Dengue Fever/Severe Dengue Fever/Chikungunya Fever!

Report on suspicion of infection during business hours

PROTOCOL CHECKLIST

- ☐ Enter available information into Merlin upon receipt of initial report
- ☐ Review background information on the disease (see Section 2), case definitions (see Section 3 for dengue and for chikungunya), and laboratory testing (see Section 4)
- ☐ Forward specimens to the Florida Department of Health (DOH) Bureau of Public Health Laboratories (BPHL) for confirmatory laboratory testing (as needed)
- ☐ Inform local mosquito control personnel of suspected chikungunya or dengue case as soon as possible (if applicable)
- ☐ Inform state Arbovirus Surveillance Coordinator on suspicion of locally acquired arbovirus infection
- ☐ Contact provider (see Section 5A)
- ☐ Interview case-patient
  - ☐ Review disease facts (see Section 2)
  - ☐ Mode of transmission
  - ☐ Ask about exposure to relevant risk factors (see Section 5. Case Investigation)
    - ☐ History of travel, outdoor activities, and mosquito bites two weeks prior to onset
    - ☐ History of febrile illness or travel for household members or other close contacts in the month prior to onset
    - ☐ History of previous arbovirus infection or vaccination (yellow fever, Japanese encephalitis)
  - ☐ Provide education on transmission and prevention (see Section 6)
    - ☐ Awareness of mosquito-borne diseases
    - ☐ Drain standing water at least weekly to stop mosquitoes from multiplying
    - ☐ Discard items that collect water and are not being used
    - ☐ Cover skin with clothing or Environmental Protection Agency (EPA)-registered repellent such as DEET (*N*,*N*-diethyl-*meta*-toluamide)
    - ☐ Use permethrin on clothing (not skin) according to manufacturer's directions
    - ☐ Cover doors and windows with intact screens to keep mosquitoes out of the house
- ☐ Enter additional data obtained from interview into Merlin (see Section 5D)
- ☐ Arrange for a convalescent specimen to be taken (if necessary)

Dengue Fever/Severe Dengue/Chikungunya

1. DISEASE REPORTING

A. Purpose of reporting and surveillance

1. To rapidly detect and monitor exotic arboviral disease activity
2. Work with partners to respond rapidly to arbovirus outbreaks
3. Keep public and other stakeholders informed of activity and increased risk
4. Use surveillance data to monitor success of response
5. Characterize risk factors for infection to use for development of targeted preventive messaging
6. Increase awareness of mosquito-borne illness while traveling

B. Legal reporting requirements

Laboratories and physicians are required to report suspected cases to the county health department (CHD) (Chapter 64D-3, Florida Administrative Code). Reports should not be delayed for final laboratory confirmation. Report any suspected cases during business hours.

C. County health department investigation responsibilities

1. Begin investigation on the same day as notification.
2. Inform mosquito control personnel of suspected chikungunya or dengue case as soon as possible (if applicable).
3. Contact commercial laboratories as soon as possible after a case is reported and request that the specimen be forwarded to BPHL-Tampa or -Jacksonville for confirmatory testing. Imported cases only require an acute specimen while suspect locally acquired cases may require a convalescent specimen.
4. Rapidly establish patient travel history in the two weeks prior to symptom onset.
5. Inform state Arbovirus Surveillance Coordinator on suspicion of locally acquired arbovirus infection.
6. Report all confirmed, probable, and suspect cases in Merlin. See case definitions in Section 3 for proper classification. The Florida Confidential Vector-borne Disease Case Report form is available to assist in follow-up and investigation: www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/_documents/crf-vectorborne.pdf
7. Note: Imported and locally acquired chikungunya cases should be reported in Merlin as chikungunya (Merlin disease code=06540). Imported and locally acquired dengue cases should be reported in Merlin as either dengue fever (Merlin disease code=06100) or severe dengue (Merlin disease code=06101) based on clinical symptoms as described in the case definition. Guidance for Zika fever is located on the surveillance and investigation guidance website: www.floridahealth.gov/gsi.

2. THE DISEASES AND THEIR EPIDEMIOLOGY

A. Etiologic agents

Dengue fever and severe dengue (dengue hemorrhagic fever [DHF] and dengue shock syndrome [DSS]) are caused by any of four closely related dengue virus (DENV) serotypes (DENV 1–4) belonging to the family *Flaviviridae*. Chikungunya fever is caused by infection with chikungunya virus (CHIKV), an alphavirus in the family *Togaviridae*.

B. Description of illness

Dengue: Symptoms generally last 3–10 days, although the febrile stage usually ranges 2–7 days. This illness is characterized by fever, myalgia, arthralgia, and retro-orbital pain. Up to 50% of infected persons may be asymptomatic but still infectious to mosquitoes. Others may experience a non-specific febrile illness rather than the classic break-bone fever. Severe dengue occurs in a small proportion of those infected. Symptoms may include abnormal vascular permeability, hypovolemia, and abnormal blood clotting mechanisms. Signs of shock or severe bleeding typically begin immediately after the febrile period ends. In those with severe disease, shock is the predominant sign. Acute hepatitis or encephalitis can occur rarely. The DHF case fatality rate can be 10% or higher if untreated but is typically drastically lowered (<1%) with timely and appropriate fluid therapy. Those at greater risk for DHF and DSS include persons with previous dengue infection, pregnant women, infants, the elderly, and those with co-morbidities. However, severe illness can also occur in those without any of these risk factors.

