

# Yellow Fever!

Report immediately 24/7 by phone upon initial suspicion or laboratory test order

## 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](#)), 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 State Arbovirus Surveillance Coordinator on suspicion of arbovirus infection
- Inform local mosquito control personnel of suspected yellow fever case as soon as possible (if applicable)
- Contact provider (see [Section 5A](#))
- Interview case-patient
  - Review disease facts (see [Section 2](#))
  - Mode of transmission
  - Importance of vaccination
  - 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 collected (if necessary)

# Yellow Fever

## 1. DISEASE REPORTING

### A. Purpose of reporting and surveillance

1. 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 immediately 24/7 upon suspicion.

### C. County health department investigation responsibilities

1. Begin investigation on the same day as notification.
2. Inform mosquito control personnel of suspected yellow fever case as soon as possible (if applicable).
3. Contact health care provider as soon as possible after a suspected case is reported and request a serum specimen be forwarded to BPHL-Jacksonville or -Tampa 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 and probable 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](http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/_documents/crf-vectorborne.pdf)
7. Note: Imported and locally acquired yellow fever cases should be reported in Merlin as yellow fever (Merlin disease code=06090). Guidance for dengue fever, chikungunya fever, Zika fever, or other arboviruses are located in their respective Guide to Surveillance and Investigation (GSI) chapters as well as on the surveillance and investigation guidance website: [www.floridahealth.gov/gsi](http://www.floridahealth.gov/gsi).

## 2. THE DISEASES AND THEIR EPIDEMIOLOGY

### A. Etiologic agents

Yellow fever is caused by infection with yellow fever virus (YFV), a flavivirus in the same family as West Nile, dengue, and Zika viruses.

**B. Description of illness**

Illness ranges in severity from a self-limited febrile illness to severe hepatitis and hemorrhagic fever. Symptoms of infection may include high fever, chills, headache, muscle aches, vomiting, and backache. Approximately 15% of infected persons will progress to the toxic stage. After a brief recovery period, the infection can lead to shock, bleeding, and kidney and liver failure. Liver failure causes jaundice, the yellowing of the skin and the whites of the eyes. Severe infections can be fatal, with a 20–50% fatality rate.

During the febrile illness stage, YFV infections are often difficult to differentiate clinically from chikungunya virus, dengue virus, and Zika virus infections (chikungunya fever/dengue fever and Zika fever have their own GSIs.) Signs of shock or hemorrhage are also possible with both yellow fever and severe dengue. It is also important to note that these viruses can occur as co-infections and are vectored by the same mosquito species. Travel history is important for determining risk of infection with these or other similar exotic arboviruses.

**C. Reservoirs**

Non-human primates serve as the primary reservoir for YFV in the jungle (sylvatic) cycle; however, humans may also serve as potential hosts and are the primary reservoir for the urban transmission cycle.

**D. Modes of transmission**

Transmission is through the bite of an infected mosquito. YFV is spread by several mosquito species in the genus *Aedes* and *Haemagogus* (uncommon in the United States). It is theoretically possible for YFV to be transmitted by organ transplants or blood transfusions, and there is evidence of [perinatal transmission from an infected pregnant mother to her infant](#). While rare, vaccine-associated illness has also been reported. There has also been evidence of transmission of the yellow fever vaccine virus through [breastfeeding](#).

Mosquitoes – *Aedes aegypti* and *Aedes albopictus*

The primary vector for the YFV urban transmission cycle 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 yellow fever is typically 3–6 days from the time of the mosquito bite.

**F. Period of communicability**

People can transmit the virus to mosquitoes if bitten while viremic; the viremic stage usually begins shortly before onset of fever and may continue for about 3–5 days.

**G. Treatment**

There is no specific treatment for yellow fever. Treatment is supportive and aimed at decreasing the severity of symptoms. Aspirin and other nonsteroidal anti-inflammatory drugs should be avoided.

**H. Prophylaxis**

Yellow fever vaccine is a live-virus vaccine that has been used for several decades. A single dose provides lifelong protection for most people. Yellow fever vaccine is recommended for people aged  $\geq 9$  months who are traveling to or living in areas at risk for YFV transmission. Yellow fever vaccine may also be used to limit/prevent outbreaks of disease, as seen in Brazil in 2016–2018, including the use of fractional dosing (1/5 of the normal dose provides temporary protection). Yellow fever vaccine is available only at approved vaccination centers. Locations of centers are available on the [yellow fever vaccination clinic search page](#). [Rare vaccine-associated infection can occur](#) and usually needs to be investigated to differentiate from natural infection. Adverse events to vaccinations should be reported to the Vaccine Adverse Event Reporting System (VAERS) by the administering provider.

