Yellow fever vaccine

Public health strategies

Yellow fever is endemic in 33 countries in Africa and 11 countries in South America. There are two modes of transmission of the yellow fever virus, the sylvatic or forest cycle and the urban cycle. Transmission begins when vector mosquitoes (*Aedes africanus* in Africa, and several species of the genus *Haemagogus* in South America) feed on non-human primates infected with the virus. The infected mosquitoes then feed on humans travelling through the forest. The greatest risk of an epidemic occurs when viraemic humans return to urban areas and are fed on by the domestic vector mosquito *Aedes aegypti*, which then transmits the virus to other humans.

A severe epidemic is most likely to occur if conditions allow the density of vector populations to increase substantially, as can happen in a rainy season. Good epidemiological surveillance can be critical in preventing an epidemic.

Yellow fever continues to be a public health concern in many countries of Africa and the Americas. It is estimated that 200 000 cases and 30 000 deaths are attributable to yellow fever annually, most of them occurring in sub-Saharan Africa, although far fewer cases than this are reported.

The main strategies to control yellow fever are based on a combination of immunization for protection against the disease and surveillance, and are outlined below:

a) Prevention

- Administering yellow fever vaccine as part of routine infant immunization*;
- Preventing outbreaks in high-risk areas through mass campaigns*;
- Control of *Aedes aegypti* in urban centres.

**Both these strategies should ensure a minimum coverage of at least 80%.*

(b) Control

- Instituting a sensitive and reliable YF surveillance system including laboratory capacity to analyse samples and confirm suspected cases.
- Emergency response to outbreaks through mass campaigns.

WHO perspective

For the 33 countries of equatorial Africa where yellow fever is endemic, which have a combined population of 508 million, the vaccine should be routinely administered at the same time as measles vaccine, i.e. around nine months of age. Immunization services and disease-reporting systems are well established in these countries, all of which are committed to the goals of measles reduction and polio eradication. Improvement in disease surveillance is expected to follow and to be sustainable. Linking yellow fever to planned polio and measles immunization activities could save thousands of lives each year.

The incorporation of yellow fever vaccine into the routine infant and child immunization schedules was recommended in 1988 by a joint WHO/UNICEF Technical Group on Immunization in Africa. It was suggested that this be done at the time of the visit for measles vaccine (at 9 to 12 months of age), thus avoiding the need for an additional visit. As at the end of 2001, 15 of the 33 at-risk countries had implemented the recommendation. At the end of 2000, 10 countries in Africa reported coverage by the age of 12 months, the estimated average being 42%. In the at-risk countries of the Americas, 204 cases and 97 deaths were reported in 1999. After this, a more aggressive implementation contributed to a significant reduction in the number of cases from the Americas (102 cases and 51 deaths in 2000, and 80 cases and 46 deaths in 2001).

Special issues

International health regulations: A yellow fever vaccination certificate is now the only vaccination certificate that should be required in international travel, and then only for a limited number of persons. Many countries require a valid international certificate of vaccination from travellers, including those in transit, arriving from infected areas or from countries with infected areas. Some countries require a certificate from all entering travellers, even those arriving from countries where there is no risk of yellow fever. Although this exceeds the provisions of International Health Regulations, travellers may find that it is strictly enforced, particularly for people arriving in Asia from Africa or South America. Vaccination is strongly advised for travellers outside urban areas of countries in zones where yellow fever is endemic, even if these countries have not officially reported the disease and do not require evidence of vaccination on entry. The actual areas of yellow fever virus activity far exceed the officially reported infected zones.

Vaccine supply: Efforts are being made to ensure an adequate supply of vaccine so as to permit routine immunization, preventive campaigns and outbreak response in countries of endemicity. Until recently the vaccine was in short supply. A global stockpile currently exists for use in emergencies.

***Contraindications*:** The vaccine is contraindicated in immune-deficient patients, in individuals allergic to eggs and before six months of age. Individuals with symptomatic HIV infection should not receive yellow fever vaccine until such time as more information is available on its safety. Some travel clinics decide whether to administer the vaccine on the basis of the CD4 count. The risk of exposure to disease must be weighed against the potential risk of the vaccine during pregnancy.

Adverse events: Very rare cases of serious adverse events, including deaths, have recently been reported. The risk to unimmunized individuals either living in or travelling to areas where there is known yellow fever transmission is far greater than the risk of having a vaccine-related adverse event. Therefore, WHO policy on yellow fever vaccination remains unchanged.

Administration summary

Type of vaccine	Live viral
Number of doses	One dose of 0.5 ml subcutaneously
Schedule	Routine immunization with measles vaccine at nine months of age
Booster	International health regulations require a booster every 10 years
Contraindications	Egg allergy; immune deficiency from medication or disease; symptomatic HIV infection; hypersensitivity to previous dose; pregnancy*
Adverse reactions	Hypersensitivity to egg; rarely, encephalitis in the very young; hepatic failure. Rare reports of death from massive organ failure (*see above*).
Special precautions	Do not give before six months of age; avoid during pregnancy

* To be weighed according to risk of exposure and term of pregnancy

Key references

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