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YELLOW FEVER IN THE CARIBBEAN*

BY DR. FRED L. SOPER

*Director of the Pan American Sanitary Bureau, Regional Office of
the World Health Organization*

The occurrence of scattered cases of yellow fever in Panamá, in 1948-49-50 and the first half of 1951, followed by a wave-like epidemic during the past six months in Costa Rica, moving from south-east to north-west, has focused attention on the yellow fever potentialities of the Caribbean area, as the equally significant occurrence of the disease, under similar conditions since 1933, almost continuously in Colombia, and less regularly in Venezuela, had failed to do. Until the occurrence of cases in Panama and Costa Rica, there was a tendency to consider Colombia and Venezuela as epidemiologically part of the South American continent rather than of the Caribbean area, where North, South and Central America and the West Indies meet. It is fitting that the yellow fever potential of the Caribbean area, previously the most important stronghold of yellow fever, be considered in the light of present-day knowledge of this great historical scourge of the American tropics.

Yellow fever is a very modern disease, the first recognizable description of which dates back only 300 years to the Yucatan Peninsula in 1648. Apparently many other places in the Caribbean, including Barbados, St. Kitts, Guadalupe and Havana, were infected about the same time. Just 20 years later, in 1668, yellow fever appeared for the first of many visits in the port of New York. This was 16 years before its first recorded visit to Brazil in 1684.

From the middle of the 17th until the early years of the present century, the history of yellow fever is very closely linked to the history of the Caribbean area. So important was yellow fever as a handicap to European exploitation of the Caribbean, especially through the destruction of newly arrived European troops, that it came to be called, in many places, "La fiebre patriótica" or "The Patriotic Fever." It is easy to imagine that, had the Finlay theory of the transmission of yellow

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fever by the *Aedes aegypti* mosquito been accepted, when first proposed in 1881, Cuba might well be a Spanish colony, and the Panama Canal, a French possession.

Besides being the site of the first reported outbreak of yellow fever, the Caribbean area was the great stronghold of the disease from which summer excursions to the United States and Europe originated during two-and-a-half centuries, and was the scene of the dramatic events leading to the first successful measures for the control of yellow fever.

It was in Havana that the theory of mosquito transmission was developed by Finlay in 1881, convincingly demonstrated by Reed in 1900, and put into operation by Gorgas in 1901. The Havana anti-mosquito campaign convinced the epidemiologists, and another Caribbean campaign, that in Panama, made possible the digging of the Canal and convinced the world in general that yellow fever could be conquered through mosquito-control measures in urban centers. This conviction lasted for 30 years, during which yellow fever was known as an epidemiologically-simple, urban and maritime disease, transmitted from man-to-man by the *Aedes aegypti* mosquito which, in the Americas, is found breeding only in artificial water-containers, in, and about, human habitations.

