- Immunohistochemical staining (IHC)

Routine chikungunya virus diagnostic testing performed on serum specimens at CDC
- RT-PCR: ≤5 days after illness onset†
- IgM antibody tests: ≥5 days after illness onset‡

Instructions

Texas samples can be sent to Focus Diagnostics or can be routed through DSHS to CDC Fort Collins.
- If sample was collected within 5 days of onset of illness, PCR should be requested
- If sample was collected on day 5 of illness, both PCR and serology should be requested
- If sample was collected more than 5 days after onset of illness, serology (IgM/IgG) should be requested

To submit samples through the DSHS Laboratory, each submitter must establish an account with the DSHS Lab prior to shipping (call 512-776-7318; additional instructions at www.dshs.state.tx.us/lab/). Under section 10, "Other," on the G2-A form, indicate that chikungunya and dengue testing is being requested at CDC reference lab (see example). **Samples will not be forwarded by DSHS to CDC for chikungunya or dengue testing if the patient does not have clinical signs compatible with these illnesses**.

Testing will NOT be initiated by CDC without the inclusion of the following:
1. DATE OF ONSET OF SYMPTOMS
2. Date of specimen collection
3. Pertinent travel history (3 months prior to the date of symptom onset)
4. Patient's name
5. Date of birth

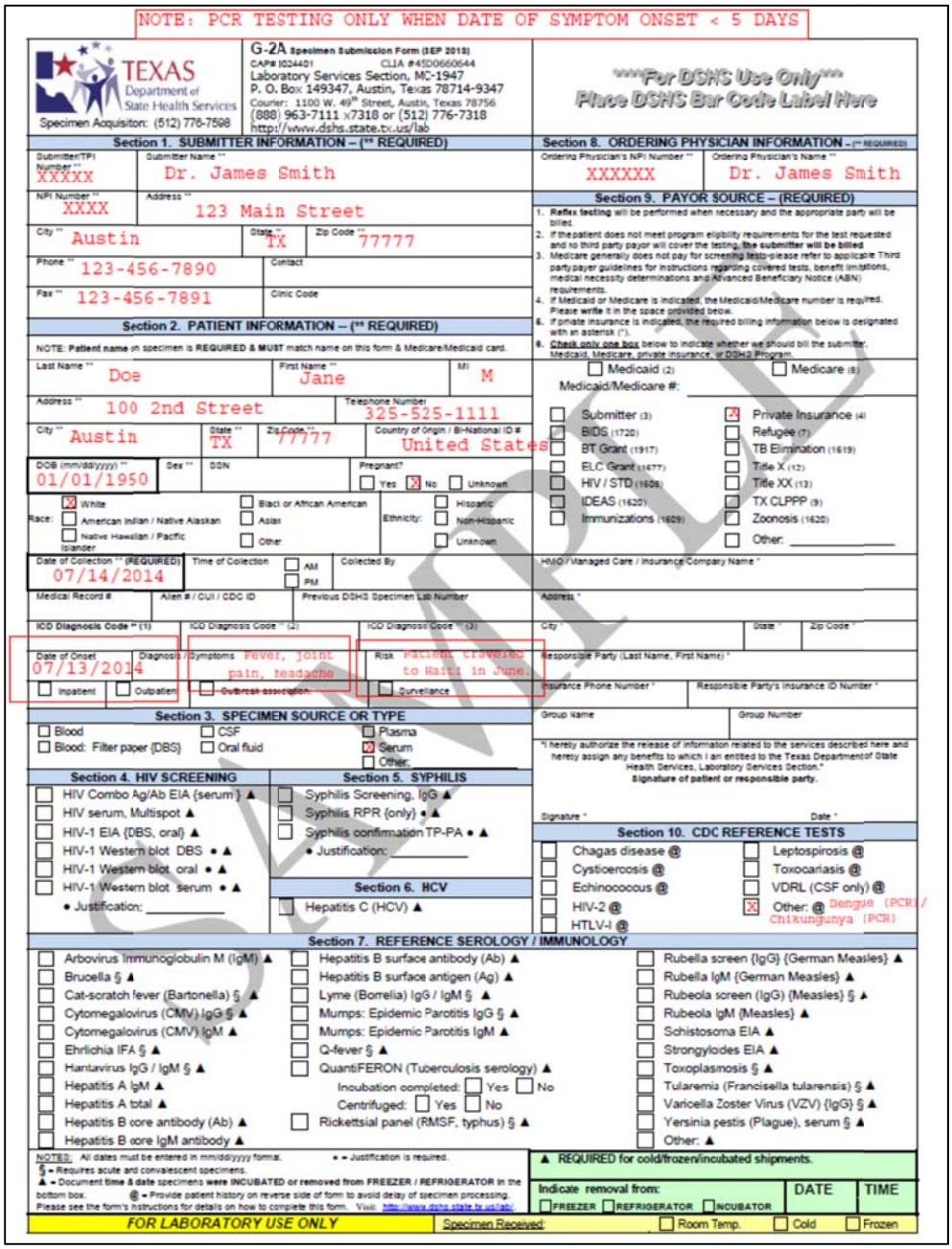
Directions on how much sample to send and how to store/ship:

At least 0.5 mL of serum and/or 1.0 mL of CSF is required for serology testing of each virus. CSF specimens are routinely tested undiluted and therefore require larger amounts. Whole blood will not be accepted for serology testing.

For serology testing, the specimen should be kept cold or frozen. The sample may be placed in an insulated container with blue ice packs. Additional blue ice packs should be used in the summer to ensure specimen integrity in hot weather.

For virus isolation and/or nucleic acid amplification testing, acceptable specimens are fresh frozen tissue, serum, or cerebrospinal fluid. Tissue specimens should be approximately 1 cm^3; frozen as soon as possible at -70ºC, and shipped on enough dry ice so that specimens remain frozen until received.

Example of DSHS G-2A form requesting chikungunya and dengue PCR testing:



NOTE: PCR TESTING ONLY WHEN DATE OF SYMPTOM ONSET < 5 DAYS

TEXAS Department of State Health Services
Specimen Acquisiton: (512) 776-7598

G-2A Specimen Submission Form (SEP 2013)
CAPN# I024401 CLIA # 45D0660644
Laboratory Services Section, MC-1947
P. O. Box 149347, Austin, Texas 78714-9347
Courier: 1100 W. 49th Street, Austin, Texas 78756
(888) 963-7111 x7318 or (512) 776-7318
http://www.dshs.state.tx.us/lab

"For DSHS Use Only" Place DSHS Bar Code Label Here

Section 1. SUBMITTER INFORMATION – (** REQUIRED)
Submitter/TPI Number **: XXXXX
Submitter Name **: Dr. James Smith
NPI Number **: XXXX
Address **: 123 Main Street
City **: Austin
State **: TX
Zip Code **: 77777
Phone **: 123-456-7890
Contact:
Fax **: 123-456-7891
Clinic Code:

Section 2. PATIENT INFORMATION – (** REQUIRED)
NOTE: Patient name on specimen is REQUIRED & MUST match name on this form & Medicare/Medicaid card.
Last Name **: Doe
First Name **: Jane
MI: M
Address **: 100 2nd Street
Telephone Number: 325-525-1111
City **: Austin
State **: TX
Zip Code **: 77777
Country of Origin / Bi-National ID #: United States
DOB (mm/dd/yyyy) **: 01/01/1950
Sex **:
DSN:
Pregnant? ☐ Yes ☒ No ☐ Unknown
Race: ☒ White ☐ American Indian / Native Alaskan ☐ Native Hawaiian / Pacific Islander ☐ Black or African American ☐ Asian ☐ Other
Ethnicity: ☐ Hispanic ☐ Non-Hispanic ☐ Unknown
Date of Collection ** (REQUIRED): 07/14/2014
Time of Collection: ☐ AM ☐ PM
Collected By:
Medical Record #:
Alien # / CUI / CDC ID:
Previous DSHS Specimen Lab Number:
ICD Diagnosis Code ** (1):
ICD Diagnosis Code ** (2):
ICD Diagnosis Code ** (3):
Date of Onset: 07/13/2014
Diagnosis / Symptoms: Fever, joint pain, headache
Risk: Patient traveled to Haiti in June.
☐ Inpatient ☐ Outpatient ☐ Outbreak association ☐ Surveillance

Section 3. SPECIMEN SOURCE OR TYPE
☐ Blood ☐ CSF ☐ Plasma
☐ Blood: Filter paper (DBS) ☐ Oral fluid ☒ Serum
☐ Other:

Section 4. HIV SCREENING
☐ HIV Combo Ag/Ab EIA (serum) ▲
☐ HIV serum, Multispot ▲
☐ HIV-1 EIA (DBS, oral) ▲
☐ HIV-1 Western blot DBS • ▲
☐ HIV-1 Western blot oral • ▲
☐ HIV-1 Western blot serum • ▲
• Justification:

Section 5. SYPHILIS
☐ Syphilis Screening, IgG ▲
☐ Syphilis RPR (only) • ▲
☐ Syphilis confirmation TP-PA • ▲
• Justification:

Section 6. HCV
☐ Hepatitis C (HCV) ▲

Section 7. REFERENCE SEROLOGY / IMMUNOLOGY
☐ Arbovirus Immunoglobulin M (IgM) ▲
☐ Brucella § ▲
☐ Cat-scratch fever (Bartonella) § ▲
☐ Cytomegalovirus (CMV) IgG § ▲
☐ Cytomegalovirus (CMV) IgM ▲
☐ Ehrlichia IFA § ▲
☐ Hantavirus IgG / IgM § ▲
☐ Hepatitis A IgM ▲
☐ Hepatitis A total ▲
☐ Hepatitis B core antibody (Ab) ▲
☐ Hepatitis B core IgM antibody ▲
☐ Hepatitis B surface antibody (Ab) ▲
☐ Hepatitis B surface antigen (Ag) ▲
☐ Lyme (Borrelia) IgG / IgM § ▲
☐ Mumps: Epidemic Parotitis IgG § ▲
☐ Mumps: Epidemic Parotitis IgM ▲
☐ Q-fever § ▲
☐ QuantiFERON (Tuberculosis serology) ▲
Incubation completed: ☐ Yes ☐ No
Centrifuged: ☐ Yes ☐ No
☐ Rickettsial panel (RMSF, typhus) § ▲
☐ Rubella screen (IgG) (German Measles) ▲
☐ Rubella IgM (German Measles) ▲
☐ Rubeola screen (IgG) (Measles) § ▲
☐ Rubeola IgM (Measles) ▲
☐ Schistosoma EIA ▲
☐ Strongyloides EIA ▲
☐ Toxoplasmosis § ▲
☐ Tularemia (Francisella tularensis) § ▲
☐ Varicella Zoster Virus (VZV) (IgG) § ▲
☐ Yersinia pestis (Plague), serum § ▲
☐ Other: ▲

Section 8. ORDERING PHYSICIAN INFORMATION – (** REQUIRED)
Ordering Physician's NPI Number **: XXXXXX
Ordering Physician's Name **: Dr. James Smith

Section 9. PAYOR SOURCE – (REQUIRED)
1. Reflex testing will be performed when necessary and the appropriate party will be billed.
2. If the patient does not meet program eligibility requirements for the test requested and no third party payor will cover the testing, the submitter will be billed.
3. Medicare generally does not pay for screening tests-please refer to applicable Third party payer guidelines for instructions regarding covered tests, benefit limitations, medical necessity determinations and Advanced Beneficiary Notice (ABN) requirements.
4. If Medicaid or Medicare is indicated, the Medicaid/Medicare number is required. Please write it in the space provided below.
5. If private insurance is indicated, the required billing information below is designated with an asterisk (*).
6. Check only one box below to indicate whether we should bill the submitter, Medicaid, Medicare, private insurance, or DSHS Program.

☐ Medicaid (2) ☐ Medicare (8)
Medicaid/Medicare #:
☐ Submitter (3) ☒ Private Insurance (4)
☐ BIDS (1720) ☐ Refugee (7)
☐ BT Grant (1917) ☐ TB Elimination (1619)
☐ ELC Grant (1477) ☐ Title X (12)
☐ HIV / STD (1608) ☐ Title XX (13)
☐ IDEAS (1620) ☐ TX CLPPP (9)
☐ Immunizations (1629) ☐ Zoonosis (1620)
☐ Other:
HMO / Managed Care / Insurance Company Name *:
Address *:
City *: State *: Zip Code *:
Responsible Party (Last Name, First Name) *:
Insurance Phone Number *: Responsible Party's Insurance ID Number *:
Group Name: Group Number:

"I hereby authorize the release of information related to the services described here and hereby assign any benefits to which I am entitled to the Texas Department of State Health Services, Laboratory Services Section."
Signature of patient or responsible party.
Signature *: Date *:

Section 10. CDC REFERENCE TESTS
☐ Chagas disease @
☐ Cysticercosis @
☐ Echinococcus @
☐ HIV-2 @
☐ HTLV-I @
☐ Leptospirosis @
☐ Toxocariasis @
☐ VDRL (CSF only) @
☒ Other: @ Dengue (PCR) / Chikungunya (PCR)

NOTES: All dates must be entered in mm/dd/yyyy format. • = Justification is required.
§ = Requires acute and convalescent specimens.
▲ = Document time & date specimens were INCUBATED or removed from FREEZER / REFRIGERATOR in the bottom box. @ = Provide patient history on reverse side of form to avoid delay of specimen processing.
Please see the form's instructions for details on how to complete this form. Visit: http://www.dshs.state.tx.us/lab/

▲ REQUIRED for cold/frozen/incubated shipments.
Indicate removal from: ☐ FREEZER ☐ REFRIGERATOR ☐ INCUBATOR
DATE: TIME:

FOR LABORATORY USE ONLY
Specimen Received: ☐ Room Temp. ☐ Cold ☐ Frozen

SAMPLE

* Biosafety in Microbiological and Medical Laboratories (BMBL) 5th edition recommends that chikungunya virus be handled under biosafety level 3 (BSL-3) containment.

† Viral RNA may be detected in serum for up to 8 days after onset of symptoms.

‡ IgM antibodies are generally first detectable at 4 to 8 days after onset of illness and can persist for months. Serum collected within 8 days of illness onset may not have detectable IgM antibodies and testing should be repeated on a convalescent-phase sample to rule out infection in those with a compatible clinical syndrome.

Appendix B. Chikungunya case definitions and classifications

Confirmed case*
A person with fever or chills as reported by the patient or healthcare provider, absence of a more likely explanation, and one or more of the following laboratory criteria:

- Isolation of virus from, or demonstration of specific viral antigen or nucleic acid in, tissue, blood, or other body fluid, OR
- Four-fold or greater change in virus-specific quantitative antibody titers in paired serum samples, OR
- Virus-specific IgM antibodies in serum with confirmatory neutralizing antibodies in the same or a later specimen

Probable case*
A person with fever or chills as reported by the patient or healthcare provider, absence of a more likely explanation, and virus-specific IgM antibodies in serum but with no other testing

Suspected case
A person with acute onset of fever and severe arthralgia or arthritis not explained by other medical conditions, and who resides or has visited epidemic or endemic areas within 2 weeks before the onset of symptoms.

Indeterminate case
A suspected case without a more likely explanation and negative chikungunya virus testing but no virus-specific IgM or neutralizing antibody testing performed on a serum specimen collected ≥8 days after illness onset

Not a case
A suspected case with negative virus-specific IgM or neutralizing antibodies in serum collected ≥8 days after illness onset or evidence of a more likely explanation for their illness

* Complete the DSHS “Mosquito-borne Illness Case Investigation Form,” submit completed forms through HSR ZC to DSHS ZCB, and report confirmed and probable cases in NEDSS using the existing case definition, data variables, and mechanisms for “Arboviral Diseases, neuroinvasive and non-neuroinvasive.”

Appendix C. Environmental and Educational Response to Chikungunya Cases

The mosquito vectors for chikungunya virus (CHIKV) are *Aedes aegypti* and *Ae. albopictus*. They are quite common in many areas of Texas (especially the eastern portion of the state).

To prevent the establishment of local transmission of CHIKV in Texas, the Texas Department of State Health Services (DSHS) in consultation with the Centers for Disease Control and Prevention recommends the following actions, as time and resources allow, when a person **suspected** of having a CHIKV infection is present in Texas:

Vector Control

- Determine where the person has had the opportunity to sustain mosquito bites in Texas during the first 7 days following the onset of illness
- Conduct a site visit(s)
  - identify and eliminate mosquito breeding habitat to the extent possible
  - apply larvicidal products as appropriate
  - apply adulticide products as appropriate
    - manual delivery around buildings is more effective for the control for the CHIKV vectors than delivery by vehicle

Mosquito Surveillance and Testing

Unlike testing of mosquitoes for West Nile virus (WNV) or Saint Louis encephalitis virus (SLE), mosquito test data is not predictive of human risk for contracting either dengue or CHIKV. The transmission cycle of WNV and SLE involves amplification of the virus in a bird reservoir prior to an increase in risk of human infection. This is not the case with CHIKV, where its cycle in the western hemisphere involves only humans and mosquitoes. By the time CHIKV becomes evident in collected mosquitoes, human cases are likely being reported to public health authorities. In addition, testing of mosquitoes for CHIKV is expected to have a very low yield, even during a major outbreak.

