

Yellow Fever Investigation Guideline

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Yellow Fever

Disease Management and Investigative Guidelines

CASE DEFINITION (CDC 1997)

A. Clinical Description for Public Health Surveillance:

- A mosquito-borne viral illness characterized by acute onset and constitutional symptoms followed by a brief remission and a recurrence of fever, hepatitis, albuminuria, and symptoms and, in some instances, renal failure, shock, and generalized hemorrhages.

B. Laboratory Criteria for Case Classification:

- Fourfold or greater rise in yellow fever antibody titer in a patient who has no history of recent yellow fever vaccination and cross-reactions to other flaviviruses have been excluded, or
- Demonstration of yellow fever virus, antigen, or genome in tissue, blood, or other body fluid.

C. Case Classification:

- Confirmed: a clinically compatible case that is laboratory confirmed.
- Probable: a clinically compatible case with supportive serology (stable elevated antibody titer to yellow fever, see examples below). Cross-reactive serologic reactions to other flaviviruses must be excluded, and the patient must not have a history of yellow fever vaccination.
 - greater than or equal to 32 by complement fixation,
 - greater than or equal to 256 by immunofluorescence assay,
 - greater than or equal to 320 by hemagglutination inhibition,
 - greater than or equal to 160 by neutralization, or
 - a positive serologic result by immunoglobulin M-capture enzyme immunoassay].

D. Laboratory Testing:

- Warning: Prior consultation with CDC recommended. Call the Arbovirus Branch in Ft. Collins, CO at 970-221-6407.
- Call Epidemiologic Services at 877-427-7317 before sending any samples to the Kansas Health and Environment Laboratory (KHEL).
- Serology samples are forwarded to the CDC and must be accompanied by a CDC submission form (CDC 50.34) with the following criteria met:
 - Date of onset of symptoms
 - Date of specimen collection (Specimen collection within 8 days after the onset of symptoms, requires a convalescent specimen collection.)
 - Pertinent travel history (3 months prior to the date of symptom onset)
 - Patient's name (REQUIRED for submitting specimens)
- Specimen: Blood or serum (3-5 ml). Acute and convalescent specimens, if available, should be sent together.
- Collection: KHEL Serology kit with yellow top blood tubes or any other red topped, clot separator blood tubes.
- Timing of collection for serology: Acute obtained 3 to 10 days after onset of symptoms; convalescent 2-3 weeks after acute sample.
- Test results are normally available 4 to 14 days after specimen receipt.

Hard copy of results will take at least 2 weeks after testing is completed.

- For additional information and/or questions, call (785) 296-1620 or refer to online guidance at www.kdheks.gov/labs/lab_ref_guide.htm.

E. Bioterrorism Potential:

- Yellow fever is a potential bioterrorism weapon. If the case has no remarkable travel history, a bioterrorism event should be considered; contact the local Health Officer, the on-call epidemiologist (local) and KDHE (1-877-427-7317) immediately. See [Managing Special Situations](#).

F. Outbreak Definition:

- One or more cases for which a known risk factor (i.e., recent travel to an endemic area) cannot be identified should be considered a potential outbreak and adequate resources applied to the investigation.

INVESTIGATOR RESPONSIBILITIES

A. Investigation Related Tasks and Activities:

- 1) Confirm diagnosis with appropriate medical provider.
 - Before contacting the patient or family, first determine what information has been released about the patient's diagnosis and identify if the needed epidemiologic data can be found in the clinical record alone.
 - Obtain information that supports the [case definition](#), including travel to endemic areas.
 - Obtain information on any laboratory tests performed and results.
 - If specimens were sent to CDC for testing, obtain a copy of the CDC Submission Form for onset date, symptoms and travel information.
 - For hospitalizations, obtain medical records, including admission notes, progress notes, lab report(s), and discharge summary.
- 2) Conduct [case investigation](#) to determine the individual's at-risk activities and potential site of exposure; evaluate the possibility of additional cases.
- 3) Follow up with all confirmed cases and potential contacts to assure adequate treatment and/or medical screening.

