Yellow Fever

As long as Yellow Fever exists it is unfinished business

Pan American Health Organization
Pan American Sanitary Bureau - Regional Office of the World Health Organization

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THE ECONOMIC VALUE OF ERADICATING AĒDES AEGYPTI, vector of yellow fever, is evidenced by the fact that for 17 years prior to the eradication of the mosquito from Brazil, that country had to maintain a control service employing 3,000 men and operating in 50,000 towns, villages, and hamlets, to combat this vector. Now that Aēdes aegypti has been eradicated there, Brazil maintains only a vigilance service, employing 50 men, to prevent reintroduction of the mosquito from other infested areas in the Americas.

Eradication of Aēdes aegypti from 12 American countries has required untold millions of man-days of work in the repeated inspection of millions of houses and other premises, and a total cost in money that is now incalculable. It is vital that this investment be protected by eradicating the species from the rest of the Western Hemisphere, for reinfection from Africa or Asia is most unlikely.

In the year 1902 yellow fever was one of the major pestilences of the New World, where it had been endemic in tropical cities for 250 years. In 1902 the 21 republics of the Americas convened and established the first international public health organization—the
Pan American Sanitary Bureau—for the major purpose of dealing with yellow fever and other quarantinable diseases in a more expeditious and effective manner.

Excellent progress has been achieved in the past half-century, but there is still a great deal of work to be done.

Yellow fever occurs in the tropics on both sides of the Atlantic Ocean. It has never occurred in the Orient.

There is only one type of the disease yellow fever, and only one type of yellow fever virus, the causative agent of the disease; but the disease occurs under two very different sets of conditions.

First, historically, there is URBAN yellow fever, which used to occur in devastating epidemics in the cities of the New World all the way from Buenos Aires to New York and Boston, to say nothing of New Orleans and Memphis. In the Old World, similar epidemics ravished southern Europe, chiefly the Iberian Peninsula. This form of yellow fever is transmitted by the Aëdes aegypti mosquito, which is a house-breeding and highly domesticated species in the New World. When this mosquito is eradicated, there can be no more urban yellow fever.

The second manifestation of the disease, which is basically a zoonosis, is JUNGLE yellow fever, recognized only 25 years ago. This form is transmitted to man from other vertebrate hosts by the bite of various species of forest mosquitoes that breed in tree holes and almost never enter human habitations.

REPORTED CASES OF YELLOW FEVER* IN THE AMERICAS, 1947-1960

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* All the cases reported 1947-1960 were jungle yellow fever except for three cases of urban yellow fever in Trinidad and Tobago in 1954.

** Excludes three cases not supported by clinical or laboratory diagnosis.

1,818 cases, of which all but three were of jungle yellow fever, were reported from thirteen American countries in the fourteen-year period from 1947 to 1960.

The threat that jungle yellow fever constitutes was clearly shown in 1954 when, in Port-of-Spain, Trinidad, W.I.F., three proven but nonfatal cases of aegypti-transmitted yellow fever were diagnosed during an epizootic which had spread to the island from the mainland.
THE AÉDES AEGYPTI ERADICATION CAMPAIGN

Acting upon the sagacious advice of Carlos Finlay, William Gorgas demonstrated in Havana and Panama nearly 60 years ago that the reduction of aegypti-breeding to a low level would cause yellow fever to disappear from a city, so long as the low level was maintained. Emilio Ribas in Santos and Oswaldo Cruz in Rio de Janeiro soon confirmed the value of the methods that had been pioneered in Cuba.

Today we know that Aedes aegypti can be eradicated—completely eliminated—at reasonable cost, thereby giving complete and permanent protection to American cities. The accompanying map shows the areas from which the mosquito was declared eradicated as of December 1960, and those in which its continued presence means that there is still UNFINISHED BUSINESS.

STATUS OF THE AÉDES AEGYPTI ERADICATION CAMPAIGN
DECEMBER 1960

The accompanying map shows the areas from which the mosquito was declared eradicated as of December 1960, and those in which its continued presence means that there is still UNFINISHED BUSINESS.
In 1947 the countries of the Americas gave the Pan American Sanitary Bureau, executive body of the Pan American Health Organization, a mandate to solve the problem of urban yellow fever throughout the Continent, based fundamentally on the eradication of Aëdes aegypti. This concerted action by the countries of the Americas to coordinate their eradication programs through the PASB represents the first regional, continent-wide program in public health work.