Chikungunya: Acute phase symptoms generally last 3–10 days and include sudden onset of continuous or intermittent high fever (usually >102°F) with severe joint pain. Joint and tendon pain commonly involve the hands and feet, is usually bilateral, and often is accompanied by swelling. Other joints may be involved, and back pain is reported in up to 50% of cases. Maculopapular rash is reported in approximately half of all patients usually two to five days after fever onset. Children and infants may demonstrate vesiculobullous skin lesions. Other symptoms may include headache, fatigue, depression, nausea, vomiting, and myalgia. Relapse of joint and tendon pain without fever can occur after initial improvement of clinical signs; relapse is most common within one to three months after symptom onset. Some patients have prolonged fatigue and depression lasting weeks or months. Chronic joint pain lasting years may also occur in some patients, with those over age 45 or with pre-existing joint conditions at increased risk. Between 3–28% of infections may be asymptomatic. Persons at risk for more severe disease include: neonates exposed intrapartum, adults >65 years of age, and persons with underlying medical conditions (e.g., hypertension, diabetes, or cardiovascular disease).

CHIKV, DENV, and Zika virus (ZIKV) infections are often difficult to differentiate clinically. However, polyarthralgia or pain in a CHIK case is often more localized in joints and tendons, particularly the hands and feet, and may be associated with visible swelling. Signs of shock or hemorrhage are uncommonly associated with CHIK compared to DEN. It is also important to note that these viruses can occur as co-infections and are vectored by the same mosquito species. CHIKV and ZIKV infection is believed to provide life-long immunity while DENV infection only provides life-long immunity to the infecting serotype.

Several other exotic flaviviruses and alphaviruses may cause symptoms similar to chikungunya and dengue, including Mayaro, Ross River, and O'nyong-nyong viruses. Travel history is important for determining risk of infection with these viruses.

C. Reservoirs

Humans serve as the primary reservoir for these viruses; however, other vertebrates such as non-human primates may also serve as potential hosts.

D. Modes of transmission

Transmission is through the bite of an infected mosquito. Chikungunya and dengue viruses are spread by several mosquito species in the genus *Aedes*. It is possible for dengue to be transmitted by organ transplants or blood transfusions, and there is evidence of transmission from an infected pregnant mother to her fetus. While there have been no reports of chikungunya being transmitted by a blood transfusion, it is theoretically possible. There is evidence that chikungunya may spread from mother to newborn around the time of birth. Studies have not found chikungunya virus in breast milk, and there have been no reports to date of infants acquiring chikungunya virus infection through breastfeeding. Because the benefits of breastfeeding likely outweigh the risk of chikungunya virus infection in breastfeeding infants, mothers should be encouraged to breastfeed even if they are infected with chikungunya virus or live in an area with ongoing virus transmission. Dengue may also be transmitted through breast milk. The risk of a mother transmitting the virus to her newborn through breastmilk is considered low, and the health benefits of breastfeeding greatly outweigh the likelihood of disease transmission. Breastfeeding mothers should consult with their pediatricians about concerns they have regarding breastfeeding and dengue risk.

Mosquitoes – *Aedes aegypti* and *Aedes albopictus*
The primary vector for these viruses is *Aedes aegypti. Aedes albopictus* is the other important vector and has also become established in Florida. Both species prefer to feed during the day. *Ae. aegypti* feeds almost exclusively on humans, is highly domesticated (evolved to live around homes), and primarily utilizes artificial containers as larval habitats. In contrast, *Ae. albopictus* is an opportunistic feeder and utilizes both natural and artificial containers as larval habitats. Because *Ae. albopictus* feeds on many different animals, risk of infection of humans is reduced compared to *Ae. aegypti*.

E. Incubation period

The incubation period for chikungunya is typically 3–10 days from the time of the mosquito bite, but can range from 1–12 days. The typical incubation period for dengue is 3–14 days.

F. Period of communicability

People can transmit the virus to mosquitoes if bitten while viremic; the viremic stage usually begins the day before symptom onset and may continue for about five days.

G. Treatment

There is no specific treatment for chikungunya or dengue. Treatment is supportive and aimed at decreasing the severity of symptoms.

H. Prophylaxis

There are no licensed vaccines currently available for chikungunya or dengue viruses, although there are some currently in clinical trial.