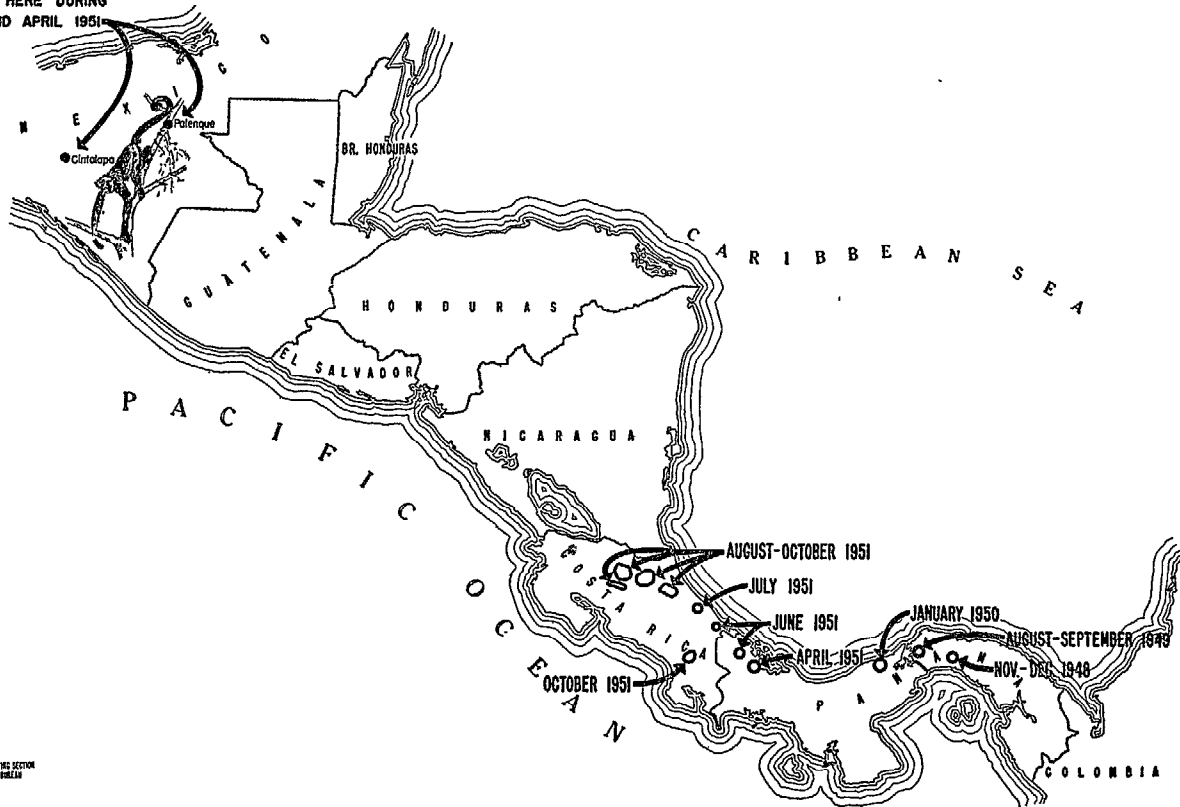
All are familiar with the stories of Gorgas in Havana and Panama, Oswaldo Cruz in Rio de Janeiro, Licéaga in Mexico, White in New Orleans, and others, who, armed with the knowledge of the mosquito transmission of yellow fever, performed miracles in the broad light of day, and became the prophets and saints of the public health movement overnight.

Anti-mosquito campaigns in the important centers of yellow fever endemicity, were followed by the disappearance of the disease, not only from these centers, but also from large tributary regions. By 1915, only a few recognized endemic centers of yellow fever remained in the Americas, including Guayaquil on the West Coast and Bahia and Pernambuco on the East Coast of South America. The then-recently organized Rockefeller Foundation embarked on a program of collaboration with the governments of the countries, in which yellow fever still might be found, in an attempt to eradicate the disease completely from the Western Hemisphere.

Campaigns in the Central American countries, in Mexico, in Ecuador, in Peru and in Colombia were completely successful and, by 1925, yellow fever was apparently limited, in the Americas, to a small coastal area of Northeast Brazil, where promising results were being reported. This attempt to eradicate yellow fever from the Americas was based on the belief, that yellow fever was limited to man and on the observation that it could be eradicated from all infected cities by the single measure of reduction of *aegypti* breeding, following which the disease would not long remain in the smaller towns and villages.

