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SURVEILLANCE OF DENGUE IN THE AMERICAS

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**PAN AMERICAN HEALTH
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15-16 JANUARY 1970
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**SCIENTIFIC ADVISORY
COMMITTEE ON DENGUE**

**SURVEILLANCE OF DENGUE IN THE AMERICAS:
A REPORT TO THE DIRECTOR**

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Pan American Sanitary Bureau, Regional Office of the
WORLD HEALTH ORGANIZATION

Washington, D.C.

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INTRODUCTION

The meeting was opened by Dr. Arreaza Guzmán, Assistant Director of PAHO, who expressed the Director's regret at not being able to be present and reviewed the reasons why the Committee had been convened.

Concern over the increasing frequency and intensity of outbreaks of dengue in the Americas, he stated, had led PAHO to recognize the need, as a first step, to create a small, central working body to coordinate the exchange of information on this disease and to recommend courses of action to the Organization. This group, composed of representatives from the principal institutions actively engaged in studies of dengue, has been charged with the responsibility of maintaining under review the current status of information in this field, suggesting new areas of study in need of attention, and laying the groundwork for a basic approach to the epidemiologic investigation of dengue. In particular, the Committee's first assignment, as set forth in the agenda of the meeting, is to develop a plan for surveillance involving the participation of all the institutions in question.

Under the chairmanship of Dr. William Scherer, the Committee then addressed itself to its task. The first day was devoted to epidemiological reports from the laboratories that have been directly concerned with the dengue problem in the Americas and to a detailed, up-to-date summary of Aedes aegypti eradication programs in the Western Hemisphere. The morning of the second day was given over to the formulation of statements on the public health importance of the disease, on existing sources of information and mechanisms for exchange, and on priorities to be established for future work in this field. Following this, there was general discussion of a design for surveillance, and a draft program, including specific recommendations, was developed and approved.

SURVEILLANCE OF DENGUE IN THE AMERICAS

1. Importance of the Disease

Dengue and dengue-like diseases have recurred in epidemic fashion at frequent intervals in the Western Hemisphere. In this century, major outbreaks took place in 1904, 1915, 1922, 1934, 1941, 1949-50, 1963-64, and 1968-69. Attack rates were high, sometimes exceeding 70 or 80 per cent. Type 2 dengue virus was isolated in 1953, and dengue type 3 was responsible for the 1963-64 epidemic. Both types 2 and 3 caused epidemic disease in the Americas during 1968, and type 2 predominated in 1969. Infection with one type does not confer protection against subsequent infection with another, and, indeed, under certain circumstances, it may even produce a hypersensitivity that is postulated to lead to the dengue shock syndrome.

Even though mortality and permanent residua are not significant features of classical dengue, the high attack rate and the associated morbidity, which includes long periods of convalescence, lead to absenteeism and impaired efficiency at work. Moreover, outbreaks of the disease place a burden on health facilities, thus diverting them from the care of persons who are more seriously ill. Finally, there may be subtle effects that have not yet been fully explored, such as the possible induction of congenital abnormalities, abortion, and recrudescence of underlying diseases.

The toll of an outbreak includes, in addition to the direct cost of treatment of the disease, indirect losses from expensive emergency vector control measures, lowered manpower productivity, and, in some areas, decreased revenue from tourist trade. In addition to these economic losses, the costs of initial and follow-up programs to control Aedes aegypti are a heavy burden to communities at risk. Despite large recent expenditures in several countries for the control and eradication of this vector, dengue outbreaks continue to recur.

Some 30 to 35 million persons, not including an undertermined number of tourists, reside in areas at risk to dengue outbreaks. These areas currently include the Caribbean islands, the countries of the northern coast of South America, and the southeastern part of the United States. The geographical extent of the disease may increase as reinfestation of formerly Aedes aegypti-free areas continues. There is evidence that 11.8 million km², or

29 per cent of the land in the Western Hemisphere, is capable of supporting Aedes aegypti, and that, as of December 1969, 3.4 million km² were infested.