**I. Yellow fever in Florida**

Yellow fever was previously a major public health concern in the United States, and was one of the major driving forces for the creation of many state health departments, including in Florida, which had large outbreaks in the 1700s and 1800s. The last epidemic in North America occurred in New Orleans in 1905. The risk of sylvatic transmission in the United States is low. Currently, YFV circulates only in tropical regions of Africa, parts of South America, Panama, and in several Caribbean islands. In recent years, yellow fever has resurged in many endemic areas, including in South America due to re-emergence of *Ae. aegypti* mosquitoes and changes in vaccination practices. In 2018, yellow fever activity in popular tourist destinations near urban areas in Brazil resulted in multiple infections in unvaccinated tourists, highlighting the increased risk for introduction into non-endemic areas with competent vectors.

**3. CASE DEFINITIONS****Yellow Fever****A. Clinical criteria for case classification**

One or more of the following, in the absence of a more likely etiology:

- Fever
- Jaundice
- Bilirubin  $\geq 3.0$  mg/dL

**B. Laboratory criteria for case classification****Confirmatory:**

Any of the following:

- Both of the following:
  - Isolation of virus from, or demonstration of specific viral antigen or nucleic acid in tissue, blood, cerebrospinal fluid (CSF), or other body fluid (e.g., culture, immunohistochemistry [IHC], polymerase chain reaction [PCR]),

- **And** no history of yellow fever vaccination within 30 days before illness onset, unless there is molecular evidence of infection with wild-type yellow fever virus,
- **Or** both of the following:
  - Fourfold or greater change in virus-specific neutralizing antibody titers in paired sera (e.g., plaque reduction neutralization [PRNT]),
  - **And** no history of yellow fever vaccination within 30 days before illness onset,
- **Or** all of the following:
  - Virus-specific IgM antibodies in serum or CSF (e.g., enzyme immunoassay [EIA], microsphere immunoassay [MIA], immunofluorescence assay [IF]),
  - **And** confirmatory virus-specific neutralizing antibodies in the same or a later specimen (e.g., PRNT),
  - **And** no history of yellow fever vaccination.

Presumptive:

All of the following:

- Virus-specific IgM antibodies in serum or serum (e.g., EIA, MIA, IF),
- **And** negative, equivocal, or indeterminate result for IgM antibodies in serum or CSF for arboviruses endemic to the region where exposure occurred (e.g., EIA, MIA, IF),
- **And** no history of yellow fever vaccination.

Supportive:

Any of the following:

- Both of the following:
  - Isolation of virus from, or demonstration of specific viral antigen or nucleic acid in tissue, blood, CSF, or other body fluid (e.g., culture, IHC, PCR)
  - **And** yellow fever vaccination within 30 days before illness onset with molecular evidence of infection with the vaccine strain;
- **Or** both of the following:
  - One of the following:
    - Isolation of virus from, or demonstration of specific viral antigen or nucleic acid in tissue, blood, CSF, or other body fluid (e.g., culture, IHC, PCR);
    - **Or** fourfold or greater change in virus-specific neutralizing antibody titers in paired sera (e.g., PRNT);
    - **Or** both of the following:
      - Virus-specific IgM antibodies in serum or CSF (e.g., EIA, MIA, IF)
      - **And** confirmatory virus-specific neutralizing antibodies in the same or a later specimen (e.g., PRNT);
  - **Or** both of the following:
    - Virus-specific IgM antibodies in serum or CSF (e.g., EIA, MIA, IF)
    - **And** negative, equivocal, or indeterminate result for IgM antibodies in serum or CSF for arboviruses endemic to the region where exposure occurred (e.g., EIA, MIA, IF);
- **And** yellow fever vaccination within 30 days before illness onset where vaccine-associated illness could not be ruled out

**C. Epidemiologic criteria for case classification**

One or more of the following:

- Resides in or recent travel to an area with known yellow fever virus transmission,
- **Or** epidemiologically linked to a confirmed or probable case,
- **Or** likely vector exposure in an area with suitable seasonal and ecological conditions for potential local vector-borne transmission,
- **Or** receipt of blood or blood products within 30 days before illness onset,
- **Or** receipt of organ or tissue transplant within 30 days before illness onset.

**D. Case classification**Confirmed:

A clinically compatible illness in a person with confirmatory laboratory evidence and epidemiological criteria.

