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District guidelines for yellow fever surveillance

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The precise extent of illness and death due to yellow fever is not known. Estimates by WHO and other international agencies suggest that only 1% to 2% of the cases are actually reported. An outbreak of yellow fever can go undetected because the signs and symptoms of yellow fever are similar to viral hepatitis, malaria, leptospirosis, typhus, Ebola hemorrhagic fever and other viral hemorrhagic fevers. It is difficult for health workers to make a definitive diagnosis based on the signs and symptoms alone. And, mild cases can go undetected because the patient is likely to be treated at home and does not seek care in a health facility.

The yellow fever virus, its natural hosts and vectors

- ◆ The *agent* that causes yellow fever is a virus that belongs to the *Flavivirus* genus, a large group of RNA viruses. The yellow fever virus is 35-40 nm in size. It consists of a single strand of RNA and protein nucleocapsid surrounded with a lipid envelope.
- ◆ The *natural host* for the yellow fever virus in forest areas is non-human primates (usually monkeys and chimpanzees).
- ◆ The *vectors* of yellow fever in forest areas in Africa are *Aedes africanus*, and other *Aedes* species. In South America, the primary vector is *Haemagogus sp.* In urban areas of both Africa and South America, the vector is *Aedes aegypti*.

Clinical features of yellow fever

Yellow fever presents with a variety of clinical signs and outcomes ranging from mild to severe and fatal cases. Yellow fever in human beings has the following characteristics:

- ◆ An *acute phase* lasting for 4 to 5 days and presenting with:
 - ⇒ a sudden onset of fever
 - ⇒ headache or backache
 - ⇒ muscle pain
 - ⇒ nausea
 - ⇒ vomiting
 - ⇒ red eyes (injected conjunctiva).

This phase of yellow fever can be confused with other diseases that also present with fever, headache, nausea and vomiting because jaundice may not be present in less severe (or mild) cases of yellow fever. The less severe cases are often non-fatal.

- ◆ A temporary *period of remission* follows the acute phase in 5% to 20% of cases. The period of remission lasts for up to 24 hours.
- ◆ A *toxic phase* can follow the period of remission and present with:
 - ⇒ jaundice
 - ⇒ dark urine

 - ⇒ reduced amounts of urine production
 - ⇒ bleeding from the gums, nose or in the stool

- ☐ vomiting blood
- ☐ hiccups
- ☐ diarrhoea
- ☐ slow pulse in relation to fever

No specific treatment is available for yellow fever. In the toxic phase, supportive treatment includes therapies for treating dehydration and fever. In severe cases, death can occur between the 7th and 10th day after onset of the first symptoms.

Laboratory analysis of blood or tissue samples (usually liver) is needed to confirm a case of yellow fever. The analysis requires special reagents and techniques for measuring the presence of IgM and IgG antibodies or for isolating the virus from the blood or tissue sample.

Note: Liver samples are taken from fatal cases only.

Transmission of yellow fever

Yellow fever is transmitted to humans when they are bitten by mosquitoes infected with the yellow fever virus. The incubation period is 3 to 7 days. Mosquitoes are infected by feeding on patients in the first 3 to 4 days of illness, the time when the virus is circulating in the blood.

The yellow fever virus is transmitted in both forest and urban cycles.

- ◆ In the *forest cycle*, the yellow fever virus lives in mosquito species (*Aedes africanus*, *Haemagogus sp.*, and others) that breed in tree holes. The disease is transmitted among monkeys and other small primates. Humans become infected when they enter the forest and are bitten by a mosquito carrying the yellow fever virus. Where sylvatic vectors are present at high density, such as in the savanna zone of Africa, humans may serve as the principal host in epidemic transmission.
- ◆ In an *urban cycle*, an infected domestic mosquito, *Aedes aegypti*, transmits the virus from human to human. When a case is undetected, there is potential for an epidemic.

3.0 DETECT YELLOW FEVER

A case of yellow fever is detected when it is identified and reported.

3.1 Identify suspected cases

In an outbreak of yellow fever, identification of a suspected case is based on the signs and symptoms seen in the current outbreak. In a *non-outbreak situation*, identifying a suspected case of yellow fever is more difficult. The early signs of yellow fever -- fever, headache, nausea and vomiting -- are also signs of other fever-producing diseases commonly seen in the health facility. A health worker might not suspect yellow fever until treatment for other illnesses is not successful, or if the patient's condition worsens and additional signs develop.

Stage of yellow fever	Common signs	Differential diagnosis
Early signs or signs in mild cases of yellow fever (3 to 6 days after bite from infected mosquito)	Fever Headache Nausea Vomiting	Malaria Influenza Dengue fever (Non-hemorrhagic)
Classic signs of yellow fever (4 to 10 days after onset)	Sudden onset of fever Headache Nausea Vomiting Chills Back pain Generalized muscle pain Red eyes (conjunctival injection) Dark urine Jaundice (although jaundice may be absent in some cases)	Malaria Typhoid fever Rickettsial infections Other arboviral fevers
Later stages of yellow fever (7 to 10 days after onset)	Brief improvement followed by: Jaundice Blood in vomit (Coffee grounds seen in vomit) Bleeding from the gums, nose, or gastrointestinal tract Blood in urine Decreased or no urine production Shock Death	Other diseases with signs of bleeding and signs of liver and renal dysfunction: Viral hepatitis Severe malaria Other viral hemorrhagic fevers (Lassa, Marburg, Ebola, Crimean-Congo, and Hantaan) Leptospirosis Surgical or toxic causes of jaundice