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AEDES AEGYPTI ERADICATION

It is twenty one years ago since the Directing Council entrusted the Pan American Sanitary Bureau with the solution of the problem of the urban yellow fever in the Americas through the eradication of Aedes aegypti.

During the intervening period, with the encouragement and cooperation of the Bureau, the Aedes aegypti has been eradicated from extensive areas of the Western Hemisphere; nevertheless there is still a great deal to be done before the continental campaign for the eradication of the mosquito is completed.

The vector has been completely eradicated from the following countries and territories, which at the present date regard themselves as free of Aedes aegypti: Argentina, British Honduras, Bermuda, Bolivia, Chile, Costa Rica, Ecuador, Guatemala, Nicaragua, Paraguay, Peru, Uruguay and the Panama Canal Zone. Five other countries Brazil, El Salvador, Honduras, Mexico and Panama, which had also completed their mosquito eradication campaigns, were recently found to be reinfested.

Apart from these reinfestations, the problem of Aedes aegypti still persists in the extreme north of South America, in the United States, and in the Caribbean Area.

In the northern part of South America, the problem in Colombia has been confined to reinfestations along the frontier with Venezuela. But French Guiana, Surinam, Guyana and Venezuela are extensively infested. In French Guiana, which was found to be reinfested in 1963, the eradication campaign was resumed in 1969. Surinam began its campaign in 1963. Up to 1968 the results achieved were limited, but the budget for the program was substantially increased in 1969 and at the moment the campaign is being extended and intensified. In Venezuela, since 1968 the campaign has been restricted to a small area of the country on the frontier with Colombia.

In the United States including Puerto Rico and the Virgin Islands, the eradication campaign was suspended in July 1969, when the areas still infested by Aedes aegypti were practically the same as had been found positive at the beginning of the campaign in 1964. These comprise the whole or part of the territory of ten of the southeastern states, Puerto Rico and The Virgin Islands.

In the Caribbean area, apart from a few small islands, all the countries and territories are to a greater or lesser extent infested by the mosquito. The campaign is in its final phase in Trinidad, where in the last few years only small foci of reinfestation have been found. Activities continue in Barbados, Cuba and St. Lucia, although the results are limited; a campaign began recently in Martinique and the preparatory phase is in progress in the Netherlands Antilles and Guadeloupe. But eradication work has been suspended for a number of years in Dominique, Haiti, The British Virgin Islands, Jamaica and the Dominican Republic. In the rest of the area, in spite of the renewed interest in the eradication of Aedes aegypti shown by Governments since 1968, the campaign is inactive, or is confined to small scale mosquito control activities.

The existence of Aedes aegypti in extensive areas of the Hemisphere entails a risk of urban yellow fever which should not be underestimated. The eradication of the mosquito from the majority of the countries most exposed to the jungle virus in South America has eliminated the possibility of urban yellow fever in their territory. Consequently, the likelihood of introduction of the virus into other countries has decreased. Nevertheless, it should be remembered that because of the ease and rapidity of travel nowadays, all the countries and territories of the Hemisphere are from an epidemiological point of view very close to the enzootic areas of South America.

In the same way, the epizootic outbreaks occurring periodically in the Continent can carry the virus to regions remote from the enzootic foci mentioned; in fact, over the last 22 years, as a result of various epizootics, the presence of the yellow fever virus has been detected in jungle areas.

Apart from this threat, account must be taken of the risk of dengue epidemics in the countries and territories infested by Aedes aegypti. Although this is not a disease of major importance, epidemics of dengue such as have been occurring in the Caribbean area since 1963 can cause serious harm economically, especially in countries where the tourist trade is a substantial source of revenue.

Mention must be made also of the risk of hemorrhagic dengue in these areas. Up to the present, hemorrhagic dengue has been observed only in Asia; but we cannot exclude the possibility of this disease, which is much more serious than the ordinary dengue, occurring in the Western Hemisphere.

The areas still infested by Aedes aegypti have been the cause of frequent reinfestations throughout the Hemisphere. Over the last seven years, in addition to the reinfestations which have occurred in Brazil, Colombia, El Salvador, French Guiana, Honduras, Mexico, Panama and Trinidad, as already mentioned, there have been reinfestations in Guatemala -although they were rapidly eliminated- Guyana, and various Caribbean islands including Aruba, Antigua, Grenada, Montserrat, St. Kitts and St. Vincent.

Apart from the heavy additional costs incurred by Governments which had already spent considerable sums on the eradication of Aedes aegypti, these reinfestations help to prevent the continental campaign from being completed and increase the danger of more extensive and more serious reinfestations occurring in the Hemisphere, where they could completely wreck the campaign.

The subject has been causing serious concern to the Governing Bodies of the Pan American Health Organization, which have adopted a series of resolutions urging countries and territories still infested to complete the eradication of the mosquito at the earliest possible date, since the success of the continental campaign can only be assured if the present sources of reinfestation in the Hemisphere are eliminated without delay. However, in the last seven years, the areas in which the eradication campaign has made any progress at all are few and far between, and in some countries and territories it has actually lost ground during the period.

Bearing this situation in mind, and in compliance with a recommendation made by the XVII Pan American Sanitary Conference in Resolution XIX, the Pan American Sanitary Bureau in 1967 convened a Study Group to make a complete review of the status of the continental campaigns, and to consider ways and means of carrying out properly coordinated programs in the infested areas and in maintaining strict vigilance in the areas already freed from the mosquito.

This Study Group, comprising eight experts with experience of Aedes aegypti eradication in various areas of the Hemisphere, met at PASB Headquarters in Washington from 6 to 12 April 1967, and studied in depth the difficulties which have been hampering the progress of the campaigns. It looked into the measures to be taken to remove the difficulties; it discussed plans for carrying out simultaneous, coordinated campaigns in the infested countries and territories; and it made recommendations concerning the organization and maintenance of efficient vigilance services in the areas already cleared of the mosquito.