Despite these limitations, mosquito surveillance for *Aedes* can yield information useful to public health programs and vector control programs, e.g. the presence and location of *Aedes* and their abundance. Adult vector mosquito abundance is a key factor contributing to the risk of virus transmission. *Aedes aegypti* or *Ae. albopictus* mosquitoes submitted to the DSHS Arbovirus Laboratory will be tested for the presence of the CHIKV. While unlikely, identification of CHIKV in Texas mosquitoes would be very significant.

Standard mosquito collection traps such as light and gravid traps can capture both *Ae. aegypti* and *Ae. albopictus*, but a far higher yield of these CHIKV vectors can be achieved using traps such as those employing an attractant that is more specific for *Aedes*.

Please see the guidance for submitting mosquito specimens to DSHS at the following link:
www.dshs.state.tx.us/lab/arboFieldSurveillance.shtm

Education

Before and during periods of risk, it is strongly recommended that every community be made aware of measures residents can take to reduce their risk of arboviral infection, including CHIKV. Among these measures are:

- Use air conditioning and maintain windows and door screens in good repair
- Use mosquito repellent on exposed skin – day or night when mosquitoes are active
- Wear long-sleeved shirts and long pants
- Wear permethrin-treated clothing
- Empty standing water from outdoor containers

More detailed information for travelers on protection against mosquitoes and other arthropods that vector human disease can be found at:
http://wwwnc.cdc.gov/travel/yellowbook/2014/chapter-2-the-pre-travel-consultation/protection-against-mosquitoes-ticks-and-other-insects-and-arthropods

For additional information, please contact: Dr. David Florin, ZCB Medical Entomologist, 512-776-6545

Appendix D. Churches and Other Faith-Based Organizations Concerning Mosquito-Borne Disease Risk During Travel

The Texas Department of State Health Services (DSHS) has confirmed chikungunya virus (CHIKV) disease in travelers who visited the Caribbean and other areas where the disease occurs. This virus and another mosquito-transmitted virus called dengue pose a threat to travelers in the Caribbean, Central America, parts of South America, and other endemic areas. The list of countries in the Americas with local transmission of CHIK is expected to grow (the most current information on affected countries is available at www.cdc.gov/chikungunya/geo/americas.html).

Many churches and other faith-based organizations routinely arrange mission trips to international areas where chikungunya and dengue occur. DSHS urges these groups to assure their members and other mission participants are aware of the risk of getting a mosquito-transmitted illness and how to prevent mosquito bites. Tips to avoid mosquito bites are listed below and should be followed to reduce the chance of getting sick.

Local transmission of CHIKV has occurred in Florida, and the risk of establishing ongoing local transmission in Texas exists. Many parts of Texas have mosquitos capable of transmitting both CHIKV and dengue virus. Returning travelers should avoid mosquito bites especially during the first seven days back from visiting areas where chikungunya or dengue occur. The first seven days is the time period when infected people, even those without symptoms, will have virus in their blood and can infect Texas mosquitoes.

A person bitten by a CHIKV-infected mosquito will usually start having symptoms 3 to 7 days after the bite occurs though symptoms can start as early as 1 day or as long as 12 days afterwards. If a traveler becomes ill in 12 days or less following their return to Texas, the person should seek medical care. Travelers should tell their doctors where they traveled, so the providers can order the appropriate blood tests. Information on testing is available from the Local Health Department and DSHS.

Please remember that we have diseases caused by other mosquito-borne viruses in the U.S., most notably West Nile virus. Consequently, mosquito bite avoidance should be an ongoing effort whether at home or abroad as long as mosquitos are active.