The rapidity with which outbreaks of dengue spread from one area to another makes the disease an important international problem. Moreover, as long as ecologic factors permit outbreaks to occur frequently, the conditions exist for introduction and dissemination of other more virulent viruses, such as yellow fever, that have a similar transmission cycle. Importation of other dengue types from Asia is also an ever-present danger. In addition, the apparently accelerating frequency of epidemics (Figures 1, 2, and 3), plus the increase in population size and density, may lead to a hyperendemic situation in the Western Hemisphere similar to that now present in Southeast Asia and, consequently, to the possible occurrence of the dengue shock syndrome, with its associated mortality.

2. Current Status of Surveillance

In the Americas, recognition of infectious diseases, including dengue, has classically been, and remains, in the hands of private and government physicians working in private offices, clinics, and hospitals. In those countries where dengue has a history of recurrent epidemic behavior, major clinical signs and symptoms of this virus infection in adults are generally well appreciated by a majority of the general practitioners and internists in the communities when epidemics are occurring. It is probable, however, that in interepidemic periods sporadic cases in adults are readily overlooked or misdiagnosed. Dengue in children is less readily recognized because of its mild and unremarkable manifestations.

Resources for the specific diagnosis of dengue, as well as for certain investigative programs on the disease, exist in various laboratories in the countries and territories where dengue has been active in the last two decades. Another group of institutions, laboratories, and university microbiology departments in the United States maintains a current interest in various aspects of the problem. Within the Caribbean area, these laboratories include the Department of Microbiology at the University of the West Indies in Jamaica; the Trinidad Regional Virus Laboratory; the National Institute of Hygiene in Venezuela; the National Institute of Health in Colombia; the Department of Microbiology at the University of Valle in Cali, Colombia; the Gorgas Memorial

Laboratory; and the Middle America Research Unit (NIH) in Panama. Dengue-interested, and dengue-capable, organizations in the continental United States include the National Communicable Disease Center, the Walter Reed Army Institute of Research, the NIAID Pacific Research Section, the Gulf South Research Institute, the Yale Arbovirus Research Unit, and the departments of microbiology, epidemiology, and/or medicine at the following universities: Hooper Foundation/University of California (at San Francisco), Cornell, Hawaii, Johns Hopkins, Maryland, Miami, Pittsburgh, and Rutgers.

Systems for the collection and dissemination of information regarding dengue vary. In most instances, ministries or departments of health have an epidemiologist responsible for reporting such diseases to the Chief Medical Officer or his equivalent in the governmental health structure. With respect to the Caribbean area, such epidemiologists exist in Puerto Rico, Haiti, the Dominican Republic, Jamaica, Guyana, and Trinidad. In addition, epidemiologists reporting infectious diseases have long been established in Venezuela, Colombia, Panama, and all the countries of Central America.

The Pan American Health Organization has considered dengue a reportable infectious disease since 1965. Statistical notification of cases of dengue is therefore received at PAHO Headquarters through the regular channels of disease reporting maintained between the Organization and the various country and territory governments. Typical time between the completion of this reporting by the government agency and appearance of the data in the Weekly Epidemiological Report is between three and six weeks. A breakdown of the reporting systems used in the various countries is presented in Table 1. Table 2 shows the statistics on dengue compiled by PAHO in the last decade on the basis of regular reports, supplemented by answers received in an annual questionnaire.

Other sources of information concerning dengue fever in the Americas include Morbidity and Mortality, the weekly report of the National Communicable Disease Center; the Arbovirus Information Exchange, which is maintained as an informal service for groups actively working in the field of arbovirology; and, of course, the scientific literature. The Arbovirus Information Exchange

appears two or three times yearly in English. Although it is of considerable use to participating laboratories, it is not intended to provide standardized information to larger communities of public health workers and scientists. With respect to the scientific literature, a problem exists in the time lapse between the occurrence of significant events and the publication of findings. Another difficulty is that the literature on dengue may appear in either Spanish or English, and English-speaking workers may fail to be aware of studies and reports published in Spanish by journals of small circulation.