On the subject of the obstacles which have been standing in the way of the success of the continental campaign, the Study Group in its report made the following statement:

"At present there is no technical problem to prevent the eradication of Aedes aegypti in the Americas. Effective residual action insecticides are available, as are techniques and methods that ensure the elimination of the vector when correctly applied.

As can be seen from the report, the continental eradication program is not progressing satisfactorily. This is due to the fact that in most of the countries and territories the campaign does not meet the essential conditions for the appropriate development of the whole process leading to eradication. These conditions are basically as follows:

- (a) Firm decision on the part of the Government to eradicate the mosquito and to assume the responsibility that eradication involves.
- (b) Sufficient funds to cope uninterruptedly with the personnel, supply, and equipment requirements of the campaign until such time as the eradication of the vector is achieved.
- (c) Appropriate organization on a national scale enabling the campaign to carry out its activities in a uniform and coordinated manner throughout the country.
- (d) Administrative independence and flexibility whereby the campaign can handle its budget without bureaucratic interference; establish conditions of employment of its staff; fix salary scales and per diem allowances; and engage, transfer, discipline, or dismiss staff without delay or difficulty.
- (e) Legal provisions providing the campaign with authority to quickly enforce decisions and to adopt the necessary measures to eradicate the mosquito without delay."

The report of the Study Group was submitted to the XVII Meeting of the Directing Council in October 1967. As a result the Meeting approved Resolution XVIII, in which the Council again expressed its concern at the situation of the continental campaign, and once again urged the countries still infested to fulfill their commitments and to eradicate the mosquito as soon as possible and those which had already terminated the campaign to maintain strict surveillance against reinfestation.

The possibility of reinfestation of the countries which have eradicated Aedes aegypti is not confined to the introduction of the mosquito from outside. Colonies of Aedes aegypti maintained in laboratory or educational centers may be the cause of reinfestation.

In view of these possible sources of reinfestation, and of the risk they involve for the continental eradication campaign, the XVII Pan American Sanitary Conference adopted Resolution XX which deals specifically with the subject. In the Resolution the Conference approved the requirements for eradication of Aedes aegypti established by the Pan American Sanitary Bureau; it confirmed that the requirements must be fully complied with before the Governing Bodies of PAHO could declare a country or territory free of the vector; and it established that in order to be considered free of the vector by the Governing Bodies, a country or territory must satisfy the following conditions in addition to the above-mentioned requirements:

(a) To eliminate all colonies of Aedes aegypti that exist from areas in their territory in which the ecological conditions are favorable to the development of the vector.

(b) Not to permit the existence of any colony of the mosquito except in recognized research centers, situated in areas that are ecologically unfavorable to the vector.

(c) To insure that colonies of the vectors existing in those unfavorable areas are permanently maintained in such a way as not to allow the country or territory to be reinfested by Aedes aegypti from those colonies.

In the same Resolution, the Conference also recommended that a group of experts in this field should meet under the auspices of the Pan American Sanitary Bureau to establish the conditions those colonies must satisfy, if their presence in a country or territory is not to prevent it from being considered free of the vector by PAHO.

In accordance with this recommendation, in 1967 the Bureau sponsored a Working Group on Laboratory Colonies of Aedes aegypti, which met at PAHO Headquarters in Washington from 17 to 19 April of the same year.

The report prepared by this Working Group was likewise submitted to the Directing Council at its XVII Meeting in 1967, but the Council did not take any formal decision on it at the time. For this reason, and since it is of interest to countries to be acquainted with the views of the Directing Council on the subject, the report of the Working Group is again submitted for their consideration along with the present document (Annex).

It will be seen from the report that the Working Group recognized the importance of the continental eradication campaign and the danger of reinfestation of ecologically favorable areas by Aedes aegypti escaping from laboratory colonies, and hence recommended that non-essential colonies, in other words those intended for non-scientific use, should be eliminated.

With regard to colonies intended for such scientific research purposes as Governments may decide to allow in their particular countries, the Group prepared detailed standards governing their establishment, operation and inspection; it specified the security and surveillance measures required to prevent reinfestation originating from such colonies; and it made recommendations concerning the precautions to be taken in regard to the shipment of Aedes aegypti from one laboratory to another.

To enable all these measures to be put into practice satisfactorily, the Group suggested that, with the technical assistance of the Pan American Health Organization, interested Governments should draw up and issue the necessary regulations.

The status of the campaign in each of the countries and territories where the problem of Aedes aegypti still exists is summarized below.

BARBADOS. The results achieved up to 1967 were limited by various obstacles encountered, the chief ones being: insufficient funds, making it impossible for the campaign to recruit sufficient personnel to cover the infested areas of the country adequately; the fact that large numbers of houses were left without inspection and treatment, or were only partially inspected and treated; and the incomplete or inadequate treatment of many potential breeding grounds.

In 1968, after a complete review of the program, the Government decided to increase the funds allotted to the campaign and to adopt the other necessary measures to ensure the completion of the eradication of the campaign in Barbados over a period of three years.

During the first half of 1969 the reorganization and expansion of the campaign was completed, and at the present time a start is being made to achieve adequate coverage of the country on the basis of a new plan of operations.

BRAZIL. Brazil completed its eradication campaign in 1955 and was declared free of the vector in 1958; however, in 1967 it was discovered that the city of Belem, at the mouth of the Amazon, was reinfested, as well as other localities in the neighborhood.

As a result of this reinfestation, the Government took the necessary measures to delimit the affected area exactly, to prevent the vector from being carried to other parts of the country, to reinforce vigilance services in the most exposed localities, and to eliminate the mosquito from the reinfested areas.