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To reduce risk of mosquito bites:

- Use air conditioning and maintain windows and door screens in good repair
- Use mosquito repellent on exposed skin – day or night when mosquitoes are active
- Wear long-sleeved shirts and long pants
- Wear permethrin-treated clothing
- Empty standing water from outdoor containers

Remember, people potentially infected with chikungunya virus should be protected from further mosquito exposure during the first week of illness to reduce the risk of further transmission.

CHIKUNGUNYA

Information for vector control programs

Background

- Mosquito-borne viral disease characterized by acute onset of fever and severe joint pain
- Outbreaks have occurred in countries in Africa, Asia, Europe, and the Indian and Pacific Oceans
- In late 2013, first local transmission in the Americas was reported on islands in the Caribbean

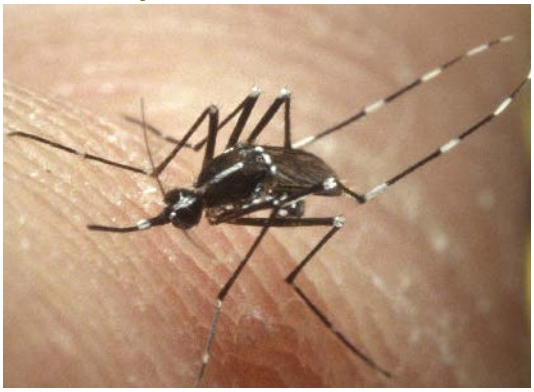
Vectors

- *Aedes aegypti* and *Aedes albopictus* are the primary vectors
- Both mosquitoes can be identified by the white stripes on their black bodies and legs
- They are aggressive daytime biters, with crepuscular peak feeding activity
- These mosquito species are present in many regions of the United States (see distribution maps below), which creates the potential for emergence of chikungunya virus.

Aedes aegypti

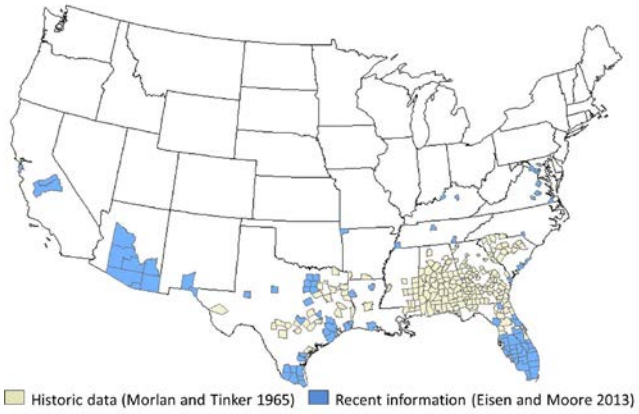
- An important vector in urban areas.
- Closely associated with humans and their homes.
- Adult mosquitoes are commonly found indoors.
- Larval habitats are typically containers on the household premises.

Aedes albopictus

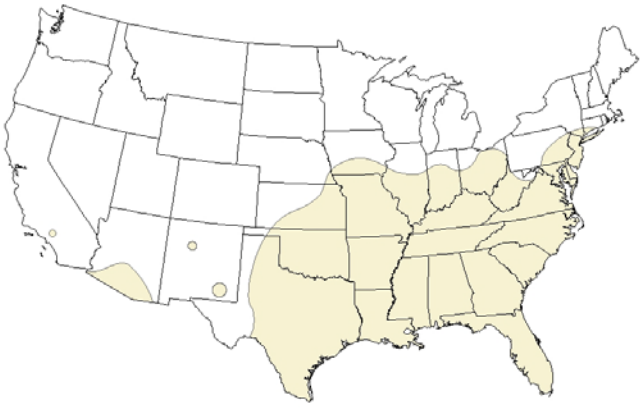


- More likely to play a larger role in transmission in the United States due to its wide distribution.
- Biting adults are found both indoors and outdoors, but are most commonly found outdoors.
- Larvae occur in peridomestic habitats as well as surrounding natural habitats.

Approximate distribution of *Aedes aegypti* in the United States*



Approximate distribution of *Aedes albopictus* in the United States*



*Maps were developed using currently available information. Mosquito populations may be detected in areas not shaded on this map, and may not be consistently found in all shaded areas.

Integrated vector management (IVM) for potential chikungunya virus vectors

During a chikungunya virus outbreak, aggressive vector management and personal protection activities that effectively reduce mosquito density and prevent mosquitoes from feeding on infected people are required to break the transmission cycle. Vector control efforts should target both species. Control procedures are generally similar for both.