I. Chikungunya/Dengue fever in Florida

Dengue: Until 2009, the last dengue virus epidemic in Florida occurred in 1934–1935. Since then, imported cases have been reported regularly. During the summer of 2009, local DENV-1 transmission was identified in Key West, Florida, and it continued through the end of 2010 when the outbreak was controlled. In total, 88 cases and 5 asymptomatic infections were identified. In the summer of 2013, local DENV-1 transmission was identified in Martin County, Florida (a different strain than Key West). Twenty-four unrelated, sporadic

introductions of locally transmitted dengue were also identified in central and south Florida counties in 2010 (2), 2011 (7), 2012 (3), 2013 (2), 2014 (5), 2015 (1), 2016 (3), and 2018 (1). Introductions have involved all dengue serotypes. No dengue introductions were identified in 2017.

Chikungunya: In December 2013, local transmission was identified on the Caribbean island of St. Martin. This marked the first time confirmed locally acquired chikungunya fever cases had been identified in the Americas. Since the initial report, local transmission has been identified on other Caribbean islands and in Mexico, and countries in South and Central America. In 2014, 12 cases of locally acquired CHIK were identified in Broward (1), Miami-Dade (2), Palm Beach (5), and St. Lucie (4) counties in Florida. In addition, 510 imported cases of CHIK were identified. No locally acquired cases have been identified since 2014, and the numbers of imported cases have decreased dramatically since 2014: 2015 (76), 2016 (8), and 2017 (5).

3. CASE DEFINITIONS

Dengue Fever and Severe Dengue Fever

A. Clinical description

Dengue fever

- Fever as reported by the patient or health care provider.
- One or more of the following signs and symptoms may be present (not required):
  - Nausea or vomiting
  - Rash
  - Headache
  - Retro-orbital pain or ocular pain
  - Myalgia
  - Arthralgia (joint pain)
  - Thrombocytopenia (platelet numbers of <200,000/mm^3)
  - Leukopenia (a total white blood cell count of <5,000/mm^3)
  - Abdominal pain or tenderness
  - Persistent vomiting
  - Mucosal bleeding at any site (e.g., gums, urinary tract)
  - Liver enlargement >2 centimeters

Severe dengue (including dengue hemorrhagic fever [DHF] and dengue shock syndrome [DSS])

- Fever as reported by the patient or health care provider **AND**
- One or more of the following:
  - Hypovolemic shock with respiratory distress
  - Pleural effusion (fluid around the lungs)
  - Pericardial effusion (fluid around the heart)
  - Ascites (abdominal fluid)
  - Elevated hematocrit value for patient age and sex, often with rapid decrease in platelet count
  - Severe bleeding from the gastrointestinal tract (e.g., hematemesis, melena) or vagina (menorrhagia) as defined by requirement for medical intervention including intravenous fluid resuscitation or blood transfusion

- Elevated liver transaminases: aspartate aminotransferase (AST) or alanine aminotransferase (ALT) ≥1,000 units per liter (U/L)
- Impaired level of consciousness or diagnosis of encephalitis, encephalopathy, or meningitis
- Heart or other organ involvement including myocarditis, cholecystitis, and pancreatitis

B. Laboratory criteria for diagnosis

Confirmatory:

- Isolation of dengue virus from, or demonstration of dengue-specific arboviral antigen or genomic sequences in tissue, blood, cerebrospinal fluid (CSF), or other bodily fluids by culture, polymerase chain reaction (PCR), immunofluorescence, or immunohistochemistry (IHC)

OR

- Seroconversion from negative for dengue-specific serum IgM or IgG antibody in an acute-phase specimen (≤5 days after symptom onset) to positive for dengue-specific serum IgM or IgG antibodies in a convalescent-phase specimen collected >5 days after symptom onset (e.g., enzyme-linked immunosorbent assay [EIA/ELISA], microsphere immunoassay (MIA), or immunofluorescence assay [IFA])

OR

- Demonstration of a four-fold rise in plaque reduction neutralization test (PRNT) end point titer (as expressed by the reciprocal of the last serum dilution showing a 90% reduction in plaque counts compared to the virus-infected control) between dengue viruses and other flaviviruses tested in a convalescent serum specimen

OR

- Virus-specific IgM antibodies (e.g., EIA/ELISA, MIA, or IFA) in CSF and a negative result for other IgM antibodies in CSF for arboviruses endemic to the region where exposure occurred

Presumptive:

- Virus-specific IgM antibodies (e.g., EIA/ELISA, MIA, or IFA) in serum but with no other testing for arboviruses endemic to the region where exposure occurred

C. Epidemiologic linkage criteria

Association in time and place (e.g., household member, family member, classmate, or neighbor) with a confirmed or probable dengue case

D. Case classification

Confirmed:

A clinically compatible illness in a person with confirmatory laboratory evidence

Probable:

A clinically compatible illness in a person with presumptive laboratory evidence

Suspect:

Either of the following:

- A clinically compatible illness in a person with epidemiological criteria
- Or a person with confirmatory or presumptive laboratory evidence

Comment
Cases meeting the criteria for severe dengue fever (including DHF and DSS) should be reported as severe dengue fever (Merlin disease code=06101), not as dengue fever (Merlin disease code=06100).