In the process of investigating the extent of the problem, inspections were carried out during 1967 and 1968 in 111 localities in the State of Para, all of them situated in within the Belem network, in addition to the city itself. Of the 111 localities, 35 were found to harbor Aedes aegypti, although in most of them infestation was still at a low level.

As a result of the eradication program reintroduced by the Government, the mosquito has already been eliminated from 16 of the 35 localities in question, but 19 of them, as well as the city of Belem, are still positive, according to the latest data available.

Apart from the State of Para, up to the present Brazilian surveillance, which has been intensified considerably since the reinfestation of that state, has not detected Aedes aegypti in any other area of the country.

COLOMBIA. Eradication was completed in 1961, but since then several reinfestations have occurred in the area bordering on Venezuela and in the port area of the town of Santa Marta on the Caribbean coast.

In the frontier area, the localities reinfested included Cúcuta (September 1961 and at the end of 1965); San Luis (1962), El Escobal and Villa del Rosario (1967). The reinfestations in El Escobal, San Luis and Villa del Rosario were eliminated, and at the moment these localities are regarded as free of the vector. But Cúcuta continues to be infested.

Apart from these reinfestations, Aedes aegypti was found in 1968 in various localities of La Guajira situated in the region of the frontier with the Venezuelan state of Zulia.

In the course of the eradication campaign in Colombia, the inspections carried out in the La Guajira peninsula constantly proved negative. Similarly, the vigilance inspections carried out in the same region after the mosquito eradication campaign was terminated also gave negative results. This was due no doubt to the fact that poor communications between La Guajira and the infested areas of Colombia and Venezuela prevented the penetration of the mosquito into the region. But the opening up of the highway between Maracaibo, Venezuela and Maicao in La Guajira has brought changes in the situation during the last few years, and the mosquito was very soon back in the region.

Up to the present the following localities have been found infested in this area: Maicao, Riohacha, Carraipia, Papayal, Fonseca, El Molino, Distracción, Uribia, Nazareth and Manaure. The Government began eradication operations in the area the moment the infestation was discovered, but five of the localities found infested are still positive.

In the port area of Santa Marta, small reinfestations were found in 1963, 1964, 1966, and 1968, all of them caused by Aedes aegypti transported by small craft from Caribbean ports. All these reinfestations have been eliminated, and the area is at the present considered negative.

Leaving aside the reinfestations mentioned, the country is still regarded as free of the mosquito on the basis of the findings of the latest vigilance inspections made by the campaign. In the last 15 months, the following localities were inspected without any Aedes aegypti being found: San Luis, the ports of Barranquilla, Buenaventura, Cartagena and Las Flores, the international airports of Barranquilla and Cali, and five localities in the Santander del Norte Department on the Venezuelan border.

CUBA. Campaign activities continue to be concentrated in the provinces of Pinar del Rio, Havana and Matanzas, and in a small area in Las Villas Province. The results obtained by the campaign up to 1967 were limited, mainly because of the reinfestations in the work area caused by the reintroduction of the vector from provinces not covered by the program. To meet this situation, the Government decided to incorporate the eradication campaign into the general health services and to expand it so that eradication activities would be undertaken simultaneously in all the infested areas in the country.

This expansion of the campaign meant increasing the field personnel strength to approximately 4,200 persons, and the Government, after studying the matter, reached the conclusion that it would be impossible to take on personnel for the campaign on such a scale owing to the demand for labor for other activities regarded as vital to the development of the country. The Ministry of Health therefore decided to try to find new ways of solving the problem, essentially by employing volunteers supplied by the workers' organizations for the application of the insecticide, and to use specialized campaign staff and health service personnel for the training and supervision of volunteers and the evaluation of the treatments.

In view of the novelty of this program, and the difficulties likely to be encountered by a mosquito eradication campaign based on such procedures, the Ministry decided to try out the program in one of the provinces of Cuba before extending it to the entire country. For this experimental plan the Province of Havana was selected, with a population of slightly more than 2 million and approximately 630,000 dwellings.

The experiment was begun early in 1968, and by July of the same year a complete evaluation had been made. As a result, the Government decided to continue the experiment until December 1969 before extending the program to the rest of the country. The work is still going on at the present time.

DOMINICAN REPUBLIC. The eradication campaign in the Dominican Republic was suspended in 1962 and has not been resumed so far.

EL SALVADOR. The eradication campaign was completed in 1957, and in 1960 the country was declared free of Aedes aegypti. But in June 1965 an area in the city of San Salvador was found to be reinfested. Later research showed that the reinfestation covered the entire city and its surroundings, and that many other areas in the country had already been reinfested.

The eradication operations were resumed in July 1965. But owing to the shortage of funds for the campaign, its activities up to the present have been limited to the city of San Salvador and the airport of Ilopango, and the results achieved in these two localities have not been satisfactory.

GUYANA. After having been free of Aedes aegypti for several years, Guyana was found to be extensively reinfested in 1962. The Government reactivated the eradication campaign in 1965, but because of lack of funds, activities were restricted to Georgetown.

The results obtained in the campaign up to 1968 have not been satisfactory. Despite the treatments carried out in Georgetown, the infestation index has remained high, because of serious administrative difficulties and the resistance of the mosquito to the insecticides used. If the campaign is to be successful it will be essential to use another insecticide, but even before that it will be necessary to overcome administrative problems which have prevented the satisfactory development of the field work, and also to allocate sufficient funds to enable the campaign to cover the infested areas of the country adequately.

In view of this situation, the Government in 1969 considerably increased the budget for the program, and at the moment it is in the process of adopting the other measures needed to ensure the success of the campaign.

HONDURAS. Honduras completed the Aedes aegypti eradication campaign in 1959, and that same year, after a special inspection carried out with the collaboration of PAHO, the country was declared free of the vector at the XI Meeting of the Directing Council of the Organization. Since then, a vigilance service has been set up in the country and has been periodically inspecting the localities most exposed to reinfestation.