Probable:

A clinically compatible illness in a person with presumptive laboratory evidence and epidemiological criteria.

Suspect:

One of the following:

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

**Comment**

Cross-reaction with related flaviviruses (e.g., dengue, West Nile, yellow fever, Japanese encephalitis viruses) on serological tests is common and results may be difficult to interpret. Due to this cross reactivity, it is important to ask if there has been any lifetime travel to a flavivirus-endemic country or vaccination for Japanese encephalitis virus.

Yellow fever vaccination history is essential to properly interpret yellow fever diagnostic test results. Following routine vaccination, yellow fever vaccine viral RNA can be detected in serum for up to 14 days, and IgM and neutralizing antibodies can persist for years. In addition, yellow fever vaccine-associated viscerotropic disease is a rare serious adverse event in which vaccine virus proliferates in multiple organs within weeks after vaccination; viral RNA and antigen can be detected in serum and tissues and may be indistinguishable from wild-type disease without additional testing.

Arboviral IgM antibodies may be detected in some patients months or years after their acute infection or vaccination. Therefore, the presence of these virus-specific IgM antibodies may signify a past infection and be unrelated to the current acute illness. Finding virus-specific IgM antibodies in CSF or a fourfold or greater change in virus-specific antibody neutralizing titers between acute- and convalescent-phase serum specimens provides additional laboratory evidence that the arbovirus was the likely cause of the patient's recent illness. Clinical and epidemiologic history also should be carefully considered.

Clinicians should also consider testing for dengue, chikungunya, and Zika viruses for suspected yellow fever cases. As testing capacity allows, specimens meeting the

requirements for yellow fever virus PCR testing at the Bureau of Public Health Laboratories (BPHL) will also be tested for dengue, chikungunya, and Zika viruses as appropriate

**Specimens from all cases must be sent to the Bureau of Public Health Laboratories for confirmation.**

#### 4. LABORATORY TESTING

##### A. Criteria for diagnosis

Confirming the diagnosis of yellow fever 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 that meet epidemiological criteria (appropriate signs and symptoms as well as travel history), suspect local cases, and individuals without health insurance.

1. Health care providers should submit acute serum specimens for imported yellow fever cases and both acute and convalescent specimens for suspect locally acquired yellow fever cases to either the BPHL-Jacksonville or -Tampa.
2. Submit acute serum without waiting for convalescent specimen.
3. There is some cross-reactivity between YFV and other closely related flaviviruses. Testing for other arboviruses should also be requested, particularly other flaviviruses (dengue and Zika viruses).

##### B. Services available at the Bureau of Public Health Laboratories (BPHL)

BPHL can test clinical specimens for yellow fever by viral isolation, polymerase chain reaction (PCR), or IgM antibody detection by enzyme-linked immunosorbent assay (EIA). Please contact the Arbovirus Surveillance Coordinator if requesting testing and provide relevant travel, symptom, and vaccination information.

##### C. Testing requests

1. Submitting specimens/isolates to BPHL
  - a. BPHL staff should be notified of specimen submission and all submissions should be accompanied by the Clinical Laboratory Submission Form found at [www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/surveillance-and-investigation-guidance/\\_documents/dh1847clinallabssubmissionform.pdf](http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/surveillance-and-investigation-guidance/_documents/dh1847clinallabssubmissionform.pdf)
  - b. When requesting testing for yellow fever, please select "other" under the virology section of the Clinical Laboratory Submission Form DH1847 and write in yellow fever. Dengue or 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, travel history, and yellow fever vaccination status.
2. Packaging and shipping
  - a. Specimens can be sent to the assigned BPHL-Jacksonville or -Tampa 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. If a yellow fever vaccine infection is suspected, PCR testing of cerebrospinal fluid (CSF) may be performed (if CSF collection is warranted). A patient-matched serum specimen should also be submitted, and a convalescent serum specimen may also be needed.
  - iv. At least 2 mL of serum are requested for testing.
  - v. Serum is stored in standard sterile airtight tubes or a serum separator tube (separated prior to refrigeration and shipping) without added media or fixative.
  - vi. Each specimen must be labeled with the patient's name, date of birth, and date of collection.
  - vii. 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](http://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 or 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.