The present system for the surveillance and diagnosis of dengue has significant shortcomings, however. Laboratory tests are not uniformly available or widely used to confirm clinically diagnosed dengue virus disease. As a concomitant, there is widespread failure to diagnose the disease in children. Also, the incidence of the disease is grossly underestimated. The system for collection and handling of information is deficient in several regards: certain regions are not covered at all; acquisition and dissemination of data is slow; and long-term clinical records that might reveal new, unrecognized manifestations have not been kept.

3. Need for Improved Surveillance

The epidemiologic mechanisms that result in periodic dengue outbreaks in the Hemisphere are poorly understood. Areas of endemicity during interepidemic years have not been defined, nor are the reasons for the appearance of an outbreak fully known. The interpretation and understanding of epidemiologic events in any single country or territory depends on knowledge of the situation in the entire area in which the potential for transmission of dengue viruses is present. It is in these areas, detected only by effective surveillance, that major investigative efforts should be made.

The persistence of large Aedes aegypti populations and the expanding size of the human population in the Americas, and in particular in the Caribbean region (Figure 4), will be associated with the continuous or periodic presence of dengue. Ultimate control of this and other Aedes aegypti-borne diseases such as yellow fever obviously depends on reduction or elimination of the primary vector. However, the present eradication program has been faced with difficulties in

several countries and territories. In the absence of adequate universal vector control, active surveillance is necessary for progress in the prevention or control of dengue. This surveillance should attempt to supply the epidemiological and virological information necessary to identify potentially dangerous developments and hopefully to provide direction for vector control programs. Any surveillance network established for the evaluation of dengue will, of course, be equally applicable to the problem of urban yellow fever.

4. Proposed Program

A coordinated, well-planned program for the surveillance of dengue in the Americas is considered essential. Such a program should be directed toward accomplishment of the following objectives:

- To discover dengue epidemics in the early stages and thus permit prompt institution of emergency control measures and pertinent research investigations
- To detect dengue shock syndrome/hemorrhagic fever or other currently unrecognized manifestations caused by dengue viruses so that prompt and proper patient management may be applied
- To monitor continuously the magnitude of dengue as a public health and economic problem
- To provide knowledge on the natural history of dengue viruses by facilitating research aimed at eventually controlling the disease, with or without eradication of Aedes aegypti

The task would be approached along several lines: through the assignment of two full-time PAHO epidemiologists to oversee the areas at risk, through the extension of laboratory facilities for the diagnosis of dengue, through the development of an effective system of information exchange, through definition and encouragement of field and laboratory research on dengue, and through the establishment of a permanent subcommittee for coordination of epidemiologic investigation.

The two epidemiologists would carry out continuous and vigorous case detection efforts, working from laboratories located in key positions, such as Trinidad, Miami, or Puerto Rico. Each could be responsible for a given geographic

area--for example, the TRVL epidemiologist might cover Guyana, Surinam, French Guiana, the Lesser Antilles, the Netherlands Antilles, Jamaica, Venezuela, and Colombia, while the other could oversee surveillance activities in the Dominican Republic, Haiti, Cuba, Puerto Rico, the Bahamas, and Central America. Specifically, the surveillance epidemiologists would undertake to do the following:

- Establish "sentinel" units in their respective areas of influence. The units would include hospitals, medical officers, and private practitioners. Personal and frequent contact between the epidemiologists and the units should be maintained.
- Select sample populations of children under five in specific areas for periodic determination of current group B virus activity on a serological basis.
- Encourage "dengue-risk" countries not now reporting suspected cases of the disease to do so, and provide them with the assistance as required.
- Make available to health officials and physicians the new information and laboratory diagnostic support necessary to permit early detection of dengue, including possibly the hemorrhagic fever/shock syndrome.
- Investigate outbreaks and immediately contact the Epidemic Subcommittee of the PAHO Scientific Advisory Committee on Dengue (see below) to determine jointly the additional steps to be taken; initiate requests to implement the measures agreed on.
- Coordinate their activities with other concerned persons, such as other PAHO epidemiologists, laboratory workers, and Aedes aegypti control personnel assigned to the zones involved.