Up to February 1968 the mosquito had not been found in the course of any of these inspections. But towards the end of March and early in April the localities of San Pedro Sula and Puerto Cortés, situated on the north coast of the country, were found to be reinfested, probably by Aedes aegypti carried by road from El Salvador, or by boat in the form of eggs

from the United States of America. Because of this discovery, vigilance was increased in other localities exposed to reinfestation, and the research carried out up to February 1969 showed that further infestation had occurred in the localities of La Lima, Choloma, Rio Branco, Chamelecon, Villanueva and El Progreso, all within 30 km of San Pedro Sula, and Nueva Ocotepeque, in the south west of the country, quite close to the El Salvador frontier.

In view of these reinfestations, the Government tried to reactivate the eradication campaign throughout the country forthwith, but for administrative reasons, up to the present field work has begun at San Pedro Sula only. The campaign has not been able to tackle the other positive localities up to the present for lack of funds.

Apart from the reinfestations already mentioned, the rest of the country still regards itself as free of the vector; but unless the mosquito is eliminated rapidly from the nine localities already positive, it will be extremely difficult to avoid reinfestation of other parts of Honduras.

HAITI. The campaign was suspended in 1958 and has not been resumed since.

JAMAICA. Eradication activities were suspended in 1961, and since then the Aedes aegypti campaign in the country has been limited to control measures in ports and international airports. Nevertheless, the Government has plans to start again, possibly this year, with an eradication program of national scope.

MEXICO. Mexico completed its eradication campaign in 1961, and in 1963 was declared free of the mosquito. Since then, the problem of Aedes aegypti in Mexico has been limited to reinfestations which have occurred in the area bordering on the United States of America.

In June 1965 a small sector in the city of Nuevo Laredo was found to be reinfested. The reinfestation was eliminated, but in February 1967 Aedes aegypti were again found in the city of Nuevo Laredo, and in June of the same year the city of Allende in the same area was found to be reinfested.

As soon as the reinfestations were discovered the Government took the necessary measures to eliminate them, and by the end of the year the two localities were presumed to be negative, according to the most recent verification. But in 1968 two small reinfestations were found in the frontier area, one in Nuevo Laredo and the other in the city of Piedras Negras.

These reinfestations were likewise eliminated, but in May 1969 a focus of Aedes aegypti was found in a house in the locality of Agujita, in the State of Coahuilas, likewise in the area of Piedras Negras. In consequence, the entire locality of Agujita with slightly more than 1,200 houses, was sprayed with insecticide. The operation was completed on 26 May of this year.

PANAMA. Aedes aegypti eradication was completed in 1955, and in 1958 the country was declared free of the vector. For economic reasons, the Government has not established a regular vigilance service in the country; nevertheless, from time to time a small sample of some of the localities most exposed to reinfestation has been inspected.

Up to March 1969 these inspections proved negative, but in the course of that month, while investigating a sample in the city of Colón on the Caribbean coast, inspectors from the General Health Services, working in conjunction with a PAHO inspector, found a number of foci of Aedes aegypti in one of the suburbs of the town.

The suburb, Pueblo Nuevo, is situated at the extreme eastern end of Colón, where there is a wharf and a dock where small craft coming from various Caribbean ports frequently tie up. These craft have probably been responsible for introducing the mosquito into the suburb.

Because of this reinfestation the Government, with the cooperation of PAHO, is at present in the process of re-starting the eradication campaign in the country, on the basis of a plan of operations comprising the elimination of the mosquito in Colón, investigation of all the other Panamanian localities exposed to reinfestation, and intensification of the vigilance control against the further introduction of the vector.

The budget for the first year of the campaign, totaling 100,000 balboas, has already been approved by the Government and at the present moment preparations are being completed to begin the regular field work.

In the meantime emergency operations are being carried out in the part of Colón already known to be positive, and the situation is being investigated in the rest of the city.

TRINIDAD AND TOBAGO. The island of Trinidad is presumed to be free of the vector, except for Port-of-Spain, where the mosquito is still being found in the port area and in small craft coming from other Caribbean ports that are still infested. The reinfestations discovered in the city in the past seven years are attributed to these sources. Efforts have been made throughout this period to prevent such craft from transporting Aedes aegypti, but it has not been possible to solve the problem as yet.

The island of Tobago continues to be regarded as free of the mosquito.

UNITED STATES OF AMERICA. The campaign begun in 1964, has from the outset only partially covered the area infected by Aedes aegypti, which includes all or part of the territory of the 10 states in the southeast of the country, as well as Puerto Rico and the Virgin Islands. Up to 1968, the results obtained by the campaign in these areas were very limited because of the inadequate coverage.

In view of this situation the Government asked PAHO to appoint a group of experts to make an evaluation of the program and to suggest ways and means of improving it. This evaluation was completed in May 1968, and in August the Government was handed the report of the group of experts, in which the experts recommended the measures they felt should be adopted to make the program a success.

In spite of this, the budget for the program during the fiscal year 1968-69 was drastically cut, so that at the end of 1968 its activities had to be reduced still further. Later on, the Government decided to terminate the program, and since July 1969, eradication operations in the country itself and in Puerto Rico and the Virgin Islands have stopped completely.

VENEZUELA. Activities are still concentrated in the State of Tachira, bordering on Colombia, in accordance with a decision by the Government not to carry out a nation-wide eradication program until 1970. This decision was taken following a complete review of the campaign carried out in 1966 with a view to eliminating the obstacles then encountered. The review was carried out by a commission appointed by the Ministry of Health and Social Welfare, and it was found that the campaign had not made any progress between 1962 and 1966, essentially because of its restricted budget, which allowed only small areas of the country to be covered, and the trade union problems which made it impossible to obtain good quality field labor.