B. Notifications:

- 1) There are no special notifications or additional reporting requirements.
- 2) Mail or deliver notification letter and/or disease fact sheet to case and contacts (if appropriate and/or requested).

EPIDEMIOLOGY

Yellow fever virus is endemic in certain regions of Africa and the Americas located between 15°N and 10°S of the equator. There are 2 types of transmission cycles, a sylvatic or jungle cycle that involves mosquitoes and nonhuman primates, and an urban cycle involving *Aedes aegypti* mosquitoes and humans. Sylvatic transmission is restricted to tropical regions of Africa and Latin America, where a few hundred cases occur annually. Historically, urban yellow fever occurred in many cities of the Americas, although in recent years has only been reported in Nigeria. An outbreak of urban yellow fever has not been reported in the Americas since 1942.

DISEASE OVERVIEW

A. Agent:

Yellow fever virus; a flavivirus

B. Clinical Description:

Acute viral infection of short duration and varying severity, characterized by acute onset of fever, chills, headache, backache, generalized muscle pain, prostration, nausea and vomiting. In addition, the pulse may be slow, weak and out of proportion to the elevated temperature (i.e., Faget sign). Most cases improve and recover within 3 - 4 days; however, about 15% enter into a second or toxic phase \leq 1 day of initial recovery. Symptoms of the toxic phase include, fever, jaundice, epistaxis, gingival bleeding, hematemesis (i.e., vomiting of blood, usually coffee-ground or black in color), Melina, and liver and renal failure. Twenty to 50% of jaundiced cases are fatal.

C. Reservoirs:

In urban areas: humans and *Aedes aegypti* mosquitoes; in forest areas: vertebrates other than humans and forest mosquitoes. Humans do not have a role in transmission of jungle yellow fever or in maintaining the virus, but are the primary amplifying host in the urban cycle.

D. Mode(s) of Transmission:

Bite of infected mosquitoes. Direct person-to-person spread does not occur.

E. Incubation Period:

3-6 days.

F. Period of Communicability:

No person-to-person transmission. Human blood can infect feeding mosquitoes during first 3-5 days of illness. Mosquitoes can transmit virus 9-12 days after feeding and remain infected for life. Mosquitoes can live weeks to months.

G. Susceptibility and Resistance:

Susceptibility of non-immunized individuals is universal. Individuals who have recovered from a yellow fever infection develop life-long immunity. Transient passive immunity in infants born to immune mothers may persist for up to 6 months.

H. Treatment:

No specific treatments. Supportive care only.

STANDARD CASE INVESTIGATION AND CONTROL METHODS

Standard investigation activities include the following:

- 1) Confirmation of diagnosis using [case definition](#).
- 2) Collection of demographic data (birth date, county, sex, race/ethnicity)
- 3) Collection of clinical information and laboratory results.
- 4) Determination of risk factors and transmission settings. (i.e., travel, outdoor activity, use of repellent)

Standard investigation **includes** completion of the General Investigation Form(s):

A. Case Investigation - Identify Potential Source of Infection:

To help identify the source of the infection, the investigator should focus their investigation within the incubation period of yellow fever (i.e., 3-6 days) and on potential vectors of disease transmission:

- Immunization history and/or a previous history of yellow fever.
- Travel history, including dates and places for travel during the incubation period.
 - List countries and cities, dates of stay.
 - Record all places the case visited before onset including forested areas.
- Exposure to mosquitoes, include dates and places during incubation period.
- With [no travel to areas endemic](#) for yellow fever prior to onset:
 - Obtain assistance to search the case's work and places visited for any mosquitoes possible of transmitting yellow fever and eradicate them.
 - Investigate febrile illness reports or unexplained deaths in the area.
 - [Refer to Managing Special Situations](#).

B. Contact Investigation – Identify Exposed Individuals / Populations:

- Contacts are not those with just close proximity to case but those who have exposure to the vector or source of infection.
- Individuals living in the same household, co-workers, and anyone who might be exposed to the same vector as the case are considered at risk.