Dengue re-infection
There are four dengue viruses or serotypes. DENV infection results in long-lasting immunity to symptomatic infection with that particular DENV serotype. However, it is possible to be re-infected with any of the remaining dengue viruses. The Centers for Disease Control and Prevention (CDC) estimates approximately 20% of dengue cases who have been previously exposed to another dengue virus may have transient or no significant elevation in dengue IgM titers, making identification of such cases extremely difficult without PCR testing on the acute specimen. An individual with a dengue re-infection may show elevated IgG values (>5.0). During an epidemiological investigation, it is important to ask if there has been any lifetime travel to a dengue-endemic country; the first dengue infection may have occurred years prior and with few or no symptoms.

Differentiating between dengue and West Nile virus (WNV) infections in patients with positive flavivirus labs

- WNV IgM titers are negative or low positive in dengue fever patients (or vice versa); however, the WNV IgG can be quite elevated in dengue patients since IgG strongly cross-reacts between flaviviruses.
- Neuroinvasive disease is relatively uncommon with dengue infections and more likely to be WNV infection. Confusion differentiating WNV and dengue infections is most likely in patients without symptoms of neuroinvasive disease (fever patients).
- Travel to a dengue-endemic country in the two weeks prior to febrile illness onset or travel of a household member to a dengue-endemic country in the four weeks prior to patient illness should increase suspicion of dengue.
- Joint pain is often much more severe in cases of dengue fever compared to WNV fever.
- Thrombocytopenia and leukopenia are more common and severe in cases of dengue fever compared to WNV fever.

Guide to Interpretation and Classification of Common Dengue Laboratory Tests

Laboratory test	Days post-onset of specimen collection	Interpretation of positive result	Explanation
Real-time PCR	≤7 days	Confirmatory*	Patient viremic while febrile; days 0–7
IgM (paired specimens, acute, and convalescent)	≤5 days for acute specimen, >5 days for convalescent (ideally 2 weeks apart)	Confirmatory	Negative IgM in an acute specimen followed by a positive IgM in a convalescent specimen
IgG (paired specimens, acute, and convalescent)	≤5 days for acute specimen, >5 days for convalescent (ideally 2 weeks apart)	Confirmatory	Negative IgG in an acute specimen followed by a positive IgG in a convalescent specimen OR four-fold increase in titer between acute and convalescent specimen and confirmed by PRNT
IgM (single serum specimen)	>5 days	Probable	IgM can remain positive for ≥3 months in cases of acute dengue infection
*Note: Only PCR for dengue or IgM ELISA-based antibody test can be used for diagnosis of dengue in single serum specimens.			
NB: Previous flavivirus infections and the high prevalence of dengue IgG antibodies in some populations (e.g., those residents in, or long-term visitors of, dengue-endemic countries) complicate interpretation of dengue serological test results. Therefore, a single serum specimen tested using a dengue-specific IgG or combined IgM/IgG (“all antibody”) test is generally not helpful for diagnosis of confirmed or probable cases of dengue. For this reason, suspect cases are defined clinically and epidemiologically, without IgG or combined IgG/IgM serological testing.			

Acute and convalescent sera from people with infections believed to be Florida-acquired must be forwarded to the BPHL. Acute sera from people with infections believed to be acquired outside Florida should also be forwarded to BPHL for PCR testing.

Chikungunya Fever

A. Clinical description

Acute phase symptoms include a sudden onset of continuous or intermittent high fever (usually >102°F) with severe joint pain in >2 joints. Tendons may also be involved. Joint and tendon pain commonly involve the hands and feet, is usually bilateral, and often is accompanied by swelling. Other joints may be involved, and back pain is reported in up to 50% of cases. Maculopapular rash is reported in approximately half of all patients, usually two to five days after fever onset. Other symptoms may include headache, fatigue, depression, nausea, vomiting, and muscle pain. Mild thrombocytopenia, leukopenia, and elevated liver function tests may be reported.

Relapse of joint and tendon pain can occur after initial improvement of clinical signs; relapse is most common one to three months after symptom onset. Some patients have prolonged fatigue and depression lasting weeks or months.

B. Laboratory criteria for diagnosis

Confirmatory:

- Isolation of virus from, or demonstration of specific viral antigen or nucleic acid in tissue, blood, CSF, or other bodily fluids (e.g., culture, immunohistochemistry [IHC], polymerase chain reaction [PCR])

OR

- Four-fold or greater change in virus-specific quantitative antibody titers in paired sera (e.g., enzyme-linked immunosorbent assay [EIA/ELISA], microsphere immunoassay [MIA], or immunofluorescence assay [IFA])

OR

- Virus-specific IgM antibodies in serum with confirmatory virus-specific neutralizing antibodies in the same or a later specimen (e.g., EIA/ELISA with serum neutralization [SN] or plaque reduction neutralization [PRNT])

Presumptive:

- Virus-specific IgM antibodies (e.g., EIA/ELISA, MIA, or IFA) in serum

AND

- Absence of negative virus-specific IgM antibodies (e.g., EIA, MIA, IFA). from a state public health laboratory

C. Case classification

Confirmed: A clinically compatible illness in a person with confirmatory laboratory evidence
Probable: A clinically compatible illness in a person with presumptive laboratory evidence
Suspect: A person with confirmatory or presumptive laboratory evidence.