To overcome these difficulties the commission recommended that members of the armed forces be used for the program, and that its budget be increased with a view to adequate coverage of the infested areas of Venezuela in accordance with a plan of operations prepared by the commission and providing for eradication of the mosquito throughout the country within six years.

In 1967 the campaign personnel was replaced by the military, as the commission had recommended. Nevertheless, the Government decided not to put the new plan of operations into force until 1970; the campaign work in the meantime being concentrated in the area bordering on Colombia.

FRANCE

Guadeloupe. The campaign was suspended in 1962 and has not been resumed so far. But the Government is making preparations to resume eradication work on the island this year.

French Guiana. This Department was declared free of Aedes aegypti in 1958, but in 1963 the capital, Cayenne was found to be reinfested. A survey carried out by the Government in 1964 showed that the reinfestation had spread throughout the city and its surroundings, and that various localities in the interior were also positive.

The Government has reactivated the eradication campaign this year, but the results obtained are limited as yet.

Martinique. Until 1968 the Aedes aegypti campaign in this Department was limited to control measures. In 1969 the Government initiated an eradication program, but so far the results have been limited.

St. Martin. The French part of the island continues to be regarded as free of Aedes aegypti, but no recent information on the situation is available.

NETHERLANDS

Aruba and Bonaire. The Aedes aegypti has been eliminated and reintroduced in these islands several times. At the moment both are positive.

Curaçao. The island is still extensively infested. Until 1968 activities were limited to mosquito control measures, and the results achieved from these operations were extremely limited. But at the present time the Government is making preparations to initiate an eradication program not only in Curaçao but also in Aruba, Bonaire, Saba, St. Eustatius and St. Martin.

Saba and St. Eustatius. No recent data are available on the Aedes aegypti situation in these islands.

St. Martin. The Netherlands part of the island continues to be infested.

Surinam. To date the results obtained by the campaign have been limited. But the Government has considerably increased its budget, and it is in the process of reorganizing the campaign and extending it to cover all the infested areas of the country adequately, and of adopting the other measures needed to ensure the success of the campaign.

UNITED KINGDOM

Antigua and Barbuda. Antigua was found to be reinfested in 1964 and Barbuda in 1965. But the eradication has not been resumed in these islands so far.

Dominica. The campaign was suspended in 1957 and has not been resumed.

Grenada. The island was found to be reinfested in 1967, and up to the present the reinfestation has not been eliminated. But the Government is studying the possibility of resuming the eradication campaign in 1969.

Grenadines. The islands of Carriacou, Little Martinique, Bequia and Union in this group are still infested, and no eradication operations are being carried out in any of them.

Bahamas. The campaign in the Bahamas is still at a very limited level, owing to insufficient funds. Consequently, the results obtained are not satisfactory.

Cayman Islands. In a investigation carried out in 1966, no Aedes aegypti were found on Grand Cayman. In 1968 it was confirmed that the island was negative, but the mosquito was found in the island of Cayman Brac. The Government is making preparations to undertake eradication in this island during the current year.

Turks and Caicos Islands. Up to the present the campaign has not been put into operation in these islands.

Virgin Islands. The campaign was suspended in 1963 and has not been resumed.

Montserrat. This island was reinfested in 1964 and continues positive. The Government has plans for reactivating the campaign this year.

St. Kitts, Nevis and Anguilla. St. Kitts and Nevis were found to be reinfested in 1964 and 1966 respectively; eradication operations have not been resumed so far. Anguilla also continues to be infested and no eradication campaign is under way.

St. Lucia. In spite of extensive infestation of the island, the campaign continues to be limited, for lack of funds, to part of Castries, the capital, and Vigie, the site of the international airport.

However, the Government is in the process of increasing the budget for the campaign and extending it to give proper coverage of the infested areas, which is essential if the program is to be successful.

St. Vincent. The island was found to be reinfested in 1964, and up to the present the reinfestation has not been eliminated. However, the Government has plans for resuming the eradication campaign this year.

CD19/7 (Eng.)
ANNEX



PAN AMERICAN HEALTH ORGANIZATION
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REPORT ON THE PAHO
WORKING GROUP ON LABORATORY COLONIES OF AEDES
AEGYPTI

Washington, D.C. 17-19 July 1967

PAHO WORKING GROUP ON LABORATORY COLONIES OF Aedes aegypti

Washington, D.C., 17 - 19 July 1967

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INTRODUCTION

The Group was welcomed on behalf of the Director of the Pan American Health Organization by Dr. Charles L. Williams, the Deputy Director, who stated that the Group had been brought together to discuss the obligations that the Organization had under the terms of RESOLUTION XX of the XVII PAN AMERICAN SANITARY CONFERENCE that met in September 1966.

Dr. Williams reviewed very briefly the history of urban yellow fever in the Americas during the past 50 years and mentioned the mandate that the Organization received in 1947 from its Directing Council to solve the continental problem of urban yellow fever through the eradication of Aedes aegypti. He then pointed out that Paragraph 3 of RESOLUTION XX stipulates that the eradication of A. aegypti from a country could not be certified by the Organization if there were any laboratory colonies of the species in a portion of the country in which the ecological conditions were favorable to the development of the vector.

He added that Resolution XX requested the Director of the Organization to convene a group of experts to establish the conditions those colonies must satisfy if their presence in a country or territory is not to prevent that country or territory from being considered free of A. aegypti by the Governing Bodies of the Organization.

Dr. Williams ended by saying that the Organization has had the privilege of convening the Group in order to have the benefit of its combined wisdom in a matter of prime importance to the Organization; and that the results of the deliberations of the Group will be of great assistance to the Organization in the execution of the responsibilities that have been assigned to it by its Governing Bodies.

The Group elected Dr. Carroll N. Smith as Chairman, Dr. Herbert F. Schoof as Vice-Chairman, and Dr. George B. Craig, Jr., as Rapporteur.