YELLOW FEVER IN CENTRAL AMERICA

MONKEYS IMMUNE TO YELLOW FEVER
CAPTURED HERE DURING
MARCH AND APRIL 1951

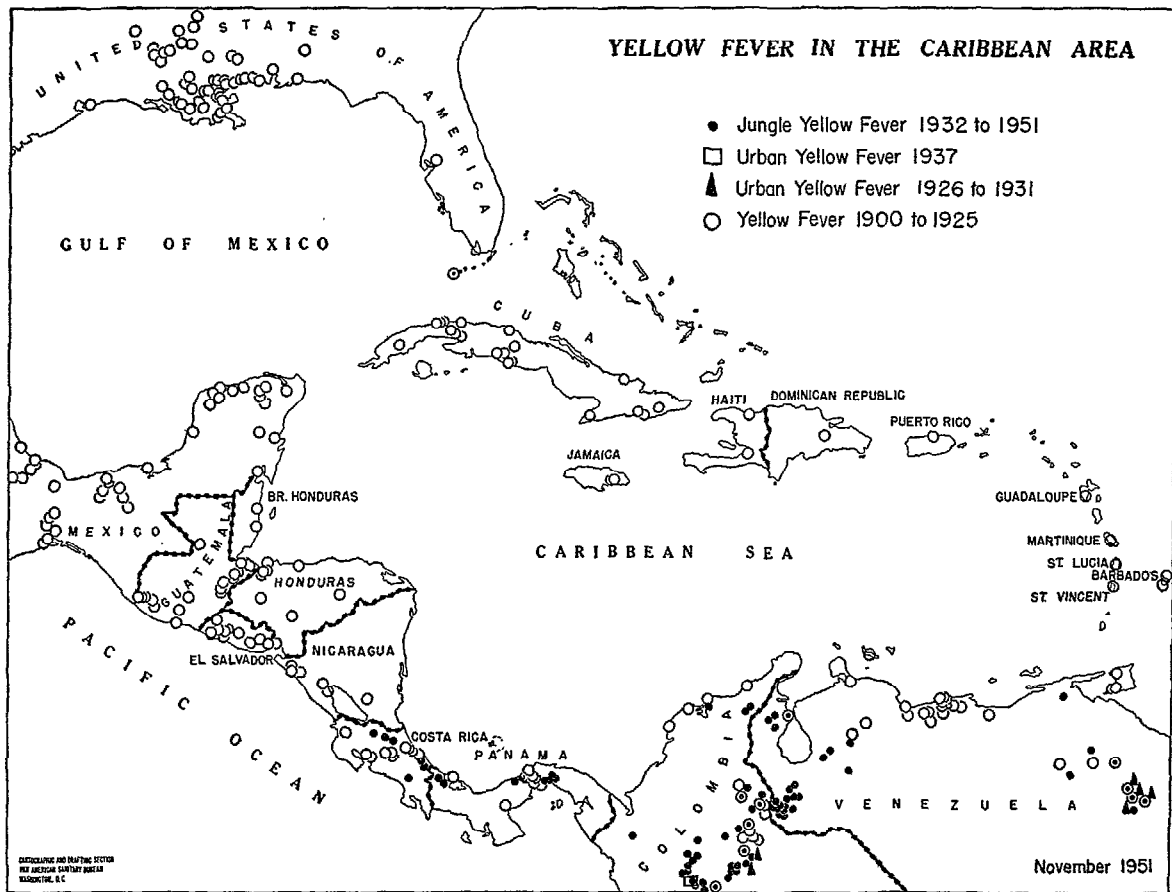


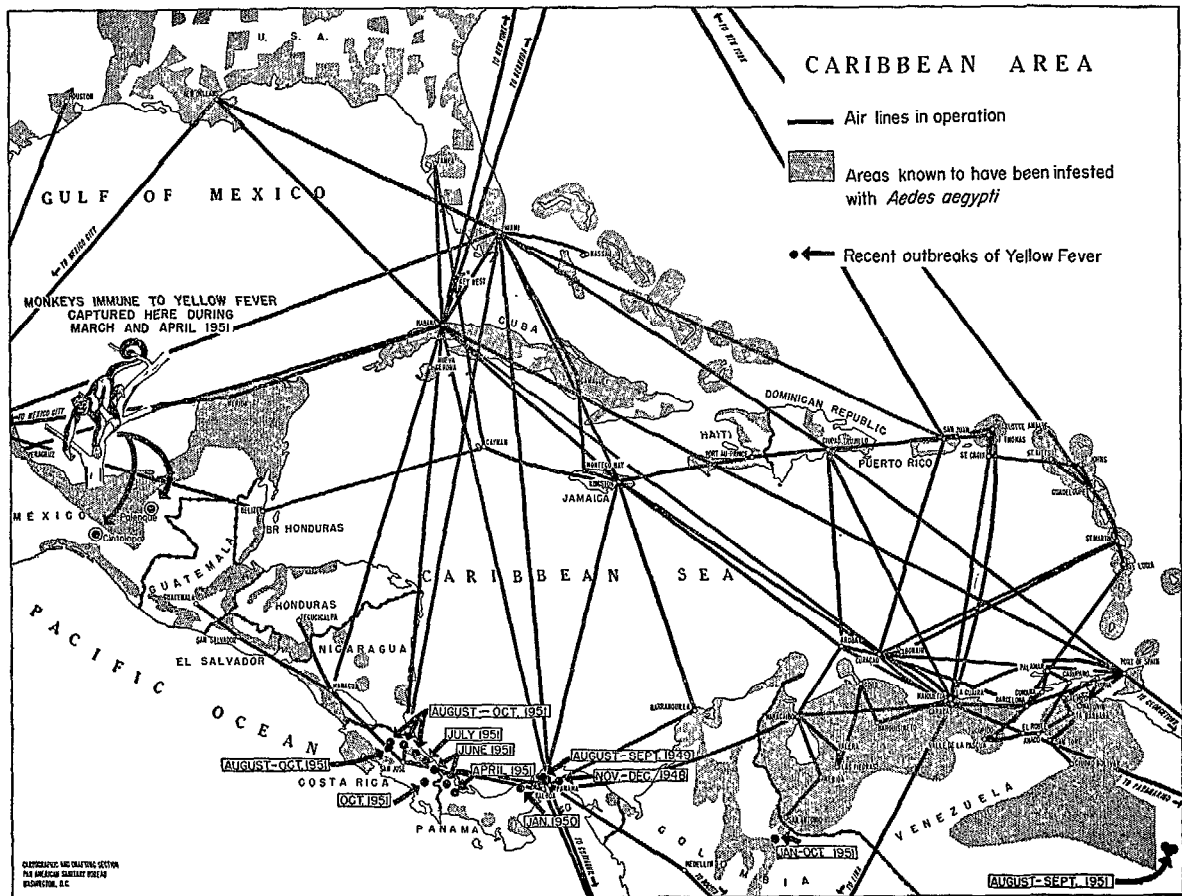
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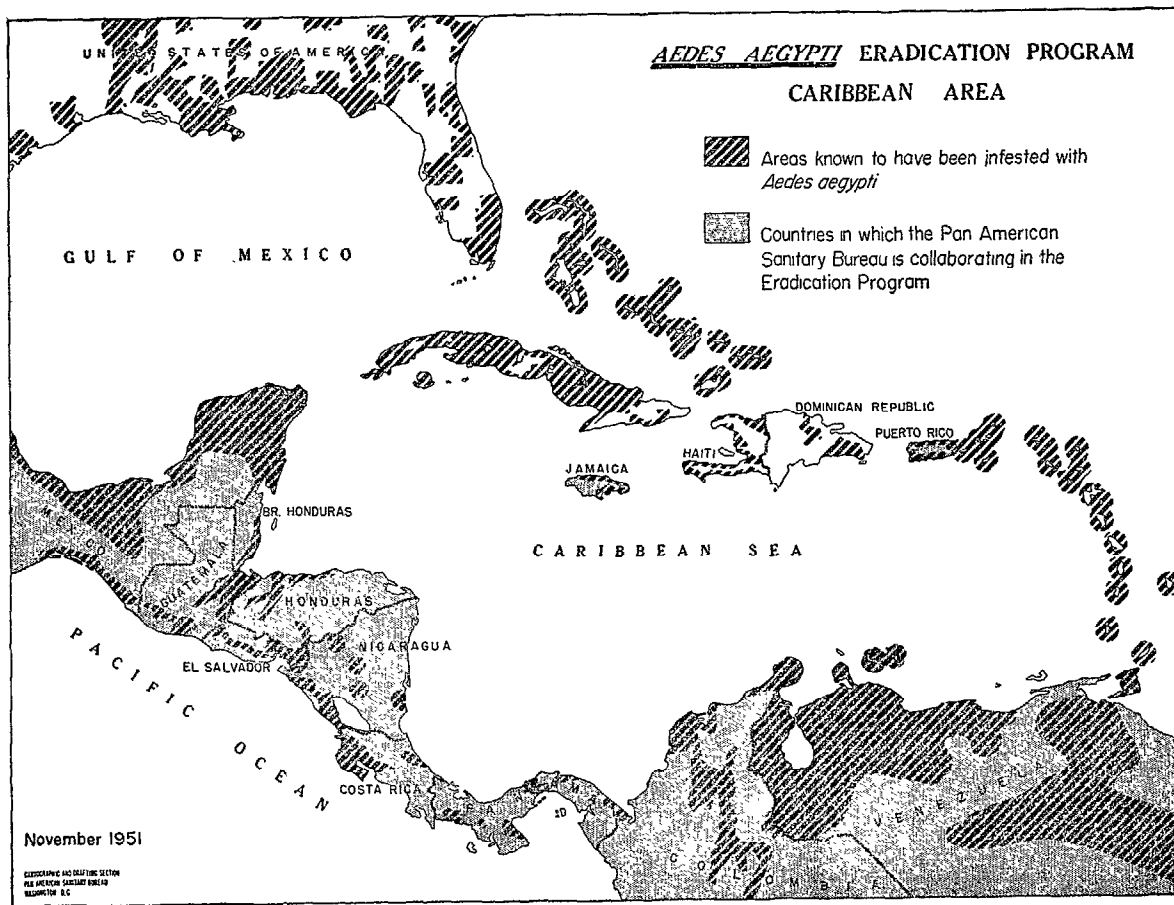




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Following the initial observation of yellow fever in Brazil, in 1932, as a rural disease occurring in the absence of the *Aedes aegypti* mosquito, the true picture of yellow fever as basically a disease of animals (monkeys and marsupials), transmitted in the tropical and subtropical forests of the Americas by mosquitoes other than *aegypti*, and involving human infection only secondarily, has been filled in. Outbreaks of this so-called jungle yellow fever, which has been shown to be a source of virus for the re-infection of previous yellow fever centers, and hence is a permanent obstacle to the eradication of yellow fever, as planned by the Rockefeller Foundation, have been observed in all of the countries of South America, except Chile and Uruguay, and in Panama and Costa Rica.

