

YELLOW FEVER

REPORTING INFORMATION

- **Class A: Report immediately via telephone** the case or suspected case and/or a positive laboratory result to the local public health department where the patient resides. If patient residence is unknown, report immediately via telephone to the local public health department in which the reporting health care provider or laboratory is located. Local public health departments should report immediately via telephone the case or suspected case and/or a positive laboratory result to the Ohio Department of Health (ODH). The local health department should also enter the case(s) into the Ohio Disease Reporting System (ODRS) within 24 hours of the initial telephone report to ODH.
- Reporting Form(s) and/or Mechanism:
 - *Immediate telephone reporting* is required.
 - For the local health department, the case should be entered into the Ohio Disease Reporting System (ODRS) within 24 hours after the telephone report.
- Additional reporting information, with specifics regarding the key fields for ODRS reporting, can be located in [Section 7](#).

AGENT

Yellow fever (YF) virus is a flavivirus that cross-reacts serologically with other flaviviruses (e.g. St. Louis encephalitis virus [SLE], West Nile virus, dengue virus, Japanese encephalitis virus).

Infectious dose

A single bite of an infectious mosquito.

CASE DEFINITION

Case Description

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, in some cases, renal failure, shock and generalized hemorrhages.

Laboratory Criteria for Diagnosis

- Four-fold 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.

Case Classification

Probable: A clinically compatible case with supportive serology (stable elevated antibody titer to yellow fever virus [e.g. ≥ 32 by complement fixation; ≥ 256 by immunofluorescence assay; ≥ 320 by hemagglutination inhibition; ≥ 160 by neutralization or a positive serologic result by immunoglobulin M (IgM)-capture enzyme immunoassay]. Cross-reactive serologic reactions to other flaviviruses must be excluded, and the patient must not have a history of yellow fever vaccination.)

Confirmed: A clinically compatible case that is laboratory confirmed.

Comment

Yellow fever antibodies cross-react extensively with other flaviviruses (e.g. St. Louis encephalitis virus, dengue virus, West Nile Virus, Japanese encephalitis). Travel history may suggest that these other infections be ruled out.

SIGNS AND SYMPTOMS

Clinical presentations range from mild fever to more severe cases with fever, headache, prostration, nausea, vomiting, hemorrhagic symptoms and jaundice. The initial illness presents as a sudden onset of fever, chills, headache, backache, myalgias, prostration, nausea and vomiting. Most patients improve after the initial presentation, but approximately 15% of cases experience a brief remission for a few hours to a day and then progress to develop a more serious or toxic form of the disease, which is characterized by jaundice, hemorrhagic symptoms and eventually shock and multisystem organ failure. The overall case fatality for cases with jaundice is 20%-50%.

DIAGNOSIS

The viremia for yellow fever virus in humans ceases by the time of, or soon after, onset of symptoms. The acute phase blood specimen should be collected immediately upon suspicion of a viral illness and a convalescent sample two or more weeks later. All of the tests listed under **Case Classification** are performed by the Centers for Disease Control and Prevention (CDC). Proper protocol is to send the serum or other specimens to CDC through the ODH Laboratory. Please contact the ODH Laboratory at 1-888-ODH-LABS (1-888-634-5227) (Monday – Friday; 8 AM – 5 PM) prior to shipment for CDC specimen submission criteria. The diagnosis is supported by the typical lesions in the liver.

EPIDEMIOLOGY**Source**

Monkeys serve as vertebrate reservoirs in the sylvatic cycle, and humans serve as the vertebrate reservoir in the urban cycle.

Occurrence

Enzootic sylvatic (forest-dwelling) yellow fever occurs in Africa south of the Sahara and in South America. Urban outbreaks are still reported. A primary case in Ohio would probably be imported.

Mode of Transmission

Urban yellow fever is transmitted by the mosquito, *Aedes aegypti*. Sylvatic vectors include *Haemagogus* species and other *Aedes* species. Transovarial transmission in mosquitoes may contribute to the persistence of YF virus through dry periods.

Period of Communicability

Humans are infectious to certain vector mosquito species from symptom onset through day 5.