1. NEED FOR COLONIES OF AEDES AEGYPTI FOR SCIENTIFIC PURPOSES.

A. aegypti has immeasurable value as a research tool for scientists. It is a superb experimental animal for biochemical, physiological, histological, cytological, genetical, ethological, and toxicological research and for the development of new approaches to the control of this and other species. It is indispensable as an experimental vector of certain arboviruses that cause disease in man and animals. Knowledge applicable to all phases of vector control and culicidology has been derived from investigations with A. aegypti.

A. aegypti poses problems to public health on both the national and international levels. Even though the species were to be eradicated from the Americas, it will continue to be a serious problem in Southeast Asia and Africa. Certain unique research programs being conducted in

the Americas have applications far beyond the boundaries of this hemisphere and their continuation represents an essential obligation to international health.

To further research efforts with this species and to meet the criteria for A. aegypti eradication, it is imperative that the establishment and maintenance of colonies be restricted to those of known value for research purposes. A colony is defined as a unit of caged specimens capable of reproducing itself for one or more complete generations under laboratory conditions. Non-essential colonies include those devoted to any non-scientific use, such as training purposes, displays, fish food and hobbies, and those for which a colony of another species could be substituted without detriment to the research. The decision on the essentiality of any specific colony rests upon the national government concerned, which should avail itself of the services of an advisory group representing diverse interests and appropriate international agencies.

2. DEFINITION OF AREAS THAT ARE: a) ECOLOGICALLY FAVORABLE; AND
b) ECOLOGICALLY UNFAVORABLE TO A. AEGYPTI.

The ecologically favorable areas in the United States of America include the Yellow Fever Receptive Areas as defined under Article 70 of the INTERNATIONAL SANITARY REGULATIONS, Third Annotated Edition, 1966, namely: the States of Alabama, Arkansas, Florida, Georgia, Hawaii, Louisiana, Mississippi, North Carolina (added on 4 November 1966), South Carolina, Tennessee, and that part of Texas east of a line extending from Del Rio through Wichita Falls and including those two cities. Puerto Rico and the Virgin Islands (U.S.A.) are also included. In the Caribbean Area the following countries and territories are similarly designated in the I. S. R.: Antigua, Bahamas, Barbados, British Virgin Islands, Cayman Islands, Cuba, Dominica, Dominican Republic, Grenada, Guadeloupe, Haiti, Jamaica, Martinique, Montserrat, Netherlands Antilles, St. Kitts-Nevis-Anguilla, St. Lucia, St. Vincent, Trinidad and Tobago, and the Turks and Caicos Islands.

Additional ecologically favorable areas comprise the Bermuda Islands, and all the countries and territories on the mainland of the Americas located south of the border between Mexico and the United States of America, except the southernmost portions of Chile and Argentina.

From time to time other areas may be designated as being ecologically favorable by national ministries of health, e.g. counties or states bordering on the Yellow Fever Receptive Areas. In defining such areas ecologic factors such as elevation, temperature and rainfall should be taken into consideration.

The Group recognizes that ecologically unfavorable areas may exist within the Yellow Fever Receptive Areas, and in very exceptional circumstances of national, or world, health importance applications may be made

to governments for continuance or establishment of laboratory colonies of A. aegypti in such ecologically unfavorable areas.

Any increases in the extent of the Yellow Fever Receptive Areas, as defined in the I. S. R., Third Annotated Edition 1966, that are made from time to time, shall automatically cause such areas to be considered as ecologically favorable areas. But any decrease in the extent of the Yellow Fever Receptive Areas, defined in similar fashion, shall NOT per se change the status of the area from ecologically favorable to ecologically unfavorable.

The ecologically unfavorable areas comprise the balance of the continental United States of America, all of the Dominion of Canada, and those portions of the other countries and territories of the Americas possessing a combination of climatic and geographic conditions that preclude the continued survival of A. aegypti.

7. CONDITIONS GOVERNING THE ESTABLISHMENT, OPERATION, AND INSPECTION OF LABORATORIES WITH COLONIES OF A. AEGYPTI.

It would be advisable for all the member governments of PAHO to open and maintain a registry of all public and private organizations with laboratories that maintain colonies of A. aegypti.

The registry should record the name and location of the laboratory or organization, the name of the professional in charge of the laboratory or organization, the name of the professional in charge of the breeding and use of the colony, and the general purpose for which the colony of A. aegypti is maintained.

The registry would be updated annually, and the current information conveyed to PAHO so that the information could be distributed by WHO/PAHO to the interested laboratories and organizations throughout the world.

In each country or territory the national ministry of health or its equivalent, e.g. the Public Health Service of the United States, with the technical assistance of the Pan American Health Organization, should prepare and issue Regulations governing the establishment and operation of colonies of A. aegypti devoted directly or indirectly to research purposes.

Such Regulations, together with any specifications and procedures outlined in them, would take into consideration, but not necessarily be limited to, the strains of A. aegypti to be maintained in the laboratory, the physical facilities employed in the rearing and use of the colonies, the qualifications of the professional or professionals responsible for the colony and its use, the general nature of the research program of the laboratory, surveillance measures to be carried out by personnel of the laboratory staff itself, and inspection of the laboratory and colonies by personnel of the ministry of health.

These Regulations should also include provisions for the discontinuation of colonies as conditions warrant during the progress of the national program for the eradication of A. aegypti.

4. PERMANENT SECURITY AND SURVEILLANCE MEASURES TO BE MAINTAINED IN AND BY LABORATORIES WITH COLONIES OF A. AEGYPTI.

A. FACILITY REQUIREMENTS

1. Building:

- a) The security area, comprising both the rearing and experimental areas, shall be as mosquito-proof as it is possible to make it. Preferably the security area shall be windowless. Any existing windows shall be permanently sealed except for emergency exits, which may have a breakable seal.
- b) All openings from security areas shall be protected by filters or durable screens fine enough (20 mesh to the inch or finer) to retain all A. aegypti adults.