Comment

Chikungunya fever and dengue fever are difficult to differentiate clinically. Maculopapular rash is more frequent in chikungunya fever. Polyarthralgia or pain in a chikungunya fever case is often more localized in joints and tendons, particularly the hands and feet, and may be associated with visible swelling. Signs of shock or hemorrhage are much less commonly reported for chikungunya fever compared to dengue fever. It is also important to note that chikungunya fever and dengue fever can occur as co-infections. Suspect cases of chikungunya or dengue fever should have specimens submitted for appropriate testing (PCR or ELISA/IFA) for both viruses as well as Zika virus if applicable.

Acute and convalescent sera from reported cases without recent international travel (two weeks prior to symptom onset) must be forwarded to BPHL for confirmatory testing.

4. LABORATORY TESTING

A. Criteria for diagnosis

Confirming the diagnosis of chikungunya or dengue can be made using a variety of testing methods. BPHL provides confirmatory laboratory testing services for patients with clinical signs of arboviral disease. BPHL tests all specimens forwarded for confirmation that meet epidemiological criteria (appropriate signs and symptoms as well as travel history), suspect local cases, and individuals without health insurance.

1. Positive private laboratory test results for antibodies to DENV and CHIKV should be confirmed by BPHL.
2. Health care providers should submit acute serum specimens for imported dengue cases and both acute and convalescent specimens for suspect locally acquired dengue cases to either BPHL-Tampa or -Jacksonville.
3. Health care providers should submit both acute and convalescent serum specimens for suspect locally acquired chikungunya cases to either BPHL-Tampa or -Jacksonville.
4. Submit acute serum without waiting for convalescent specimen.
5. There is some cross-reactivity between DENV and other closely related flaviviruses. Please reference the information at the end of the dengue case definition and the Zika case definition to help interpret laboratory results.

B. Services available at BPHL

BPHL can test clinical specimens for either chikungunya or dengue by viral isolation, polymerase chain reaction (PCR), or antibody detection by serologic assays, such as the plaque reduction neutralization test (PRNT) or enzyme-linked immunosorbent assay (ELISA). Only the Tampa laboratory has the capacity to perform the PRNT test. Please contact the Arbovirus Surveillance Coordinator if requesting testing for other exotic arboviruses and provide relevant travel and symptom information.

C. Testing requests

1. Submitting specimens and isolates to BPHL
   a. BPHL staff should be notified of specimen submission and all submissions should be accompanied by a Clinical Laboratory Submission Form DH1847 found at: www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/surveillance-and-investigation-guidance/_documents/dh1847clinicallabsubmissionform.pdf
   b. When requesting testing for dengue or chikungunya, please select both viruses on the Clinical Laboratory Submission Form DH 1847. Select option 1500 under the virology section for dengue and for chikungunya, select “other” under the virology section, and write in chikungunya. Zika testing should also be listed if appropriate. Fill out additional mandatory information in the box below the virology section as indicated on the form.
   c. Include clinical history, onset, specimen collection date, and travel history.
2. Packaging and shipping
   a. Specimens can be sent to the assigned BPHL-Tampa or -Jacksonville for testing.
   b. Specimen type and labeling

i. If the specimen is acute (collected seven or fewer days post onset), the serum should be shipped frozen on dry ice in an insulated cooler. Hold serum in an insulated container with dry ice or an ultra-low freezer until shipped. This is best for virus isolation, but viral RNA may still be detectable in freshly collected acute serum that is immediately sent overnight to the laboratory with frozen gel ice in an insulated cooler.
ii. If the specimen is convalescent (collected eight or more days post onset), the serum may be shipped frozen on dry ice or cold with frozen gel ice in an insulated cooler because the serum will be tested for antibody only. Hold serum in a refrigerator until shipped.
iii. At least 2 ml of serum are requested for testing.
iv. Serum is stored in standard sterile airtight tubes or a serum separator tube (separated prior to refrigeration and shipping) without added media or fixative.
v. Each specimen must be labeled with the patient's name, date of birth, and date of collection.
vi. Unseparated whole blood is an unsatisfactory specimen and should not be shipped to the laboratory.

c. A DOH Clinical Laboratory Submission Form must be included for each patient, listing all specimens. Follow packaging and shipping guidelines for diagnostic specimens (Biological Substance, Category B, UN3373). All suspect diagnostic specimens must be shipped and packaged according to International Air Transport Association (IATA) and Department of Transportation (DOT) Packaging Instructions 650 for Biological Substance, Category B Agents. Per these regulations, anyone who handles, offers for transport, or transports specimens must be trained and certified to do so. Specifications state specimens must be packed in a basic triple packaging system consisting of a primary watertight container wrapped with absorbent material, secondary watertight container, and an outer shipping package. Enclose an itemized list of contents between the secondary packaging and the outer packaging.
d. Contact BPHL for packaging and shipping training dates. BPHL conducts approximately 20 face-to-face trainings per year throughout Florida, free of charge. DOH employees must register for the classes in the DOH online training system TRAIN-FL. For shipping guidance, contact BPHL. Additional shipping trainings are also available commercially through vendors.
e. To expedite receipt of specimens at the laboratory, overnight or two-day express shipment is suggested. If sera are shipped on Friday, the package must be clearly marked for "Saturday Morning Delivery."