Surveillance:

- Monitor the populations of potential vectors and risk of chikungunya virus circulation in your area.
- Implement larval surveillance programs to determine the number, type, and distribution of containers producing *Aedes aegypti* and *Aedes albopictus*.
- If not already developed, establish close lines of communication with local and state health department to share epidemiological and ecological data and obtain information about travel-related or locally-transmitted chikungunya virus disease cases in the area.

Source reduction:

- Reduce mosquito densities by removing larval habitats.
- Remove discarded, unused, and unmaintained containers through community involvement programs or by vector control personnel. Containers are ideal larval habitats.

Larval control:

- When source reduction is not feasible, apply biological or chemical larvicides to potential larval habitats.
- Use larvicides registered by EPA for application to containers.

Adult mosquito control:

- Generally only in outbreak situations.
- *Aedes aegypti* and *Aedes albopictus* are most active during the day and are not effectively controlled by standard night-time ultra-low volume (ULV) applications. Early morning or late evening ULV applications are recommended against these species.
- If case residences or areas of focal transmission can be rapidly identified, ULV or barrier applications to individual residences may be warranted to further reduce the likelihood of vectors feeding on infectious people.

Resistance monitoring:

- Evaluation of pesticide susceptibility in local populations of potential chikungunya virus vectors should be performed in advance to ensure that emergency control measures will be effective if needed.

Prevention of transmission

There is no vaccine or medication to prevent chikungunya virus infection or disease. Encourage the following measures to reduce the risk of human-vector contact:

- Use air conditioning or window/door screens
- Use mosquito repellents on exposed skin
- Wear long-sleeved shirts and long pants
- Wear permethrin-treated clothing
- Empty standing water from outdoor containers

People infected with chikungunya virus should be protected from further mosquito exposure during the first week of illness to reduce the risk of further transmission.

FOR MORE INFORMATION VISIT: http://www.cdc.gov/chikungunya/

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CHIKUNGUNYA

Information for healthcare providers

Background

- Mosquito-borne viral disease characterized by acute onset of fever and severe polyarthralgia
- Often occurs as large outbreaks with high attack rates
- Outbreaks have occurred in countries in Africa, Asia, Europe, and the Indian and Pacific Oceans
- In late 2013, first local transmission in the Americas was reported on islands in the Caribbean

Chikungunya virus

- Single-stranded RNA virus
- Genus *Alphavirus*; Family *Togaviridae*

Mosquito vectors

- *Aedes aegypti* and *Aedes albopictus* are the primary vectors (above)
- Both are aggressive daytime biting mosquitoes

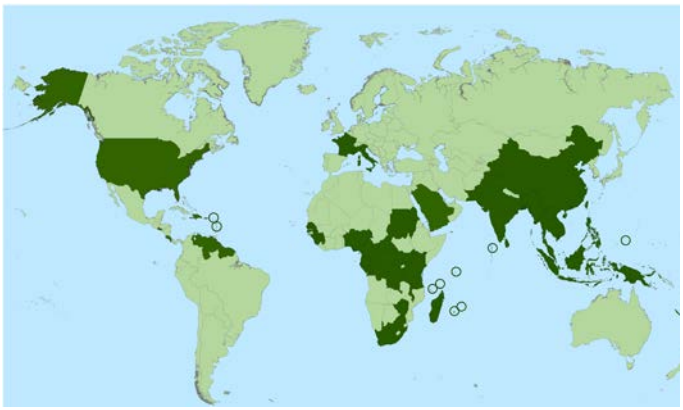
Animal hosts

- Humans are the primary host of chikungunya virus during epidemic periods

Clinical findings

- Majority of infected people become symptomatic
- Incubation period usually 3–7 days (range 1–12 days)
- Acute onset of fever and polyarthralgia are the primary clinical findings
- Joint symptoms usually symmetric and often occur in hands and feet; they can be severe and debilitating
- Other symptoms: Headache, myalgia, arthritis, conjunctivitis, nausea/vomiting, maculopapular rash
- Lymphopenia, thrombocytopenia, elevated creatinine, and elevated hepatic transaminases are the most common clinical laboratory findings

Countries with reported local transmission of chikungunya virus (as of July 2014)