2. Room Layout

- a) The rearing and experimental use area shall open only into a second secure room or vestibule and not directly to the outside. Exits from the second secure room or vestibule shall be through an anteroom provided with double doors, so arranged that one door can be opened and closed before the other is opened. Protective netting curtains on doors may be an additional safety measure.
- b) Security areas shall have smooth light colored walls and ceilings in order to facilitate inspection for A. aegypti adults. The anteroom shall be well lighted, with smooth walls and ceiling, light colored and empty. Floors shall be smooth and light in color.
- c) All drains shall be screened and must enter a secure sewer system, in which all stages of the mosquito will be killed.

B. LABORATORY AND REARING PROCEDURES

1. Eggs:

- a) All eggs shall be stored in closed containers in the rearing room.

- b) Excess eggs shall be destroyed with heat or chemicals, before disposing of them. This shall include all eggs papers or strips and loose eggs, hatched or unhatched.

2. Larvae and Pupae:

a) Larvae:

Larvae shall be reared under conditions that will prevent the escape of adults from the larval medium into the general rearing area in case pupal collections are not made as scheduled. This may be accomplished by covering the containers with tight fitting lids, maintaining the larval containers in a screened enclosure, or similar means.

b) Pupae:

1) Pupae shall be routinely collected, so that no adults emerge in the larval rearing containers.

2) Pupae shall be placed in special containers and the container introduced into the adult cage for emergence. The design of the pupal container shall permit its removal from the cage without escape of adults.

3) Unneeded larvae and pupae and discarded rearing water shall be treated by heating or with chemicals so that only dead waste materials enter the sewerage system.

3. Adults.

- a) Cages shall be of such design as to prevent escape of adults. The host animal should not be introduced directly into the cage, i.e. there should be a screen barrier between the mosquitoes and the host.
- b) The rearing room shall be kept neat and clean and no sugar, sugar solution or fruit should be left exposed.
- c) Hosts for blood feeding:
 - 1) Animal room separate from the rearing room.
 - a) After use the host animal shall be examined for the presence of escaped mosquitoes that may have been attracted to it, immediately prior to its removal from the rearing room.

2) Animals housed within the rearing room.

a) After use the host shall be examined for the presence of escaped mosquitoes that may have been attracted to it, immediately prior to being returned to its cage. All animal cages shall be kept in a screened enclosure.

4. General Procedures:

- a) No live mosquitoes in any stage shall be removed from security conditions. All mosquitoes transported from one secure area to another shall be enclosed within a solid surface container that cannot be accidentally opened.
- b) When passing through any door, within or from the secure area, persons shall make an adequate inspection to insure that no mosquitoes are carried on their clothing or person.
- c) Any escaped mosquitoes observed shall be immediately captured and destroyed.
- d) Access to rearing and laboratory facilities that use A. aegypti shall be limited to authorized personnel who understand the need to retain all live stages under security conditions.
- e) Mechanical devices that prevent escape or trap escaped mosquitoes are suggested as adjuncts to the security measures described above.

C. SURVEILLANCE PROCEDURES

I. Purpose: The principal objective of surveillance is to provide a continuous evaluation of the security measures that are in operation to prevent the escape of A. aegypti.

II. Technique: The presently recommended method of surveillance is the use of the oviposition container, or ovitrap, a device designed to attract female A. aegypti that are seeking a site for oviposition.

(This device was developed in 1964 and a description of an early model published by Fay and Eliason in Mosquito News, 1966, vol. 26, pp. 531-535. Information about the model in current use may be obtained from the National Communicable Disease Center, Technical Development Laboratories, P.O. Box 769, Savannah, Georgia 31402, U.S.A., which has expressed its willingness to provide sample ovitraps upon request.)

A. Material required for ovitraps

1. Tapered wide-mouth glass jars of one-pint capacity ("Atlas" 723, or equivalent).
2. Wooden paddles (6" tongue depressors).
3. Brown paper towels, or brown blotting paper.
4. High gloss black enamel paint.

B. Preparation

1. The cover of the jar is discarded and the jar itself painted on the outside with high gloss black enamel.
2. The wooden paddle is used to hold a strip of paper towelling about 4-3/4" wide on which the eggs are collected. The strip is wrapped around the paddle about 1/4" from one end, and overlapped on one surface, after which the strip is cut off flush with the side of the paddle, and stapled to it at each end.
3. An identification number is written on the exposed end of the paddle, which is then fastened vertically against the inner surface of the jar with masking tape or a paper clip.
4. When the ovitrap is put in place, 100 ml (approximately 1 inch) of water is added. More water may be necessary in areas of high evaporation but in all cases the volume used should be limited to that which will keep the jar and paper moist during a period of one week.

III. Survey pattern and operation:

A. Remove or protect all potential breeding containers on the premises.

B. Select sites for ovitraps within and surrounding the facilities in which the mosquitoes are reared or used, as follows:

1. Inside buildings in:

- a) Rooms where mosquitoes are housed or handled.
- b) Halls adjacent to rearing or handling rooms and to outside exits.

2. Outside buildings at:

- a) Approximately 150 feet intervals around buildings within 25 feet of the building.

b) Additional sites up to 300 feet from the building.

3. The number of ovitraps used within a room or inside area depends on the presence of other oviposition sites, e.g. a greater number is required in a rearing room than in a use room.

C. Selection of ovitrap sites

1. Inside building: place ovitraps in darker corners or areas of rooms.
2. Outside building: place ovitraps beneath bushes or shrubbery and in shady areas rather than in open sunny spots.

D. Frequency of inspection

1. Collect and examine the ovitrap paddles weekly throughout the year at all indoor sites. Follow a similar schedule for outdoor sites except during the period when weather conditions preclude survival of adult mosquitoes.