C. Isolation, Work and Daycare Restrictions

- Follow blood and body fluid precautions.
- Prevent access of mosquitoes to case for at least 5 days after onset of symptoms through the use of screened sickrooms, spraying with insecticides and using bed nets.

D. Case Management, Including Follow-up of cases:

- None.

E. Contact Management, Including Protection of Contacts:

- If indicated, recommend yellow fever vaccine.
- Certified Yellow Fever Vaccination Clinics can be found at <http://wwwn.cdc.gov/travel/yellowfever.aspx>.

F. Environmental Measures:

- Mosquito control is an important part of preventing virus transmission. Although the *A. aegypti* mosquito is relatively rare in the United States they have been found in the following areas: Alabama, Arkansas, Delaware, Florida, Georgia, Illinois, Kansas, Kentucky, Louisiana, Maryland, Mississippi, Missouri, New Mexico, New York, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia and Washington, D.C..

G. Education:

- Instruct travelers to endemic areas on the risks and the need for immunizations and to minimize contact with mosquitoes through the use of nets and repellents.
- Information for travelers to Malaria endemic areas can be found at the CDC Traveler's Health website. (wwwn.cdc.gov/travel/)

MANAGING SPECIAL SITUATIONS

A. No Recent Travel to Endemic Areas:

- A single diagnosed or suspected case of non-indigenous yellow fever with no travel history should be reported and investigated immediately. Contact the on-call epidemiologist (local) and KDHE (1- 877-427-7317) immediately.
- A locally acquired case of yellow fever would be an unusual occurrence in the United States. However, in recent years a resurgence of the *A. aegypti* mosquito has occurred in South America and has increased the potential for reemerging urban yellow fever.
- Environmental measures such as investigating local areas visited by the case to locate the source of infection and surveillance of other people for illness may be necessary.

B. Intentional Contamination

If a natural etiology cannot be established by a prompt, vigorous investigation; the situation is considered a bioterrorist act until proven otherwise.

If suspected:

- Notify local law enforcement and state public health officials.
- Implement "[Chain of Custody](#)" procedures for all samples collected, as they will be considered evidence in a criminal investigation.
- Work to define population at risk which is essential to guide response activities. Public health authorities will play the lead role in this effort, but must consult with law enforcement, emergency response and other professionals in the process. The definition may have to be re-evaluated and redefined at various steps in the investigation and response.
- Once the mechanism and scope of delivery has been defined, the identification of the symptomatic and asymptomatic exposed individuals can be completed and recommendations for the treatment and/or chemoprophylaxis made.
- Establish and maintain a detailed line listing of all cases and contacts with accurate identifying and locating information.

Safety Considerations:

- By the time the first cases are identified the risk of exposure is dependent on the number of infected mosquitoes remaining at the exposure site. Appropriate protective clothing and repellents should be used.

Vaccination:

- Yellow fever vaccine is a live virus vaccine which has been used for several decades. A single dose confers immunity lasting 10 years or more. If a person is at continued risk of yellow fever infection, a booster dose is needed every 10 years. Adults and children over 9 months can take this vaccine.

Treatment:

- No specific therapy. Patients who develop severe illness may require anticonvulsant and supportive care to maintain fluid and electrolyte balance,

for ventilation, and to prevent secondary bacterial infections.

Postexposure prophylaxis (PEP):

- No post-exposure prophylaxis is associated with this group of diseases; however, vaccination may be an option for some of the arboviruses.

Environmental decontamination:

- The viruses do not persist in the environment for long periods of time. No environmental decontamination necessary.
- A release in areas populated with appropriate animal host and/or appropriate arthropod vectors could initiate both an epizootic and epidemic trends.
- Integrated pest management at the presumed infected site, including insecticide fogging, may be a reasonable approach.