The extension of laboratory facilities should permit the establishment of a functional system to cover the areas at risk in the Americas. It should include provision for the collection, transportation, and testing of specimens, as well as the reporting of results back to physicians.

An effective system of information exchange on dengue should be established. This could be done through a quarterly newsletter, supplemented as necessary by special editions, prepared by one of the surveillance epidemiologists. Information on Aedes aegypti control would be included when pertinent. These newsletters would be distributed by PAHO to the laboratories directly concerned, to Chief Medical Officers in the area, and to the sentinel units, as well

as to the members of the PAHO Scientific Advisory Committee on Dengue and all the persons on the Organization's regular mailing list for the Weekly Epidemiological Reports.

Within certain areas of the Caribbean, such as Cuba, Santo Domingo, and the smaller islands, and in Colombia and Central America, periodic serological surveys should be conducted. In localities that are considered relatively or absolutely free of Aedes aegypti, such surveys would provide information on unrecognized foci of transmission; of particular interest are projects such as the studies at MARU of serum samples collected by INCAP for the recent nutrition surveys in Central America and Panama. Laboratory investigations which may produce results of most relevance in the present epidemiological situation are those directed toward biologic and antigenic characterization of dengue viruses, the ultimate objective being to clearly differentiate subtypes and relate the differences to epidemiologic and clinical observations. Efforts to increase the sensitivity and efficiency of virus isolation procedures should be encouraged. An efficient serologic method for detecting type-specific anti-dengue antibody in large numbers of sera is critically needed. An effort should be made to further develop and adapt the micro plaque-reduction neutralization test for use with dengue viruses.

Finally, to permit prompt coordination of epidemiologic investigations and control measures, a Permanent Epidemic Subcommittee of the PAHO Scientific Advisory Committee on Dengue should be constituted.

CONCLUSIONS AND RECOMMENDATIONS

The Committee recommended that the program, as described above, be established, and that two full-time epidemiologists be provided for its implementation. Coordination with all existing dengue activities in the Americas was stressed.

Priorities for designation of areas of investigation were considered to be important because of the magnitude of the problem and the limited resources available. The heavily populated areas where Aedes aegypti is prevalent and where dengue has occurred in the past should, the Committee felt, receive first attention. In particular, Venezuela was cited as a critical area because of its size, population, geographical location, and history of epidemic,

and possibly endemic, dengue. The situation would appear to call for short-term epidemiologic and long-term laboratory support, and it was suggested that a virologist-epidemiologist be assigned to work there locally. Haiti, Jamaica, and Puerto Rico were also considered important areas. The initial evidence for endemicity in Jamaica and Haiti should be further explored and serial studies carried out to prove or disprove the question of continued endemicity. The Committee recommended, therefore, that the capability be developed to sustain epidemiological studies in these areas.

The Committee then recommended formation of a Permanent Epidemic Subcommittee, with its initial membership to consist of Drs. Russell (Chairman), Downs, Henderson, and Scherer.* The two surveillance epidemiologists would serve ex officio.

Finally, it was agreed that the PAHO Scientific Advisory Committee on Dengue should meet at least annually.

* Members were selected from the United States to facilitate quick and easy assembly and communication; persons from involved regions would be added to the Subcommittee on an ad hoc basis.

