

REPORT OF THE BUREAU OF MALARIA CONTROL

1925-1926

After completing the surveys of Barceloneta, Fajardo, Ponce and Aibonito, the Department of Health established control measures in the zone of Fajardo. The work was started on May 1925 and this area was selected after considering the following facts:

1. A rate of thirty-three per cent of endemic malaria.
2. The city is surrounded by hills and mountains which acting as natural barriers stop the mosquito in its flight.
3. The Fajardo Sugar Company, one of the most important sugar factories in the Island, and situated in the city proper, takes water for the irrigation of its plantations from numerous ditches which constitute artificial mosquito breeding places.
4. Treatment of the laborers employed in the Central naturally will make them more efficient and the results at length will be beneficial to the individual proper and the community in general.
5. The reduction of malaria in this zone will evidently be more rapid than in other regions, as the number of inhabitants in need of attention is considerable and the medical service can be given promptly and without very much expense.

The Bureau completed a census of this zone by means of the three known indexes, namely: historic, splenic and parasitic and found a high infection. The proportion of the endemia in relation to its extension and intensity were studied, this furnishing the data necessary for the inauguration of the work. While this was being carried on, other members of the staff studied various species of the anophele mosquito captured outdoors and in the houses, investigated the places and the conditions under which the larvæ are found, the general physical aspect of the land, its general agricultural conditions and geologic formation, its natural water resources as well as its irrigation system and drainage in order to initiate the campaign in the most efficient way.

CAUSES OF ENDEMIC MALARIA IN THIS ZONE

This intensive study determined that the endemic percentage existing in Fajardo had its origin in the following way.

The Fajardo River situated near the city accumulates an abun-

dance of vegetation on its banks and as the current is not swift except in the rainy season, the larvæ have a most favorable field for their development.

2. Many of the low lands have no permanent drainage and the stagnant water stimulates the breeding of the anopheles mosquito, particularly at the road to the beach and at the beach proper.

3. Flooded lands, where the rain water forms pools which do not disappear for some time, make ideal breeding places.

4. The brooks known as "Josefa" and "Flores" near the city have very little depth and as the current of both is not swift the vegetation on their banks increases, rapidly forming permanent breeding places.

5. The extensive and frequent irrigation carried out for the cultivation of sugar cane is done by ditches and large drainage projects without any scientific plan causing the formation of pools which at times overflow due to obstruction.

6. Pasture lands which are not adequately drained and holes and depressions formed by the hoofs of animals are also converted into breeding places.

7. There are other channels which present the same deficiencies found in the irrigation system.

8. There are also some extensive swamps, one situated in the village at the beach and the other at about a half kilometer to the east of the beach where there is an accumulation of water during the rainy season.

9. The presence in Fajardo of a large number of parasite carriers as well as from other neighboring towns in the region where malaria is endemic afford the best means and source for the propagation of the disease.

TREATMENT

Due to the limited personnel assigned to this Bureau it has not been possible to take blood samples from all the persons within the zone of activities. This would have been the ideal method for determining with more accuracy the number of patients infected for the purpose of administering treatment immediately, but as stated before, with a small staff and population of eight thousand inhabitants in the zone of control we were compelled to disregard this plan so that other methods of treatment might be instituted as follows:

(a) The treatment of those who were found with the parasite in the blood when an examination was performed at the laboratory during the month of June and July, and these were twenty-eight.

(b) The treatment of those carriers of the parasite discovered during the census made in the month of May and June 1925, these being one hundred and forty in all.

PERSONNEL

The staff of the Bureau was duly trained in all the fundamental and elementary aspects of the treatment in order to start the campaign and the city was divided into three districts, two in the urban zone and one in the rural zone, each being in charge of an inspector. The urban district was divided into two sections, one to the north of the city and one to the south with the rural district including the village on the beach and Sardinera and also the colonies known as "Jerusalem", "Santa Rita", "Josefita", "Mata Redonda" and "Isidra", property of the Fajardo Sugar Company.

The inspectors were duly instructed by means of conferences and they were furnished with the necessary material to perform their duties. Their principal work consisted in discovering patients suffering from malaria by making regular visits to their homes and in applying the specific treatment prescribed. These visits were made by the inspector each day and medicine was given personally so as to avoid a loss of time and of medicine, due to carelessness or to any other cause. The material used by the inspector was carried in a kit adequately equipped with the medicine in its respective doses: glass, plates, cotton, alcohol, etc., and two note books, one for the record of treatment and the other for the necessary data in each case.

After having made these daily rounds they investigated or located new positive or suspicious cases so that treatment could be given at once. If according to the inspector's judgment these cases were found to be positive, then a blood sample was taken for confirmation in the laboratory with the registration of the patient's name as to age, color, sex, address and date, place of birth and any other data in relation to the past and present history and as to the type of parasite found.

The blood samples were marked on their respective slides and each inspector has his own register beginning with number 1, but in order to better identify the case the first letter of the inspector's surname was placed beside the number. This marking was done with pencil on one of the edges above the blood stain. If the result of the examination was positive the inspector started to treat the case according to instructions given to him and when the exami-

nation was negative he informed the physician so that he might personally examine the patient. The inspectors used the same treatment established by the Bureau for all cases unless some justifiable cause made it necessary to proceed in some other way, in which case, the physician instructed the inspector as to the treatment to be given.