DATA MANAGEMENT AND REPORTING TO THE KDHE

- A.** Organize, collect and report data with the General Investigation Form(s) and the CDC Specimen Submission Form (CDC 50.34).
- B.** Report data electronically via KS-EDSS using the Disease Name = Yellow Fever or report by fax, include:
 - All essential data that was collected during the investigation, especially data that helps to confirm or classify a case;
 - All information collected on the General Investigation form(s).

(The CDC Specimen Submission Form has important information that is needed to confirm cases, fax copies to 1-877-427-7318.)

ADDITIONAL INFORMATION / REFERENCES

- A. Treatment / Differential Diagnosis:** Red Book: 2009 Report of the Committee on Infectious Diseases. 28th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2009: 214-220.
- B. Epidemiology, Investigation and Control:** Heymann. D., ed., Control of Communicable Diseases Manual, 18th Edition. Washington, DC, American Public Health Association, 2004.
- C. Case Definitions:** CDC Division of Public Health Surveillance and Informatics, Available at: www.cdc.gov/ncphi/diss/nndss/casedef/case_definitions.htm
- D. Kansas Regulations/Statutes Related to Infectious Disease:** www.kdheks.gov/epi/regulations.htm
- E. Chain of Custody:** KDHE Chain of Custody Standard Operating Guide, www.kdheks.gov/cphp/operating_guides.htm#coc
- F. Community Containment Standard Operation Guide:** www.kdheks.gov/cphp/comm_containment_sog.htm
- G. Guidelines for Arbovirus Surveillance Programs in the United States (CDC 1993).** Available at: www.cdc.gov/ncidod/dvbid/Arbor/arboguid.pdf
- H. ASTO Mosquito Control Resources:** www.astho.org/index.php?template=mosquito_control.html
- I. Additional Information (CDC):** www.cdc.gov/health/default.htm
- **CDC Arboviral Specimen Submission Instructions:** www.cdc.gov/ncidod/dvbid/misc/arboviral_shipping.htm

Kansas Disease Investigation Guidelines

General Investigation Form

| Investigation Information | | |
|---|--|--|
| Case Type: <input type="checkbox"/> Human Case <input type="checkbox"/> Non-human Case | Disease Name: _____ | |
| Classification: <input type="checkbox"/> Suspect <input type="checkbox"/> Probable <input type="checkbox"/> Confirmed | KS-EDSS Investigation ID: _____ | |
| Outbreak: <input type="checkbox"/> Yes <input type="checkbox"/> No | Outbreak Name: _____ | Outbreak #: _____ |
| Onset Date: _____ | Diagnosis Date: _____ | Report Date: _____ |
| Assigned to (Investigator): _____ | Patient Died: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown | |
| Patient Information | | |
| Name Type: <input type="checkbox"/> Default/Common <input type="checkbox"/> Legal <input type="checkbox"/> Maiden <input type="checkbox"/> Nickname | | |
| Last: _____ | First: _____ | Middle: _____ |
| Street: _____ | City/State: _____ | Zip: _____ |
| Evening Phone #: _____ | Daytime Phone #: _____ | |
| Sex: <input type="checkbox"/> Failure to Report <input type="checkbox"/> Female <input type="checkbox"/> Male <input type="checkbox"/> Other <input type="checkbox"/> Transexual <input type="checkbox"/> Unknown | | |
| Race: <input type="checkbox"/> American Indian or Alaska Native <input type="checkbox"/> Asian <input type="checkbox"/> Black or African American <input type="checkbox"/> Native Hawaiian or Other Pacific Islander <input type="checkbox"/> White <input type="checkbox"/> Unknown | | |
| Hispanic / Latino Ethnicity: <input type="checkbox"/> Yes <input type="checkbox"/> No | | |
| Date of Birth: _____ | Age: _____ | Age Unit: <input type="checkbox"/> Days <input type="checkbox"/> Weeks <input type="checkbox"/> Months <input type="checkbox"/> Years |
| Parent Information (if under 18) | | |
| Last: _____ | First: _____ | Middle: _____ |
| Street: _____ | City/State: _____ | Zip: _____ |
| Evening Phone #: _____ | Daytime Phone #: _____ | |
| Work / Occupation or School / Grade | | |
| Worksites / School: _____ | | |
| Occupations / Grade: _____ | | |
| Travel History | | |
| 1st | Destination: _____ | Depart Date: _____ Return Date: _____ |
| 2nd | Destination: _____ | Depart Date: _____ Return Date: _____ |
| 3rd | Destination: _____ | Depart Date: _____ Return Date: _____ |
| 4th | Destination: _____ | Depart Date: _____ Return Date: _____ |