Blood tests on monkeys, shot in Mexico early this year, have shown that jungle yellow fever has been present in the forests of Mexico during the life-time of the animals tested. There is every reason to assume that jungle yellow fever occurs in all the countries of Central America except, possibly, in El Salvador, where deforestation is well advanced.

It is noteworthy that *aegypti*-transmitted yellow fever has not been reported from any of the cities of the Caribbean since 1937, when a few cases occurred at Buena Vista, a small town on the Magdalena River in Colombia. Likewise, no jungle yellow fever has been found in the West Indies, although one of the early references to the possibility of monkeys having a part in the life history of yellow fever, published in 1915, referred to illness among monkeys in the forests of Trinidad during epidemics of yellow fever. It is believed that this freedom of the island areas, from jungle yellow fever, is due to the fact that the monkey population of the islands has been liquidated, and that suitable conditions for it no longer exist in the remaining forests.

A line can be drawn, then, from between Yucatan and Cuba, south and east to a point just north of Trinidad, dividing the Caribbean into mainland and island zones. The mainland zone has the double threat of jungle yellow fever, as an important disease for forest inhabitants and laborers, and as a source of virus for the re-infection of such cities and towns as remain infested by the *Aedes aegypti* mosquito.

The island zone is apparently subject only to the threat of *aegypti*-transmitted yellow fever, if, and when, the yellow fever virus may be re-introduced from the mainland. The potential threat of the movement of yellow fever virus from forest to urban areas grows with the increased rapidity and facility of passenger traffic. However, the threat of urban yellow fever, originating from jungle yellow fever, is greatest at those urban centers, infested with *aegypti*, most closely in contact with infected jungle districts. If these exposed danger points are kept clean of the *aegypti* mosquito, there is very little opportunity for the disease to jump long distances.

The unrecognized introduction of yellow fever into urban communities, from nearby jungle districts, is the most probable mechanism by which persons preparing to travel to other countries might be infected

close to the date of departure. This danger disappears with the eradication of the *Aedes aegypti* mosquito.

Fortunately, about the time that jungle yellow fever was being demonstrated, as a permanent potential source of yellow fever virus for the re-infection of urban areas, methods for the complete eradication of *Aedes aegypti* were being developed in Brazil. Once the larger cities of Brazil were cleared of *aegypti*, it was found more economical to eradicate this mosquito from the suburbs and from the interior towns, and even rural areas, than it was to attempt to maintain *aegypti*-control services in the larger cities. Eradication of *aegypti* has proven to be an ever-expanding program and, since 1947 when Brazil proposed its eradication on a continent-wide scale, the Pan American Sanitary Bureau has been dedicated, under a mandate from its Directing Council, to collaboration with the governments of the Americas in the eradication of *Aedes aegypti* from North, Central and South America and the West Indies. The eradication of *aegypti* will eliminate all possibility of surprise returns of yellow fever to old endemic centers of infection, such as occurred in Rio de Janeiro in 1928. Although it is impossible to eradicate the yellow fever virus from the Americas, as was planned by the Rockefeller Foundation, it is possible to eradicate completely the urban vector and remove all threat of all but jungle yellow fever.

The program for the eradication of *aegypti* is well advanced in South and Central America and Mexico and has begun in some of the West Indies. It is of the highest importance, not only for the comfort but also for the safety of the Caribbean, that the *Aedes aegypti* mosquito be eradicated, not only from both the mainland and island zones of the Caribbean, but also from the United States and the rest of the Americas, thus eliminating possible sources of re-infestation in the Western Hemisphere.

LA FIEBRE AMARILLA EN EL CARIBE (*Sumario*)

La ocurrencia de casos aislados de fiebre amarilla en Panamá y la aparición subsiguiente de una onda epidémica que afectó a Costa Rica, moviéndose de Sudeste a Noroeste, ha llamado la atención a las potencialidades de esta enfermedad en la zona del Caribe—potencialidades que deben estudiarse a la luz de los conocimientos actuales sobre este azote histórico del trópico americano. Desde mediados del Siglo XVII su historia ha estado relacionada íntimamente con la de esta región, entorpeciendo la explotación europea y haciendo estragos en las tropas invasoras, llegando a merecer en muchas partes el nombre de “fiebre patriótica.”