3. Contact BPHL-Tampa or -Jacksonville with questions at www.floridahealth.gov/programs-and-services/public-health-laboratories/locations/index.html.

D. Interpretation of results

For any questions about lab results from BPHL or other labs, consult the Arbovirus Surveillance Coordinator or BPHL-Tampa or -Jacksonville. Interpretation of each of the tests is dependent upon the time of specimen collection relative to the date of symptom onset, the patient's previous arbovirus infection history, and serum cross-reactivity within the antigenic complex. In Florida, previous WNV, DENV, or ZIKV infection, previous yellow fever, or Japanese encephalitis vaccination are the most common factors that can complicate the interpretation of antibody tests. In addition, current infections with herpes simplex virus (HSV), Epstein-Barr virus (EBV), *Streptococcus*, influenza, or other pathogens may also complicate the interpretation of antibody tests.

Interpretation of dengue serological test results may be complicated by previous flavivirus infections, which can result in high dengue IgG results (>5.0) and negative to low-positive dengue IgM results. While these results may not meet laboratory criteria alone, **acute** specimens from individuals with compatible symptoms should be forwarded to the state laboratory for confirmatory PCR testing.

5. CASE INVESTIGATION

A. Contact the physician or hospital

1. **Florida Confidential Vector-Borne Disease Case Report form (required):** This form can be used to guide the interview and can be completed during the interview: www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/_documents/crf-vectorborne.pdf.
2. Confirm that a chikungunya or dengue illness has been diagnosed in the reported case.
3. Obtain the following from the health care provider or facility:
   a. Date of onset
   b. Signs and symptoms
   c. Travel history
   d. Any similar illness in other contacts
   e. Predisposing conditions (e.g., immunosuppression)
   f. Tests performed (including EIA, PCR, culture, or any other test performed)
   g. Treatment for pre-existing conditions (e.g., rheumatic arthritis)
4. Ask what information has been given to the patient, including whether the patient knows about the diagnosis and risk factors.
5. Ask if patients were advised to avoid mosquito bites while ill.
6. Obtain as much demographic information as possible, including contact information (home, cellular, pager, and work numbers). Ask how and where the patient can be contacted (i.e., at hospital or home).
7. Notify the physician that you will be contacting the case as DOH follows up on all cases of chikungunya and dengue to assess risks factors, to better characterize the occurrence of these infections in Florida, and to identify potential means for preventing further transmission. It may also be appropriate at this point to determine if the physician has any concerns about the health department contacting the case.
8. The CHD designee will arrange acute and convalescent blood specimen collection and submission to BPHL, as appropriate, to confirm infection with a vector-borne disease. Specimens from suspect local cases, individuals without health insurance, and acute cases with travel history should be forwarded for confirmation.
9. If the potential case meets the case definition for a confirmed, probable, or suspect case, the CHD is responsible for reporting all required information in Merlin under the appropriate disease code.

B. Inform local mosquito control personnel of suspected chikungunya or dengue case (if applicable)

1. For counties with a mosquito control district, notification should occur for the following: A suspected symptomatic case that was in Florida any time from two days prior to symptom onset to 10 days post symptom onset. If reporting occurs more than two months after symptom onset, no notification to mosquito control is needed. Discuss this timeframe with mosquito control to ensure they have no concerns.

2. For counties without a mosquito control district, the County Health Officer should alert the Arbovirus Surveillance Coordinator to coordinate with the Florida Department of Agriculture and Consumer Services (FDACS) regional response team. FDACS team deployment will be determined on a case-by-case basis depending on the risk for sustained local transmission. This should only occur if the following criteria is met: A suspected symptomatic case with PCR-positive laboratory results from a commercial or reference laboratory.
3. Provide work or other addresses as appropriate to mosquito control for suspected cases who have a high risk for mosquito exposure due to occupation or other activities (i.e. primarily outdoors).