Incubation Period

3-6 days.

PUBLIC HEALTH MANAGEMENT

Case

Investigation

Investigation should reveal a specific travel history to an endemic area within 1 week prior to onset of illness. Accurate travel history and confirmation are necessary to document cases and identify the source. In ODRS, fully complete the travel history, epidemiology and onset date.

Treatment

Supportive.

Isolation and Follow-up Specimens

Section 3701-3-13, (EE), of the Ohio Administrative Code states:

“A person with confirmed or suspected yellow fever shall be isolated to prevent access of mosquitoes to the patient for at least five days after onset of disease.”

A convalescent sample should be obtained two or more weeks after the acute sample. Autopsy blood and/or tissue samples may also be taken. If the CDC laboratory is to be used, proper protocol is to send the sample(s) to CDC via the ODHL (see **DIAGNOSIS** above).

Public Health Significance

High in endemic areas.

Special Information

There is a low probability of endemic transmission of yellow fever in Ohio due to the low prevalence of the vectors and because of the brief period during which the patient is viremic.

Contacts

No prophylaxis is indicated.

Prevention and Control

Follow-up Specimens

Does not apply if yellow fever has been laboratory confirmed.

Travelers

Travelers entering endemic areas should be warned to avoid mosquitoes, use mosquito repellents, occupy screened quarters and use mosquito netting over beds.

Vaccination

The International Certificate of Vaccination (ICV) against yellow fever is required by many countries to gain entry. Vaccination is highly recommended for travel into infected areas. The ICV is valid for 10 years beginning 10 days after the date of vaccination. For ACIP recommendations on vaccine go to:

<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5117a1.htm>

Vector Investigation

A survey should be performed by the local health department to determine if *Aedes aegypti* or *Aedes albopictus* are present near the patient's home or travel

sites in Ohio. For advice on vector assessment, contact the ODH Zoonotic Disease Program at 614-752-1029.

SPECIAL INFORMATION

Accurate travel history and confirmation are desirable to document importation of yellow fever from endemic areas into the United States. It should be noted if travelers spent any time in the southeastern Atlantic or Gulf Coastal states, where *Aedes aegypti* is endemic, before returning to Ohio.

Aedes aegypti probably cannot become established in Ohio due to the cold winter temperatures; however, introduction into Ohio during the summer months via traffic in used tires has been documented. Another competent vector, *Aedes albopictus*, has recently become established in Ohio. Since 1987, it has been found throughout the state. The spread of *Aedes albopictus* is due primarily to commerce in used tires, in which it breeds.

What is yellow fever?

Yellow fever is a viral disease transmitted by mosquitoes, and it occurs only in Africa and South America. The last case in Ohio was in 1878 in Gallipolis during an epidemic that began in New Orleans.

In South America, sporadic infections occur almost exclusively in forestry and agricultural workers from occupational exposure in or near forests. Endemic zones in South America include Panama, Venezuela, Guyana, Surinam, French Guiana and parts of Colombia, Ecuador, Peru, Bolivia and Brazil.

In Africa the virus is transmitted in three geographic regions:

- Principally and foremost, in the moist savanna zones of West and Central Africa during the rainy season,
- Secondly, outbreaks occur occasionally in urban locations and villages in Africa and
- Finally, to a lesser extent, in jungle regions.

Yellow fever is a very rare cause of illness in travelers, but many countries have regulations and requirements for yellow fever vaccination that must be met prior to entering the country. Specific requirements identified country by country are available in the CDC publication "Health Information for International Travel."

How is yellow fever transmitted?

Yellow fever is transmitted by the bite of an infected mosquito. Infants and children are at higher risk. There are two cycles of infection: one carried by monkeys and one by humans.

"Jungle yellow fever" is mainly a disease of monkeys in the tropical rain forest. People get it when they are bitten by mosquitoes that have been infected by monkeys. Jungle yellow fever is rare and occurs mainly in persons who work in tropical rain forests.

"Urban yellow fever" is a disease of humans. It is spread by mosquitoes that have been infected by other people. Urban yellow fever is the cause of most yellow fever outbreaks and epidemics.