## 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](http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/_documents/crf-vectorborne.pdf).
2. Confirm that yellow fever has been diagnosed or is suspected in the reported case.
3. Obtain the following from the health care provider or facility:
  - a. Date of onset
  - b. Signs and symptoms
    - i. Include bilirubin levels (direct and total) if available
  - c. Travel history
  - d. Yellow fever vaccination history
  - e. Any similar illness in other contacts
  - f. Predisposing conditions (e.g., immunosuppression)
  - g. Tests performed (including EIA, PCR, culture or any other test performed)
  - h. 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 yellow fever 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 tested.
9. If the Arbovirus Surveillance Coordinator approves testing for yellow fever or if the patient meets case definition, the CHD is responsible for reporting all required information in Merlin under the appropriate disease code.

### B. Inform local mosquito control personnel of suspected yellow fever 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 anytime 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 time frame 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 a suspected symptomatic case has PCR-positive laboratory results from a 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 within 48 hours, a field visit to the home should be made for suspected locally acquired cases.
2. **Florida Confidential Vector-Borne Disease Case Report form (required):** [www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/\\_documents/crf-vectorborne.pdf](http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/_documents/crf-vectorborne.pdf). This form can be used to guide the interview and can be completed during the interview.
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 yellow fever-endemic areas and ask if additional travelers were ill (all travelers should be advised to use mosquito bite precautions for three weeks post-travel)
    - iii. Ask for yellow fever vaccination history
    - iv. Any febrile illnesses or travel reported for household members or other contacts in the month prior to patient's onset
    - v. Occupation and address
    - vi. Hobbies (gardening, fresh water fishing, hunting) and locations
    - vii. Other outdoor activities (smoking outside, etc.) and locations
    - viii. 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 serum specimen to be drawn, if needed.

### D. Merlin data entry

1. Create a case in Merlin under the appropriate Merlin disease code=06090. Cases should be created for both imported and locally acquired cases. **Cases should also be created for non-Florida residents that were exposed or tested in Florida.**
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

(including vaccination history), and attach all relevant labs. Please associate **ALL** labs 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 YFV infection or possible vaccine-associated illness.**

**F. Enhanced surveillance for additional cases**

1. In the event of a locally acquired yellow fever case or an increase in the number of imported cases, alert health care providers, hospital emergency rooms, and student health centers.
2. The Arbovirus Surveillance Coordinator will notify Florida blood banks and provide the ZIP Code(s) of likely exposure locations for a single suspect or confirmed YFV 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 yellow fever in any person(s) presenting with fever and other symptoms associated with this virus. A document for medical providers, "Yellow Fever – Information for Clinicians," can be found in the [List of Appendices](#).
4. Other enhanced surveillance methods can include reverse 911 calls, monitoring 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 yellow fever.
  - 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 Arbovirus Surveillance Coordinator and mosquito control of additional cases that are discovered.

## **6. CONTROLLING FURTHER SPREAD**

**A. Patient/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 rainwater 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.
  - e. Cover doors and windows with intact screens to keep mosquitoes out of the house and repair broken screening on windows, doors, porches, and patios.

## B. Environmental evaluation

In the event of a locally acquired yellow fever case or outbreak, 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](http://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](http://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](http://www.cdc.gov/zika/public-health-partners/vector-control-us.html).

## C. Possible yellow fever vaccination campaigns may also be conducted in areas of local transmission as needed, particularly if there are signs of ongoing transmission.

## D. 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.

## E. 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 appropriate languages other than English 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 exotic diseases like yellow fever, 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 all 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 yellow fever when CDC issues a Health Alert Network (HAN) or there are unusual numbers of imported cases or increased trend of imported cases compared to base line for the county. A document for medical providers, "Yellow 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](http://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](http://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](http://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](http://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](http://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](http://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](http://www.floridahealth.gov/%5C/diseases-and-conditions/mosquito-borne-diseases/_documents/fl-resident-guide-to-mosquito-control-ifas.pdf)
- H. CDC Yellow Fever Vaccine Information  
[www.cdc.gov/vaccines/hcp/vis/vis-statements/yf.html#whoshould](http://www.cdc.gov/vaccines/hcp/vis/vis-statements/yf.html#whoshould)  
[www.cdc.gov/vaccines/vpd/yf/index.html](http://www.cdc.gov/vaccines/vpd/yf/index.html)  
[wwwnc.cdc.gov/travel/yellow-fever-vaccination-clinics/search](http://wwwnc.cdc.gov/travel/yellow-fever-vaccination-clinics/search)
- I. CDC Yellow Book Health Information for International Travel  
[wwwnc.cdc.gov/travel/page/yellowbook-home](http://wwwnc.cdc.gov/travel/page/yellowbook-home)

## 8. REFERENCES

- A. Heymann, D.L. (Ed.). (2015). *Control of Communicable Diseases Manual* (20<sup>th</sup> 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.