C. Interview the case

1. Contact the case or the case's proxy to complete an interview as soon as possible after being reported to optimize recall.
   a. Make at least three phone call attempts to reach the case.
   b. Calls should be made at different times of the day, with at least one attempt in the evening.
   c. If unable to reach by phone or certified letter, a field visit to the home should be made for suspected locally acquired cases.
2. **Florida Confidential Vector-Borne Disease Case Report form (required):** This form can be used to guide the interview and can be completed during the interview. www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/_documents/crf-vectorborne.pdf
3. Items to cover during interview include:
   a. Provide brief background on disease, including mode of transmission, incubation period, symptoms, etc.
   b. Remind patient to avoid mosquito bites while ill.
   c. Ask for travel and activity history
      i. Travel outside county of residence, state, or country
      ii. Travel to dengue- or chikungunya-endemic areas and ask if additional travelers were ill (all travelers should be advised to use mosquito bite precautions for 3 weeks post-travel)
      iii. Any febrile illnesses or travel reported for household members or other contacts in the month prior to patient's onset
      iv. Occupation and address
      v. Hobbies (gardening, fresh water fishing, hunting) and locations
      vi. Other outdoor activities (smoking outside, etc.) and locations
      vii. Use of preventive measures (intact screens, regular use of repellents, drain standing water, etc.)
   d. Collect history of blood transfusions or organ transplants in the past six months and any blood donations in the two weeks prior to symptom onset.
   e. As part of the interview, provide basic education to the cases about personal protection measures to prevent mosquito bites and the "Drain and Cover" message. Emphasize the need to drain standing water at least once a week.
4. Arrange for a convalescent specimen to be drawn, if needed.

D. Merlin data entry

1. Create a case in Merlin under the appropriate disease code. Cases should be created for both imported and locally acquired cases. **Cases should also be created for non-Florida residents who were exposed or tested in Florida.**

   a. Imported and locally acquired chikungunya cases should be reported in Merlin as chikungunya (Merlin disease code=06540).
   b. Imported and locally acquired dengue cases should be reported in Merlin as either dengue fever (Merlin disease code=06100) or severe dengue (Merlin disease code=06101) based on clinical symptoms as described in the case definition.
2. Enter the data collected into Merlin, being sure to include all required fields on the Basic Data screen, complete the Case Symptoms, Travel History, and Extended Data screens, and attach all relevant medical records. Please associate **ALL** positive results from any laboratory and negative results from BPHL received via electronic laboratory reporting (ELR) to the case. For questions regarding lab results, please contact the Arbovirus Surveillance Coordinator.

E. Inform Arbovirus Surveillance Coordinator on suspicion of locally acquired arbovirus infection

F. Enhanced surveillance for additional cases

1. In the event of a locally acquired chikungunya or dengue case, an outbreak of either, or an increase in the number of imported cases, alert health care providers, hospital emergency rooms, and student health centers of the potential for additional patients.
2. The Arbovirus Surveillance Coordinator will notify Florida blood banks and provide the ZIP Code(s) of likely exposure locations for two or more suspected or confirmed local dengue or chikungunya infections or a single suspect or confirmed Zika virus infection. As more detailed epidemiologic information becomes available, the ZIP Codes of concern will be adjusted accordingly. Blood banks at a minimum will screen and defer donors as described in the OneBlood Strategy to Protect the Blood Supply From Mosquito-Borne (Arbovirus) Disease document found in the List of Appendices.
3. Encourage health care providers to consider chikungunya and dengue in any person(s) presenting with fever and other symptoms associated with these viruses. Two documents for medical providers, “Dengue and Chikungunya Fever – Information for Clinicians”, can be found in the List of Appendices.
4. Other enhanced surveillance methods can include reverse 911 calls, Florida’s Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE-FL), medical record review, and media outreach.
5. Cluster investigations in areas near locally acquired cases may also be conducted.
   a. Cluster investigations should focus on both symptomatic and asymptomatic individuals for dengue and only symptomatic individuals for chikungunya.
   b. Include households within 150 meters of a locally acquired case.
   c. Know what languages are appropriate to the local population. Data obtained from census surveys can be useful in determining what translators may be needed.
   d. Please contact the Arbovirus Surveillance Coordinator for more information on how to conduct a cluster investigation.
6. Promptly inform the Arbovirus Surveillance Coordinator and mosquito control of additional cases that are discovered.

6. CONTROLLING FURTHER SPREAD

A. Patient and household education on prevention recommendations

1. Awareness of mosquito-borne diseases
2. Drain standing water to stop mosquitoes from multiplying

   a. Drain water from garbage cans, house gutters, buckets, pool covers, coolers, toys, flowerpots, or any other containers where sprinkler or rain water has collected.
   b. Discard old tires, drums, bottles, cans, pots and pans, broken appliances, and other items that are not being used.
   c. Empty and clean birdbaths and pet water bowls at least once or twice a week.
   d. Protect boats and vehicles from rain with tarps that do not accumulate water.
   e. Maintain swimming pools in good condition and appropriately chlorinated. Empty plastic swimming pools when not in use.
3. Cover skin with clothing or repellent
   a. CLOTHING: Wear shoes, socks, and long pants and long sleeves. This type of protection may be necessary for people who must work in areas where mosquitoes are present.
   b. REPELLENT: Apply mosquito repellent to bare skin and clothing.
   c. Always use repellents according to the label. Repellents with DEET, picaridin, oil of lemon eucalyptus, *para*-menthane-diol, and IR3535 are effective. See the repellent frequently asked questions document in the List of Appendices for more information.
   d. Use mosquito netting to protect children younger than 2 months old.
4. Cover doors and windows with intact screens to keep mosquitoes out of the house
   a. Repair broken screening on windows, doors, porches, and patios.