YELLOW FEVER VACCINATION

Yellow fever vaccine is one of the best of all vaccines because of the excellent protection it gives over a long period and the insignificant reaction it causes. The Pan American Sanitary Bureau collaborates with the Governments of Brazil and Colombia in the maintenance of the yellow fever laboratories in the Oswaldo Cruz Institute in Rio de Janeiro, Brazil, and the Carlos Finlay Institute in Bogotá, Colombia, where yellow fever vaccine is manufactured for free distribution to the countries of the Americas.

In the American tropics and subtropics many millions of persons have been vaccinated against yellow fever, and thus protected against the disease; but the virus continues to find people who have not been vaccinated, as can be seen from the table.

Vaccination against yellow fever is important because it is the only possible way to control jungle yellow fever. It is obviously impossible to control the breeding of forest mosquitoes—such as Haemagogus—that infect man with yellow fever virus. Reliance must therefore be placed on the vaccine to protect all persons exposed to the disease. People who live and work in or near infected forests require vaccination, as do all temporary workers who enter such forest areas to exploit oil, mineral, or other natural resources.

A step in the preparation of yellow fever vaccine
STUDIES OF JUNGLE YELLOW FEVER

The transmission of urban yellow fever from man to man by the bite of an infected, city-dwelling aegypti mosquito comprises a relatively simple mechanism.

The transmission of jungle yellow fever is much more complicated because man gets his infection—not from another man, but from some nonhuman reservoir of the virus—through the bite of a forest-breeding mosquito.

Human infections are not essential to the survival of the virus; the infections are accidental and are almost always dead-end. Once in a while, however, a man infected with yellow fever in the forest carries the virus to a city infested with Aedes aegypti mosquitoes and starts up an epidemic of urban yellow fever. This process is now called the “urbanization” of yellow fever virus.

Yellow fever virus is firmly entrenched in two great jungle areas where it is entirely safe from attack by any means now at the disposal of man. The two areas are the basins of the Congo River in Africa and of the Amazon River in South America. In these two areas, and in similar smaller ones, the virus is maintained continuously as an enzootic among forest vertebrates, breaking out from time to time into other tropical and subtropical forest areas and causing epizootics of jungle yellow fever. That these may represent a real threat to the human population coming into contact with the epizootic areas is shown quite clearly by the preceding table.

Yellow fever does not usually kill native monkeys of Africa nor some of the more common species of the Americas. But it does frequently kill American monkeys of the howler (Alouatta) and spider (Ateles) genera. The decimation of these genera during outbreaks may be quite spectacular where they are abundant, as in Central America.

All the factors responsible for the survival of yellow fever virus in forest vertebrates are not known. The mechanism of survival may well require the participation of vertebrates other than monkeys and vectors other than mosquitoes.

Searching a tree hole for larvae of forest mosquitoes
Vaccination is the only protection against yellow fever for these Amazon rubber plantation workers.

The study of jungle yellow fever is quite complex, involving observations in at least nine different scientific fields: virology, entomology, histopathology, immunology, clinical medicine, mammalogy, ornithology, ecology, and epidemiology. Ecology must pervade all these studies, because it deals with the relationship of an organism to all the elements of its environment. In this case the organism in question is the virus of yellow fever, rather than man. And epidemiology is really the analysis of all the information assembled by the other sciences involved. Several of these sciences provide more than one approach to the subject matter, notably the field and the laboratory viewpoints.

Studies are under way, with PASB participation, on two aspects of yellow fever vaccination: the duration of immunity after vaccination with 17D vaccine; and the feasibility of applying 17D vaccine by cutaneous scarification, instead of by subcutaneous injection with a syringe and hypodermic needle.

The Pan American Sanitary Bureau also actively participates with the Government of Colombia in supporting the Carlos Finlay Institute which, in addition to producing yellow fever vaccine for international distribution, carries out laboratory and field studies on jungle yellow fever occurring in Colombia, and provides laboratory services for similar studies elsewhere and facilities for training people in the methods used in such studies.

Yellow fever is still a subject that is very much alive, and one that will continue to remain alive for many long years to come. The eradication of aegypti from all of the Americas must be completed before the cities of the New World can be guaranteed against future outbreaks of urban yellow fever, and the safety of the rapidly expanding rural populations living and working in contact with tropical forests demands unflagging efforts to ensure the vaccination of all exposed individuals.

As long as yellow fever exists, it is UNFINISHED BUSINESS.