La zona del Caribe, además de presenciar el primer brote informado de fiebre amarilla, fué el escenario de muchos sucesos dramáticos que culminaron en la primera aplicación eficaz de medidas antiamarílicas. En la Habana, la teoría de su transmisión por el mosquito fué creada por Finlay en 1881, comprobada por Reed en 1900 y aplicada por Gorgas en 1901. Allí también se efectuó la campaña antimosquito que llegó a convencer a los epidemiólogos. Una campaña similar hizo posible la construcción del Canal de Panamá, y popularizó la convicción de que la fiebre amarilla era una enfermedad sencilla, desde el punto de

vista epidemiológico, transmitida de hombre a hombre por el mosquito *Aedes aegypti*.

En 1915, la Fundación Rockefeller emprendió una campaña en colaboración con los gobiernos de los países que aun tenían fiebre amarilla, con miras a erradicarla en todo el Hemisferio Occidental. Las campañas realizadas en Centro América, México, Ecuador, Perú y Colombia tuvieron un éxito completo, y en 1925 la fiebre amarilla se hallaba circunscrita a una pequeña zona costanera al Nordeste del Brasil, de donde provenían informes prometedores.

En 1932 se modificó el concepto sostenido anteriormente, al observarse por primera vez en el Brasil en ausencia del mosquito *Aedes*. Apareció entonces la fiebre amarilla como una enfermedad fundamentalmente animal, que ocurre en monos y marsupiales y es transmitada en las selvas tropicales y subtropicales de las Américas por mosquitos que no son el *Aedes aegypti*. La extensión de la infección a humanos es secundaria. Se observaron brotes de esta fiebre amarilla selvática en todos los países de Sud América, exceptuando a Chile y Uruguay, y en Panamá y Costa Rica; se comprobó que esta forma selvática constituye una fuente de reinfección para los centros anteriormente endémicos y un obstáculo para su erradicación continental. Hay motivos para creer que existe en todos los países de Centro América, excepto en El Salvador, donde la tala de los bosques está bastante avanzada.

En las ciudades del Caribe no se ha informado un solo caso de fiebre amarilla de origen aédico desde 1937, cuando ocurrieron varios casos en Buena Vista, Colombia. Su ausencia en las Indias Occidentales se atribuye a la eliminación de los monos y a que las condiciones existentes en las selvas que aun quedan, no son apropiadas a su desarrollo.

Puede trazarse una línea desde un punto entre Cuba y Yucatán hacia el Sur y el Este hasta el Norte de Trinidad para dividir el Caribe entre zonas continentales e insulares. La zona continental posee el doble peligro de la fiebre amarilla selvática como enfermedad que afecta a habitantes y trabajadores de la selva, y como fuente de virus para la reinfección de ciudades y poblaciones donde aun existe el *Aedes aegypti*. La zona insular es susceptible únicamente a la fiebre amarilla de origen aédico, siempre y cuando se reimportara el virus del continente. La amenaza de la fiebre amarilla urbana es mayor en los centros urbanos, infestados con *Aedes*, que están próximos a regiones selváticas infestadas. Si se erradica el *Aedes* en estas zonas expuestas, se elimina la posibilidad de que la enfermedad salve grandes distancias. Asimismo, la erradicación del *Aedes* elimina la posibilidad de que las personas que se disponen a viajar al extranjero, se infecten poco antes de partir con fiebre amarilla importada de distritos selváticos en forma encubierta.

En el Brasil se ha descubierto que resulta más económico erradicar el *Aedes aegypti* en los suburbios, poblaciones del interior y zonas rurales, que el tratar de mantener servicios permanentes de control en las ciudades más grandes. Desde 1947, cuando el Brasil propuso una campaña de erradicación en escala continental, la Oficina Sanitaria Panamericana, por mandato del Consejo Directivo, se ha dedicado a colaborar con los Estados Americanos para lograr la erradicación final del mosquito en todo Norte, Centro y Sud América y en las Indias Occidentales. Aunque es imposible erradicar el virus amarillo en las Américas, sí es posible suprimir al vector urbano y eliminar toda amenaza, excepto la de fiebre amarilla selvática. Es sumamente importante, para la seguridad del Caribe, que se erradique el *Aedes aegypti* en las regiones continentales, insulares, en los Estados Unidos y en el resto de las Américas.