Supplemental Laboratory Report Form

Lab Reports

Laboratory Name: _____

Lab Report Date: _____

Ordering Provider Name: _____

Phone: _____

Facility: _____

Specimen Accession Number: _____

Specimen Collection Date: _____

Organism Name: _____

Organism Species: _____

Organism Serogroup: _____

Organism Serotype: _____

PFGE Results

Pattern 1 KS: _____

Other State: _____

CDC: _____

Pattern 2 KS: _____

Other State: _____

CDC: _____

Pattern 3 KS: _____

Other State: _____

CDC: _____

Additional Results Information

Reported Test Name:

Coded Result:

Text Result:

Numeric Result:

Comments:

Supplemental Contact Form

Contacts

Last: _____ **First:** _____ **Middle:** _____

Street: _____ **City/State:** _____ **Zip:** _____

Evening Phone #: _____ **Daytime Phone #:** _____ **E-mail:** _____

Sex: Failure to Report Female Male Other Transexual Unknown

Race: American Indian or Alaska Native Asian Black or African American Native Hawaiian or Other Pacific Islander White Unknown

Hispanic / Latino Ethnicity: Yes No

Date of Birth: _____ **Age:** _____ **Age Unit:** Days Weeks Months Years

Worksites / School: _____

Occupations / Grade: _____

Exposure Information

Contact Type: Household Sexual Other: _____ **Partner / Cluster Code:** _____

Date of First Exposure: _____ **Date of Last Exposure:** _____ **Frequency:** _____

Nature of Exposure: _____ **Comments:** _____

Testing and Treatment Information

Clinic Code: _____ **Examination Date:** _____

Examination Test: _____ **Examination Result:** _____

Prophylaxis/empiric treatment date: _____ **Drug / Dosage:** _____

Provider (Name / Facility): _____

Disposition and Diagnosis Information

Initiation Date: _____ **Disposition Date:** _____ **Disposition:** _____

Diagnosis: _____ **Referral Type:** Patient Provider **Post-test Counseled :** Yes No

Currently Assigned To: _____ **Follow-up Date:** _____

Risk Factors

Pregnant: Yes No **If Yes, # of Weeks:** _____

Risk factors for complications in contact: None Pregnant Woman HIV Seropositive Unimmunized Index case is a super-spreader

Child younger than 5 Age > 65 Otherwise immunosuppressed (s/p transplant, high dose steroids, etc)

Justification must be completed by State health department laboratory before specimen can be accepted by CDC. Please check the first applicable statement and when appropriate complete the statement with the *.

1. Disease suspected to be of public health importance. Specimen is:
 (a) from an outbreak. (b) from uncommon or exotic disease.
 (c) an isolate that cannot be identified, is atypical, shows multiple antibiotic resistance, or from a normally sterile site(s) (d) from a disease for which reliable diagnostic reagents or expertise are unavailable in State.

2. Ongoing collaborative CDC/State project.

3. Confirmation of results requested for quality assurance.

*Prior arrangement for testing has been made.
 Please bring to the attention of:
 (Name): _____

Completed by: _____
 Date: ____/____/____

STATE HEALTH DEPARTMENT LABORATORY ADDRESS: _____

STATE HEALTH DEPT. NO.: _____ DATE SENT TO CDC: (MM/DD/YYYY) ____/____/____

Name, Address and Phone Number of Physician or Organization: _____

PATIENT IDENTIFICATION: (Hospital No.) _____

NAME: (LAST, FIRST, MI) _____

BIRTHDATE: (MM/DD/YYYY) ____/____/____ SEX: MALE FEMALE

CLINICAL DIAGNOSIS: _____

ASSOCIATED ILLNESS: _____

DATE OF ONSET: (MM/DD/YYYY) ____/____/____ FATAL? YES NO

| (FOR CDC USE ONLY) | | CDC NUMBER | | DATE RECEIVED | | |
|--------------------|----|------------|-----|---------------|----|----|
| UNIT | FY | NUMBER | SUF | MO | DA | YR |
| | | | | | | |