Laboratory testing

- Evaluate serum or plasma by:
  - Viral culture to detect virus in first 3 days of illness
  - RT-PCR to detect viral RNA in first 8 days of illness
  - Serology to detect IgM, IgG, and neutralizing antibodies that develop toward the end of the first week of illness (≥4 days post illness onset)
- Chikungunya testing is performed at CDC, several state health departments, and one commercial laboratory
- Contact your state health department for more information and to facilitate testing

Clinical course and outcomes

- Acute symptoms typically resolve within 7–10 days
- Rare complications include uveitis, retinitis, myocarditis, hepatitis, nephritis, bullous skin lesions, hemorrhage, meningoencephalitis, myelitis, Guillain-Barré syndrome, and cranial nerve palsies
- Persons at risk for severe disease include neonates exposed intrapartum, older adults (e.g., > 65 years), and persons with underlying medical conditions (e.g., hypertension, diabetes, or cardiovascular disease)
- Some patients might have relapse of rheumatologic symptoms (e.g., polyarthralgia, polyarthritis, tenosynovitis) in the months following acute illness
- Studies report variable proportions of patients with persistent joint pains for months to years

Chikungunya and dengue

- Difficult to distinguish chikungunya and dengue based on clinical findings alone
- Chikungunya and dengue viruses are transmitted by the same mosquitoes
- The viruses can circulate in the same area and cause occasional co-infections in the same patient
- Chikungunya virus more likely to cause high fever, severe polyarthralgia, arthritis, rash, and lymphopenia
- Dengue virus more likely to cause neutropenia, thrombocytopenia, hemorrhage, shock, and deaths
- Patients with suspected chikungunya should be managed as dengue until dengue has been ruled out
  - Proper clinical management of dengue reduces the risk of medical complications and death
  - Aspirin and other NSAIDs can increase the risk of hemorrhage in patients with dengue

Treatment and clinical management

- No specific antiviral therapy; treatment is symptomatic
- Assess hydration and hemodynamic status and provide supportive care as needed
- Evaluate for other serious conditions (e.g., dengue, malaria, and bacterial infections) and treat or manage appropriately
- Collect specimens for diagnostic testing
- Use acetaminophen or paracetamol for initial fever and pain control
  - If inadequate, consider using narcotics or NSAIDs
  - If the patient may have dengue, do not use aspirin or other NSAIDs (e.g., ibuprofen, naproxen, toradol) until they have been afebrile ≥48 hours and have no warning signs for severe dengue*
- Persistent joint pain may benefit from use of NSAIDs, corticosteroids, or physiotherapy

*Warning signs for severe dengue include severe abdominal pain, persistent vomiting, mucosal bleeding, pleural effusion or ascites, lethargy, enlarged liver, and increased hematocrit with decrease in platelet count

Differential diagnosis

- Depends on residence, travel history, and exposures
- Consider dengue, leptospirosis, malaria, rickettsia, group A streptococcus, rubella, measles, parvovirus, enteroviruses, adenovirus, other alphavirus infections (e.g., Mayaro, Ross River, Barmah Forest, O'nyong-nyong, and Sindbis viruses), post-infections arthritis, and rheumatologic conditions

Surveillance and reporting

- Chikungunya virus infection should be considered in patients with acute onset of fever and polyarthralgia, especially travelers who recently returned from areas with known virus transmission
- Healthcare providers are encouraged to report suspected chikungunya cases to their state or local health department to facilitate diagnosis and mitigate the risk of local transmission
- Health departments should perform surveillance for chikungunya cases in returning travelers and be aware of the risk of possible local transmission in areas where *Aedes* species mosquitoes are active
- State health departments are encouraged to report confirmed chikungunya virus infections to CDC

Prevention and control

- No vaccine or medication is available to prevent chikungunya virus infection or disease
- Reduce mosquito exposure
  - Use air conditioning or window/door screens
  - Use mosquito repellents on exposed skin
  - Wear long-sleeved shirts and long pants
  - Wear permethrin-treated clothing
  - Empty standing water from outdoor containers
  - Support local vector control programs
- People suspected to have chikungunya or dengue should be protected from further mosquito exposure during the first week of illness to reduce the risk of further transmission
- People at increased risk for severe disease should consider not traveling to areas with ongoing chikungunya outbreaks

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