Yellow FEVER

AS LONG AS YELLOW FEVER EXISTS IT IS

UNFINISHED BUSINESS

PAN AMERICAN SANITARY BUREAU
REGIONAL OFFICE OF THE WORLD HEALTH ORGANIZATION

1501 NEW HAMPSHIRE AVENUE, N. W.  •  WASHINGTON 6, D. C.  •  U. S. A.
Household water container harboring aegypti larvae and its immediate surroundings are treated with residual insecticide.
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 the year 1902 the 21 republics of the Americas convened and established the first international sanitary 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 yet 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 Aedes 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 FATAL CASES OF YELLOW FEVER IN THE AMERICAS, 1947-1956 (all jungle)

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(a) All cases confirmed by laboratory methods

1350 fatal cases, all of which were of jungle yellow fever, were reported from thirteen American countries in the ten-year period from 1947 to 1956. (See table.)
The threat that jungle yellow fever constitutes was clearly shown in 1954 when, in Port-of-Spain, Trinidad, B.W.I., 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 AEDES AEGYPTI ERADICATION CAMPAIGN**

General Gorgas demonstrated in Havana and Panama a half-century ago that the reduction of aegypti breeding to a low level would cause yellow fever to disappear from a city, so long as this low level was maintained. Today we know that this mosquito can be eradicated, thereby giving complete and permanent protection to American cities. Its eradication has proven feasible and practicable, since it has already been eradicated from major areas of Latin America once swept by epidemics. (See map.)

The Weekly Epidemiological Report, published by the Pan American Sanitary Bureau, carries information on the incidence of yellow fever and other quarantinable diseases.
In 1947 the countries of the Americas gave the Pan American Sanitary Bureau, the executive body of the Pan American Sanitary Organization, a mandate to solve the problem of urban yellow fever throughout the Continent, based fundamentally on the eradication of *Aedes 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 Bogota, 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.
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 Aëdes 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 population 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.
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.

With so many different aspects of the problem to be studied, it is essential that consultant services rendered to governments be supported by a team of specialists capable of undertaking field studies. For a number of years the PASB has maintained such a team in Central America to study the field aspects of the epizootic of jungle yellow fever that started in eastern Panama in 1948 and continued to spread west and north until in 1957 it had reached British Honduras and northern Guatemala.

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 in jungle yellow fever occurring in Colombia, 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.