

Yellow Fever



Case Definition

Confirmed Case: One or more of the following:

- isolation of yellow fever virus;
- detection of yellow fever viral antigen in serum or tissue;
- a four-fold change in serum antibody titre to the yellow fever virus or a single elevated specific yellow fever IgM antibody titre, in the absence of yellow fever vaccination, within the previous two months.

Reporting Requirements

- All positive specimens noted above are reportable by laboratory.
- All cases are reportable by attending health care professional.
- Case report universally required by International Health Regulations.

Clinical Presentation/Natural History

An acute infectious viral disease of short duration and varying severity. The mildest cases are clinically indeterminate; typical attacks are characterized by sudden onset, fever, chills, headache, backache, generalized muscle pain, prostration, nausea and vomiting. The pulse may be slow and weak out of proportion to the elevated temperature (the Faget sign). Jaundice is moderate early in the disease and intensifies later. Albuminuria (sometimes pronounced) and anuria may occur. Leukopenia appears early and is most pronounced about the fifth day. Most infections resolve at this stage. After a brief remission of a few to 24 hours, some cases progress into the ominous stage of intoxication manifested by hemorrhagic symptoms including epistaxis, gingival bleeding, hematemesis (coffee-ground or black), melena, and liver and renal failure. Twenty to 50% of jaundiced cases are fatal. The overall case-fatality rate among indigenous populations in endemic regions is less than 5%.

Etiology

The Yellow Fever virus: genus *Flavivirus* and family *Flaviviridae*.

Epidemiology

Reservoir and Source: In urban areas, humans and *Aedes aegypti* mosquitoes; in forest areas, vertebrates other than humans, mainly monkeys and possibly marsupials, and forest mosquitoes. Transovarian transmission in mosquitoes may contribute to maintenance of infection. Humans have no essential role in transmission of jungle yellow fever or in maintaining the virus, but are the primary amplifying host in the urban cycle.

Transmission: In urban and certain rural areas of endemic countries, by the bite of infective *Aedes aegypti* mosquitoes. In forests of South America, by the bite of several species of forest mosquitoes of the genus *Haemagogus*. In East Africa, *Ae. africanus* is the vector in the monkey population, while semidomestic *Ae. bromeliae* and *Ae. simpsoni*, and probably other *Aedes* species, transmit the virus from monkeys to humans. In large epidemics in Ethiopia, epidemiologic evidence incriminated *Ae. simpsoni* as a person-to-person vector. In West Africa, *Ae. fuscifer-taylori*, *Ae. luteocephalus* and other species are responsible for spread between monkeys and humans. *Ae. albopictus* was introduced to Brazil and the United States from Asia and has the potential to bridge the sylvatic and urban cycles of yellow fever in the Western Hemisphere. However, involvement of this species in transmission of yellow fever has not been documented.

Occurrence:

General: Yellow fever exists in nature in two 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. It occurs most frequently among young adult males who are occupationally exposed in forested or transitional areas of Bolivia, Brazil, Colombia, Ecuador and Perú (with 70-90% of cases being reported from Bolivia and Perú). Historically, urban yellow fever occurred in many cities of the Americas, although in recent years, *Ae. aegypti*-vectored yellow fever was reported only from Nigeria, leading to nearly 20,000 cases with more than 4,000 deaths between 1986 and 1991. Except for a few cases in Trinidad in 1954, an outbreak of urban yellow fever has not been transmitted by *Ae. aegypti* in the Americas since 1942; however, the reinfestation of many cities with *Ae. aegypti* places them at risk of renewed urban yellow fever transmission. In Africa, the endemic zone includes the area between 15°N and 10°S latitude, extending from the Sahara desert south through northern Angola, Zaire and Tanzania. There is no evidence that yellow fever has ever been present in Asia or on the easternmost coast of Africa, although sylvatic yellow fever was reported in 1992-1993 in western Kenya.

Manitoba: No imported cases were reported from 1924 to 1999.

Incubation Period: Three to six days.

Susceptibility and Resistance: Recovery from yellow fever is followed by lasting immunity; second attacks are unknown. Mild inapparent infections are common in endemic areas. Transient passive immunity in infants born to immune mothers may persist for up to six months. In natural infections, antibodies appear in the blood within the first week.

Period of Communicability: Blood of patients is infective for mosquitoes shortly before onset of fever and for the first three to five days of illness. The disease is highly communicable where many susceptible people and abundant vector mosquitoes coexist; not communicable by contact or common

vehicles. The extrinsic incubation period in *Ae. aegypti* (not found in Manitoba) is commonly nine to 12 days at the usual tropical temperatures. Once infected, mosquitoes remain so for life.

Diagnosis

Laboratory diagnosis is made by isolation of virus from blood by inoculation of suckling mice, mosquitoes or cell cultures (especially those of mosquito cells); by demonstration of viral antigen in the blood by ELISA or liver tissue by use of labeled specific antibodies; and by demonstration of viral genome in blood and liver tissue by PCR or hybridization probes. Serologic diagnosis is made by demonstrating specific IgM in early sera or a rise in titre of specific antibodies in paired acute-phase and convalescent sera. Serologic cross-reactions occur with other flaviviruses. Recent infections can often be distinguished from vaccine immunity by complement fixation testing. The diagnosis is supported by demonstration of typical lesions in the liver. Specimen testing is not available at Cadham Provincial Laboratory.

Key Investigations

- Travel history.
- Immunization history.

Control

Management of Cases:

Treatment:

- None

Public Health Measures:

- Use routine precautions.

Management of Contacts:

- The Public Health Branch will advise fellow travellers of infected persons to report and investigate, any signs and symptoms compatible with yellow fever infection.

Preventive Measures:

- Immunize all susceptible travellers to endemic areas.
- Recommend protective clothing, bed nets and repellents for those who cannot be immunized

and will be at risk of being bitten by infected mosquitoes.

- Quarantine of monkeys and other wild primates arriving from yellow fever areas may be required until seven days have elapsed after leaving such areas.