At each inspection the water in the ovitrap shall be examined for larvae. Paddles transported to the laboratory should be handled in a manner that will prevent loss or transfer of eggs.

2. Clean the ovitrap at each inspection or replace it with a fresh one.
3. As other species (e.g. A. triseriatus, A. mediovittatus) may oviposit in ovitraps, the identity of the eggs, particularly those from outdoor sites, shall be checked microscopically.

E. Records

1. Prepare a sketch or map to show the location of all ovitrap sites. Number each site.
2. Maintain a permanent record of all findings for all sites. (The distribution of standard record forms by the national regulatory agency would facilitate the maintenance of uniform records.)

5. REGULATIONS FOR THE TRANSPORT, BY WHATEVER MEANS, OF VIABLE A. AEGYPTI - EGGS, LARVAE, PUPAE, AND ADULTS - BETWEEN THE COUNTRIES AND TERRITORIES OF THE WESTERN HEMISPHERE AND FROM OTHER PARTS OF THE WORLD

Shipment of viable A. aegypti shall not be made by any laboratory or person, to any other laboratory or person, in another country or territory of the Western Hemisphere unless the receiving laboratory provides the shipping laboratory with an IMPORT PERMIT for the specific shipment of viable A. aegypti. Furthermore, a laboratory or person in the Western Hemisphere shall not receive a shipment of viable A. aegypti from any other part of the world unless the receiving laboratory or person first acquires an IMPORT PERMIT for such shipment. This restriction applies to all means of transport, including hand carriage.

The Import Permit for the viable A. aegypti would be issued by the national ministry of health of the country or territory in which the receiving laboratory was located. In the United States of America the import permit would be issued by the Foreign Quarantine Program, Public Health Service, National Communicable Disease Center, Atlanta, Georgia, in the form of a permit to import quarantinable material.

The application for the Import Permit would be required to identify the strain, or strains, of A. aegypti to be imported, the origin of the material and the specific purpose for which the material was to be used. If the strain, or strains, were known to be resistant to insecticides, that information would have to be supplied together with any other information that the ministry of health found it desirable to require.

In addition to forwarding the Import Permit, the receiving laboratory would be required to state whether it was located in an ecologically unfavorable area for A. aegypti as referred to herein, or in an ecologically favorable area for A. aegypti, and if the latter, whether or not the area was reported to be infested with A. aegypti.

It would be mutually advantageous if each national ministry of health would report annually to PAHO and WHO regarding the number of Import Permits for A. aegypti it issued, and if it would arrange for every laboratory within the country or territory to report immediately to PAHO/WHO the details of all shipments of A. aegypti that the laboratory received from or sent to a foreign country. Were this to be done a currently accurate international register of strains of A. aegypti could be established and maintained. This whole process would be very greatly facilitated if PAHO/WHO were to provide standard forms for use in reporting

RECOMMENDATIONS

1. The Group recognizes the importance of the program for the eradication of Aedes aegypti in the Western Hemisphere and the danger of reinfestation of ecologically favorable areas through escaped mosquitoes from laboratory colonies. Therefore the Group agrees that non-essential colonies should be eliminated. At the same time, it recognizes the important contribution emanating from research with this species in the past and continuing need for such research in the future. It, therefore, commends the decision in Resolution XX of the XVII Pan American Sanitary Conference to provide for the maintenance of research colonies in ecologically unfavorable areas.

The Group recommends that in the delineation of areas suitable for colonies, due consideration should be given to the scientific fact that restricted unfavorable areas may and do exist in larger geographical and political entities which may be designated as favorable. Colonies in such ecological islands might represent a reduced hazard.

2. The Group recommends that the standards given in detail herein be accepted as meeting the requirements for the maintenance of colonies in ecologically unfavorable areas.
3. The Group recommends that PAHO advise its Member Governments that they should open and maintain a Register of all public and private organizations with laboratories that maintain colonies of A. aegypti and that they keep PAHO currently informed of the entries in the Register so that information can be distributed world-wide by PAHO and WHO.
4. The Group recognizes the need for a concerted effort to develop and publish information on the safe maintenance of colonies of A. aegypti, and of other insect vectors of disease of man and animals. It recommends that PAHO and WHO support additional research to develop safe methods of insect colonization and undertake the collection of presently available information and its publication in a suitable handbook or manual, the latter to be revised as necessary. For this purpose a file of current concepts and methods in this rapidly developing field would be of great value.

The Group recommends that persons responsible for the maintenance of colonies of A. aegypti give additional attention to special techniques for security and surveillance that are applicable for certain limited research purposes. For example, genetic methods allow the development of mosquitoes that have very little or no potential for escape and survival. Such strains could be used for some studies in toxicology, physiology, and parasitology.

Also, isolation chambers (glove boxes) provide highly secure conditions for small-scale rearing and use.

5. The Group recommends that national agencies responsible for the eradication of A. aegypti consider the possibility of distributing certain special items of supply or equipment needed for security and surveillance that are not readily available in commercial channels.
6. The Group recommends that regulatory measures applicable to the importation of A. aegypti into a country should also be made applicable to shipments between persons or laboratories within the same country.
7. Recognizing that the problems associated with the maintenance of colonies of A. aegypti differ in no basic way from those connected with other insect vectors of disease, the Group recommends that PAHO/WHO encourage the formulation and promulgation of standards similar to those described herein for the maintenance of other disease vectors of potential hemispheric importance.
8. While not disagreeing in any way with the provisions of Resolution XX of the XVII Pan American Sanitary Conference, the Group desires to emphasize that there may be exceptional circumstances when in the national interest it may be necessary to give consideration to the maintenance of colonies of A. aegypti in ecologically favorable areas. The Group is strongly of the opinion that this fact should not be excluded from future considerations of the over-all problem by the national governments and the international agencies concerned.