How long after exposure before symptoms appear?

Symptoms generally appear in 2 to 6 days.

What are the symptoms of yellow fever?

Many yellow fever infections are mild, but the disease can cause severe, life-threatening illness. Infections typically cause flu-like symptoms: high fever, headache, muscle aches, vomiting and backache. Some cases will progress to more serious symptoms after a few days of apparent remission. These symptoms include shock, bleeding and kidney and liver failure. Liver failure causes jaundice (yellowing of the skin and the whites of the eyes), which gives yellow fever its name. As recently as 2007, yellow fever was reported to be fatal in approximately 60% of cases.

How is yellow fever diagnosed?

Blood can be tested for the presence of the virus or antibodies to it. More than one test is often needed to confirm yellow fever.

How is yellow fever treated?

There is no specific treatment for yellow fever. Patient care centers on treatment of symptoms and complications.

How can I prevent yellow fever?

- *Prevent mosquito bites* while traveling to endemic areas. It only takes one bite from an infected mosquito to transmit disease.
- *Vaccines* are available for those traveling to areas where yellow fever is a problem. Some countries require vaccination prior to entry. Check with your local health department for information on designated vaccination centers.

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. Adults and children over 9 months of age can receive this vaccine. Administration of immune globulin does not interfere with the antibody response to yellow fever vaccine. This vaccine is only administered at designated yellow fever vaccination centers, the locations of which can usually be given to you by your local or state health department. The CDC does not keep a list of registered yellow fever vaccination sites. If a person is at continued risk of yellow fever infection, a booster dose is needed every 10 years.

General precautions to avoid mosquito bites should be followed in yellow fever endemic areas. These include the use of insect repellent, protective clothing and mosquito netting.

Who should not receive the yellow fever vaccine?

Yellow fever vaccine generally has few side effects; fewer than 5% of those vaccinated develop mild headache, muscle pain or other minor symptoms 5-10 days after vaccination. Under almost all circumstances, there are four groups of people who should not receive the vaccine unless the risk of yellow fever disease exceeds the small risk associated with the vaccine. These people should obtain either a waiver letter prior to travel or delay travel to an area with active yellow fever transmission.

- Yellow fever vaccine should never be given to infants under 6 months of age due to a risk of viral encephalitis developing in the child. In most cases, vaccination should be deferred until the child is 9-12 months of age.
- Pregnant women should not be vaccinated because of a theoretical risk that the developing fetus may become infected from the vaccine.
- Persons hypersensitive to eggs should not receive the vaccine because it is prepared in embryonated eggs. If vaccination of a traveler with a questionable history of egg hypersensitivity is considered essential, an intradermal test dose may be administered under close medical supervision. Notify your doctor prior to vaccination if you think that you may be allergic to the vaccine or to egg products.
- Persons with an immunosuppressive condition associated with AIDS or HIV infection, or whose immune system has been altered by either diseases such as leukemia, lymphoma or thymus disease or through drugs and radiation, should not receive the vaccine. People with asymptomatic HIV infection may be vaccinated if exposure to yellow fever cannot be avoided.

If you have one of these conditions, your doctor will be able to help you decide whether you should be vaccinated, delay your travel or obtain a waiver. In all cases, the decision to immunize an infant 6-9 months of age, a pregnant woman or an immunocompromised person should be made on an individual basis. The physician should weigh the risks of exposure and contracting the disease against the risks of immunization and possibly consider alternative means of protection.

Medical Waivers

Most countries will accept a medical waiver for persons with a medical reason for not receiving the vaccination. CDC recommends obtaining written waivers from consular or embassy officials before departure. Travelers should contact the embassy or consulate for specific advice. Typically, a physician's letter stating the reason for withholding the vaccination and written on letterhead stationery is required by the embassy or consulate. The letter should bear the stamp used by a health department or official immunization center to validate the International Certificate of Vaccination.

For more information, visit these Web sites:

WHO yellow fever fact sheet <http://www.who.int/mediacentre/factsheets/fs100/en/>

CDC yellow fever fact sheet

http://www.cdc.gov/ncidod/dvbid/yellowfever/YF_FactSheet.html