SPECIAL RECOMMENDATION OF THE MEETING

During the past few years, epidemics of Venezuelan encephalitis (VE) have occurred in many countries of northern South America and Central America. In 1969 alone, epidemic VE was reported in Ecuador, Venezuela, Guatemala, El Salvador, Honduras, and Nicaragua. These epidemics have resulted in significant illness and death in human and equine populations in the affected areas. A considerable body of epidemiological and virological data has been collected by investigative groups, but this information is fragmentary. Because the geographical regions involved and the investigative resources available are similar to those applicable to dengue, it is considered to be within the province of this Advisory Committee to express concern about future VE activities. It is therefore highly recommended that PAHO utilize this unique opportunity to develop and coordinate a continuing research program on Venezuelan encephalitis, to promote efforts for the collection of available information, and to indicate the priorities of investigative activities in the future by creating a PAHO Advisory Committee on Venezuelan Encephalitis similar to this Advisory Committee on Dengue. The Advisory Committee on Dengue requests its Secretary to study the feasibility of implementing this recommendation and organizing within the next year a Symposium on Venezuelan Encephalitis, with publication of its proceedings.

TABLES AND FIGURES

Table 1

THE REPORTING OF DENGUE: CURRENT STATUS

- A. Countries that include dengue in their weekly reports of communicable diseases sent to PAHO
1. Countries that use the PAHO reporting form, which includes dengue
 - a. Dengue notifiable
 - Mexico
 - Panama
 - Bahamas
 - Canal Zone
 - St. Kitts, Nevis, Anguilla
 - b. Dengue not notifiable
 - Barbados
 - Colombia (symbol used in the reports)
 - Costa Rica
 - Guatemala
 - Haiti
 - Trinidad and Tobago
 - Guadeloupe
 2. Countries that use their own reporting form, which includes dengue (notifiable)
 - Antigua (no reports received in 1969)
 - Dominican Republic
 - El Salvador
 - Jamaica
 - Venezuela (outbreaks only)
 - Grenada
 - Puerto Rico
- B. Countries that do not include dengue in their reports or do not report regularly
1. Countries for which dengue is not listed in the weekly reports (not notifiable)
 - Cuba
 - Honduras
 - Nicaragua
 - United States (optional reports of cases in 1963 and 1964)
 - British Honduras (monthly)
 - Dominica (reported dengue in 1963, 1964, and 1968)
 - Martinique
 - St. Lucia

2. Countries for which dengue has not been stated to be notifiable,
and for which no reports were received in 1968 or 1969

Cayman Islands

Montserrat

Netherlands Antilles

St. Vincent

Turks and Caicos Islands (since June 1968)

Virgin Islands (UK)

Virgin Islands (US)

Table 2

REPORTED CASES OF DENGUE IN THE CARIBBEAN AREA, 1960-1969*

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Barbados	...	...	...	...	...	...	...	...	(p)	+ -
Dominican Republic	494	821	822	350	407	527	...	...	-	13
Jamaica	-	-	-	1 578	156	36	6	6	367	+ 530
Venezuela	56	-	-	-	18 306	4 040	7 750	1 330	-	+4 097
Antigua	-	-	-	-	264	8	-	-	+179	...
Dominica	...	...	-	2	43	-	...	-	42	+ -
Grenada	...	-	...	...	...	...	...	...	...	+ 46
Martinique	...	-	...	(p)	...	...	...	...	...	...
Montserrat	-	-	...	...	-	-	-	...	(p)	...
Netherlands Antilles	...	...	...	(p)	...	...	...	...	...	...
Puerto Rico	-	-	-	25 737	2 440	93	2	1	-	16 665
St. Kitts-Nevis and Anguilla	-	-	-	-	721	-	-	-	(p)	-
St. Lucia	-	-	...	...	...	...	...	-	(p)	...
St. Vincent	-	-	-	-	-	-	-	...	(p)	...

... Data not available

+ Incomplete data

(p) Outbreak reported

*Colombia, Panama, and the countries of Central America have been basically free of *Aedes aegypti* during the period and have not reported any cases of dengue since 1960; they are therefore not included in the table.