B. Environmental evaluation

In the event of a locally acquired chikungunya case, dengue case, or outbreak of either, local mosquito control personnel may conduct an immediate assessment of the household. A Mosquito Control Environmental Assessment Form template can be found at the following link: www.floridahealth.gov/diseases-and-conditions/mosquito-borne-diseases/_documents/mosquito-control-environmental-assessment-form.docx. Determining the vector species involved in transmission is important (*Ae. aegypti* or *Ae. albopictus*). Additional information on the control of these two species can be found at www.floridahealth.gov/diseases-and-conditions/mosquito-borne-diseases/_documents/toolbox-for-control-of-aedes-aegypti-and-aedes-albopictus.pdf and www.cdc.gov/zika/public-health-partners/vector-control-us.html.

C. Issue a mosquito-borne illness advisory or alert as necessary

The need for mosquito-borne illness advisories and alerts is determined by the CHD Director or Administrator after consultation with local mosquito control experts and DOH Central Office using the below criteria. See Chapter 11 of the guide for more detailed information. Press or media releases are **not** recommended for imported mosquito-borne disease infections.

1. **Advisory criteria: one locally acquired case**
2. **Alert criteria: a cluster of two or more locally acquired cases**
   Templates for both advisories or alerts can be found in the List of Appendices. Templates are available in both English and Spanish.

D. Education

1. Education messages should be targeted to at-risk populations (e.g. immigrant populations, outdoor workers, tribal representatives, homeless people) in languages appropriate to the local population. Media should be used, including radio, newspaper, and television public service announcements.
2. Educational materials and fact sheets should be provided in English and in appropriate languages if there are immigrant populations in the affected area.

3. The Environmental Public Health Tracking Program has created census tract-level maps designed to identify at-risk populations. Previous work on local dengue virus transmission in Key West identified several variables that put an individual at increased risk of not receiving prevention messaging, including populations that were non-white, did not speak English at home, and had low socioeconomic status. These risk maps combine these variables with women of childbearing age (relevant for Zika virus messaging) to develop a composite index value of risk. The maps can help to drive county health department outreach and education activities: http://hermes.freac.fsu.edu/che/zika/.
4. Encourage residents to always assist in the effort to eliminate artificial container habitats to prevent breeding of *Aedes* mosquitoes, which transmit the exotic diseases dengue and chikungunya, as appropriate when a local mosquito-borne disease infection is confirmed.
5. Post an EpiCom message indicating the details of locally acquired mosquito-borne disease cases. Posts are not needed for imported cases unless there is an unusual case, a cluster of travelers, etc.
6. Distribute information to local health care providers about clinical signs and symptoms of dengue and chikungunya when CDC issues a Health Alert Network (HAN) or there are unusual numbers of imported cases or increased trend of imported cases compared to baseline for the county. Two documents for medical providers, "Dengue and Chikungunya Fever – Information for Clinicians," can be found in the List of Appendices. Review the Florida Weekly Arbovirus Surveillance report for current arboviral activity in Florida.

7. IMPORTANT LINKS

A. Florida Confidential Vector-Borne Disease Case Report Form:
www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/_documents/crf-vectorborne.pdf

B. Florida Department of Health Mosquito-Borne Disease in Florida:
www.floridahealth.gov/%5C/diseases-and-conditions/mosquito-borne-diseases/index.html

C. Surveillance and Control of Selected Mosquito-Borne Diseases in Florida Guidebook
www.floridahealth.gov/diseases-and-conditions/mosquito-borne-diseases/guidebook.html

D. Mosquito-Borne Disease Surveillance Reports
www.floridahealth.gov/%5C/diseases-and-conditions/mosquito-borne-diseases/surveillance.html

E. Mosquito-Borne Illness Response Plan
www.floridahealth.gov/diseases-and-conditions/mosquito-borne-diseases/_documents/mosquito-borne-disease-guide-chapter-eleven.pdf

F. CDC FAQ: Insect Repellent Use and Safety
www.cdc.gov/westnile/faq/repellent.html

G. Florida Resident's Guide to Mosquito Control
www.floridahealth.gov/%5C/diseases-and-conditions/mosquito-borne-diseases/_documents/fl-resident-guide-to-mosquito-control-ifas.pdf

8. REFERENCES

A. Heymann, D.L. (Ed.). (2015). *Control of Communicable Diseases Manual* (20th ed.). Washington: American Public Health Association.

B. American Academy of Pediatrics. (2018). *Red Book: 2018 Report of the Committee on Infectious Diseases* (31st ed.). Grove Village, IL: American Academy of Pediatrics.

C. Division of Disease Control and Health Protection. (2018). *Surveillance and Control of Selected Mosquito-Borne Diseases in Florida Guidebook*. Tallahassee, FL: Florida Department of Health.

D. Pan American Health Organization/Centers for Disease Control and Prevention. (2011). Preparedness and Response for Chikungunya Virus Introduction in the Americas. Washington: Pan American Health Organization.