REVERSE SIDE OF THIS FORM MUST BE COMPLETED

THIS FORM MUST BE EITHER PRINTED OR TYPED
 PLEASE PREPARE A SEPARATE FORM FOR EACH SPECIMEN

D.A.S.H.

DATE REPORTED

| | |
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| 0 | 3 |
|---|---|

MO DA YR
 ____/____/____

Comments:

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DEPARTMENT OF HEALTH AND HUMAN SERVICES
 Public Health Service
 Centers for Disease Control
 Center for Infectious Diseases
 Atlanta, Georgia 30333



The Centers for Disease Control (CDC), an agency of the Department of Health and Human Services, is authorized to collect this information, including the Social Security number (if applicable), under provisions of the Public Health Service Act, Section 301 (42 U.S.C. 241). Supplying the information is voluntary and there is no penalty for not providing it. The data will be used to increase understanding of disease patterns, develop prevention and control programs, and communicate new knowledge to the health community. Data will become part of CDC Privacy Act system 09-20-0106, "Specimen Handling for Testing and Related Data" and may be disclosed: to appropriate State or local public health departments and cooperating medical authorities to deal with conditions of public health significance; to private contractors assisting CDC in analyzing and refining records; to researchers under certain limited circumstances to conduct further investigations; to organizations to carry out audits and reviews on behalf of HHS; to the Department of Justice in the event of litigation, and to a congressional office assisting individuals in obtaining their records. An accounting of the disclosures that have been made by CDC will be made available to the subject individual upon request. Except for permissible disclosures expressly authorized by the Privacy Act, no other disclosure may be made without the subject individual's written consent.

Public Health Fact Sheet

Yellow Fever

What is Yellow Fever?

Yellow fever is a viral disease transmitted by mosquitoes. It occurs in tropical and subtropical areas of the world and is not present in the United States. There is no human-to-human transmission.

What are the symptoms?

Symptoms of yellow fever range from mild to severe with death occurring in about 5% of cases. Fever, headache, vomiting, and backache are initial symptoms and is often followed by a brief remission. As the disease progresses, the pulse will slow and weaken and bleeding of the gums and bloody urine occur. Jaundice (the yellowing of the skin or eyes) may be observed.

How is Yellow Fever spread?

Yellow fever is transmitted by the bite of an infected *Aedes aegypti* mosquito.

Who gets Yellow Fever?

Yellow fever occurs only in the tropics. All non-immune people who live in or visit areas where yellow fever is present are at risk.

How is it diagnosed?

Yellow fever is diagnosed by isolating the virus from blood, or a positive antibody test.

How is Yellow Fever treated?

There is no specific treatment for yellow fever. People traveling to areas where yellow fever occurs should be immunized.

How can you prevent Yellow Fever?

Since transmission of yellow fever no longer occurs in the United States, it is important for travelers to be immunized before visiting areas where yellow fever is present. These immunizations can only be given at clinics certified to give the vaccine. In addition, precautions to avoid mosquito bites, including the use of insect repellent, protective clothing, and mosquito netting should be considered.

Where can you get more information?

- Your Local Health Department
- Kansas Department of Health and Environment, Epidemiologic Services Section at (877) 427-7317
- <http://www.cdc.gov/health/default.htm>
- Your doctor, nurse, or local health center

This fact sheet is for information only and is not intended for self-diagnosis or as a substitute for consultation. If you have any questions about the disease described above or think that you may have an infection, consult with your healthcare provider. This fact sheet is based on the Centers for Disease Control and Prevention's topic fact sheets.