Figure 1

OCCURRENCE OF DENGUE IN THE
CARIBBEAN, 1963-1965

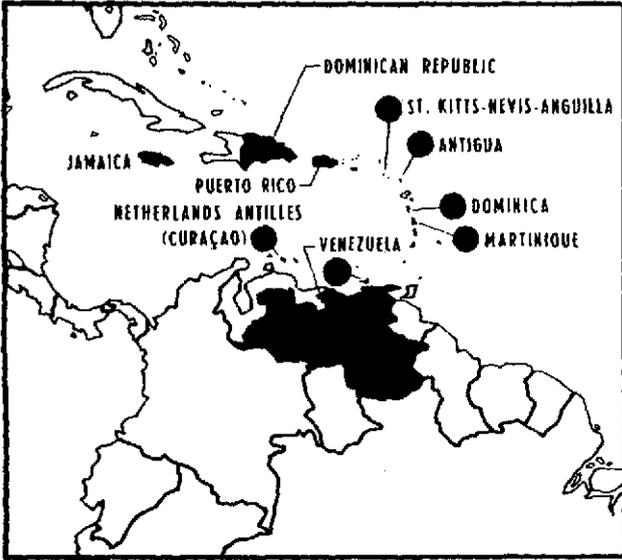


Figure 2

OCCURRENCE OF DENGUE IN THE
CARIBBEAN, 1966-1967

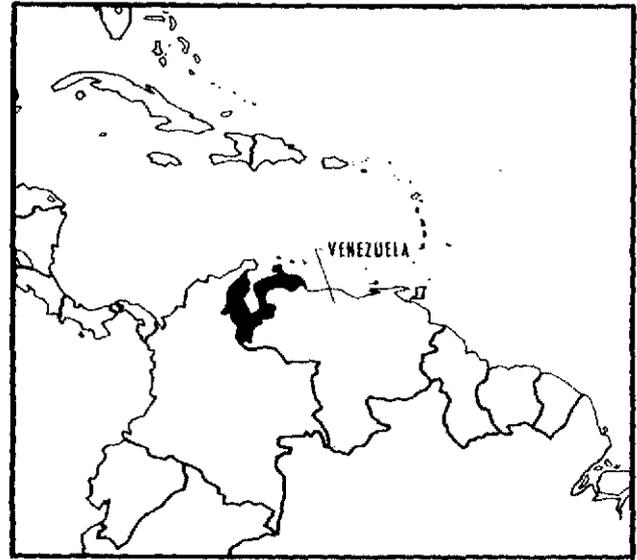


Figure 3

OCCURRENCE OF DENGUE IN THE
CARIBBEAN, 1968-1969