TREATMENT ADMINISTERED

An extensive plan of malaria control demands a certain general unity in the economy of time and money and in considering treatment a classic dose may be given by a simple method of administration which may be accepted by the patient without fear of aversion to the drug. Quinine in capsules is given according to the method recommended by the National Committee on Malaria, as this plan seems to meet our necessities perfectly and can be summarized as follows:

(a) For an acute or active attack an adult dose of ten grains of quinine three times a day for three or four days until the clinical symptoms disappear, followed by ten grains every night before retiring for a period of eight weeks.

(b) For infected persons who have no active clinical symptoms at the moment, the eight weeks' treatment is all that is required.

The proportional dose for children is as follows:

Under one year-----	½ grain
Over one year-----	1 grain
Under two years-----	2 grains
Three to four years-----	3 grains
Five, six and seven years-----	4 grains
Eight, nine and ten years-----	6 grains
Eleven, twelve, thirteen and fourteen years-----	8 grains
Fifteen or more years-----	10 grains

This method can be altered according to local conditions. In small children up to the age of seven years euquinine is used, although when capsules can be taken this treatment is used with preference. The dose of euquinine doubles that of quinine because it contains less quinine.

The eight weeks treatment has also been altered to meet circumstantial needs, as instead of administering one dose a day we have given two large doses for two consecutive days of the week according to the plan followed by the United Fruit Company. And the quantity given in this way is distributed as follows:

The total quantity of the medicine prescribed for an acute case for

one day is divided into two portions so that a person of fifteen years of age taking sixty centigrams three times a day or 1.80 gram if divided by two will make ninety centigrams per dose in the morning and in the afternoon. In this way at the end of eight weeks the patient has taken almost the same amount of medicine prescribed as per the classic method and the following advantages are obtained:

1. The daily visits to the patients are unnecessary and avoid their getting tired of the treatment, the medicine becomes less repulsive and the visit of the inspector is less annoying.
2. There is less irregularity due to the fact that Saturday afternoons and Sundays the daily visits of the inspectors are not necessary.
3. A larger number of patients can be treated and attended to than by any other method.

SPECIAL METHODS USED FOR THE TREATMENT OF SCHOOL CHILDREN

As malaria attacks such a high percentage of school children of all ages, and as this deserves the most careful personal attention, the problem of giving treatment to school children without interfering with their regular school work has been somewhat difficult. But after the interest and cooperation of the school authorities has been obtained it has been possible to adopt a plan of treatment which has given the most satisfactory results. In this way we place the medicine in the hands of the teachers who make use of the recess periods for its distribution and administration, and classes are not interrupted in any way. Even more, the doses were given in four days instead of two and the reaction of the treatment did not affect the children.

Patients who take the eight weeks' treatment have another blood sample taken after an interval of eight weeks and if the examination is positive the treatment is repeated.

SPECIFIC TREATMENT

The medicine which has yielded the best results in the campaign against malaria thus far is quinine, although the opinion of some authorities differs somewhat; but anyhow, everything depends largely on the method of applying it, that is to say, it should be given in adequate doses and without interruption during the time prescribed if the patient conforms to the rules established.

METHOD OF ADMINISTRATION

The method of administration *per os* has given fairly satisfactory results. It is as active, if not more so, than the subcutaneous or intramuscular method and with a certain amount of care it may

be tolerated for some time. It causes no pain and does not expose the patient to the accidents and annoyances derived from the injections. Different authorities recommend one form or other of quinine, but up to the present time no specific salt has been definitely adopted. As for us, we have used bisulphate and hydrochloride of quinine and in the majority of cases where the rules have been followed highly satisfactory results have been obtained.

Important investigations on malaria at Barrio Sunoco, Santurce, at Barrio Sardinera, Dorado and at Arecibo, have been carried out.

An acute outbreak of malaria was controlled very quickly in the town of Salinas, as part of the unit was transferred to that region, under the direction of Dr. Antonio Arbona, Chief of the Bureau.

In all this work we have had the full cooperation of the International Health Board of the Rockefeller Foundation.

RESUME OF ACTIVE CASES OF MALARIA AND CARRIERS TREATED DURING THE YEAR

Classification	Active cases	Carriers	Total
Under 1 year of age.....	42	2	44
From 1 to 4 years.....	190	20	210
From 5 to 9 years.....	145	53	198
From 10 to 14 years.....	195	38	233
From 15 to 19 years.....	128	29	157
From 20 to 49 years.....	447	117	564
50 years and over.....	82	30	112
Total.....	1,229	289	1,518
Color			
White.....	926	214	1,140
Colored.....	303	75	378
Total.....	1,229	289	1,518
Sex			
Males.....	533	114	647
Females.....	698	175	871
Total.....	1,229	289	1,518
Stage of disease			
Relapses.....	924	55	979
First infection.....	305	110	415
Non-classified.....	124	124
Total.....	1,229	289	1,518
Plasmodia			
Clinical diagnoses.....	102	102
Vivax.....	830	207 (*)	1,037
Falciparum.....	295	83	378
Quartan.....	2	2
Total.....	1,229	290	1,519
Treatment			
Completed.....	754	114	868
Not completed.....	194	31	225
Refused.....	140	47	187
Under treatment.....	141	97	238
Total.....	1,229	289	1,518

(*) One case found with double infection.