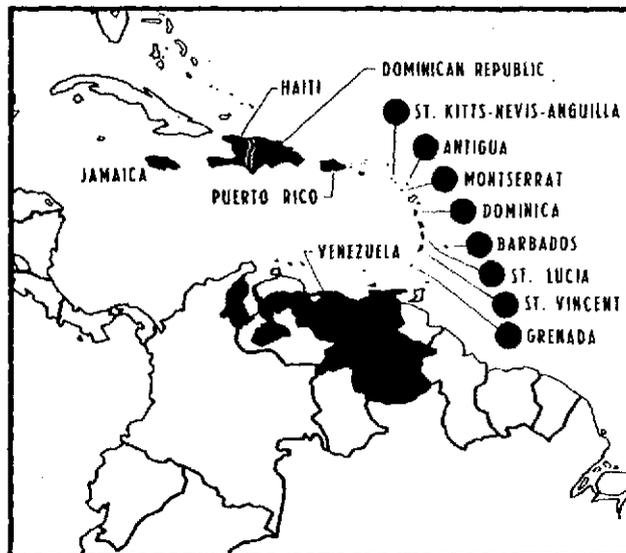
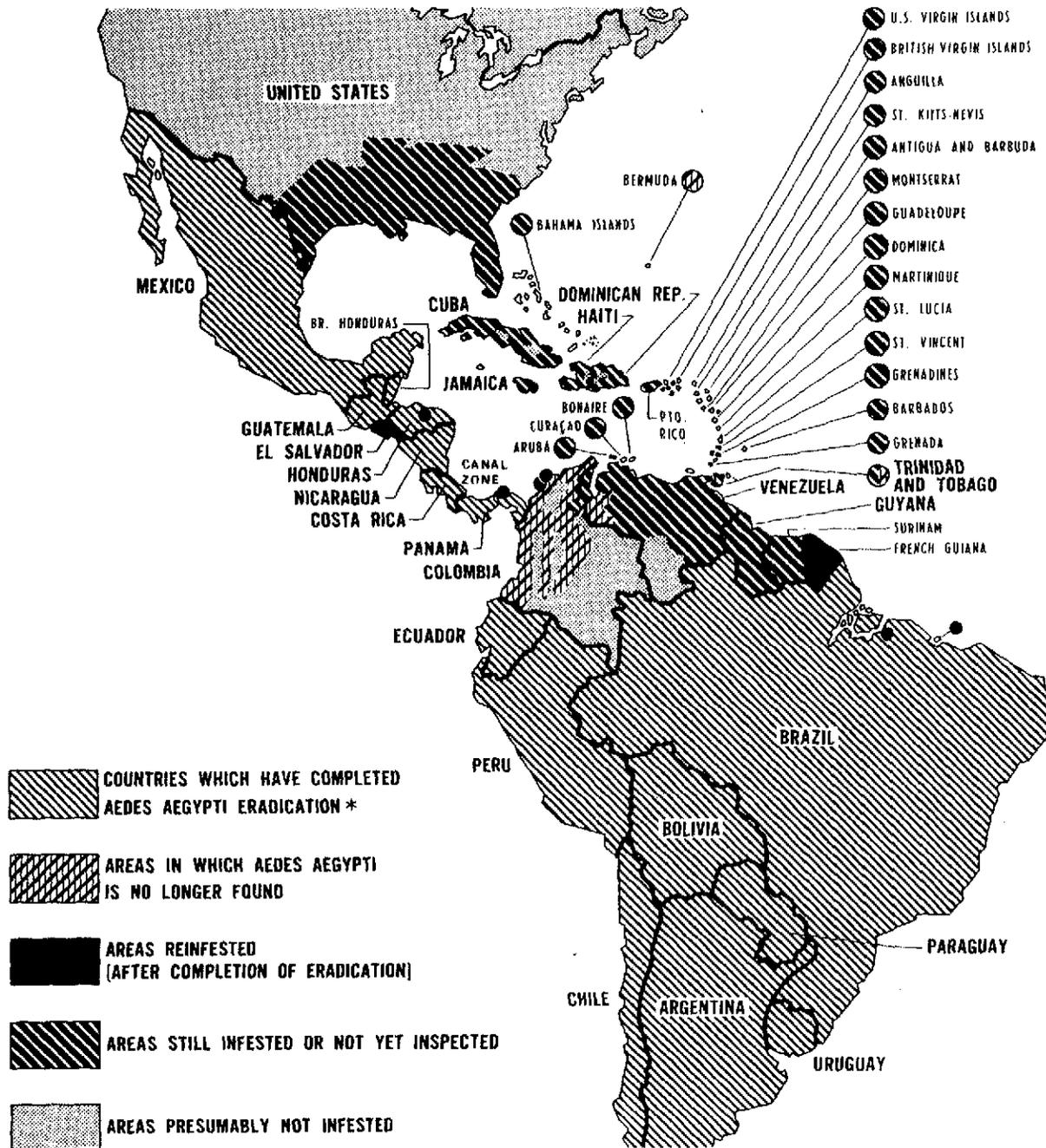


Figure 4

STATUS OF THE AEDES AEGYPTI ERADICATION CAMPAIGN IN THE AMERICAS, DECEMBER 1969



* ERADICATION CARRIED OUT ACCORDING TO THE STANDARDS ESTABLISHED BY THE PAN AMERICAN HEALTH ORGANIZATION