MALARIA AND VECTOR CONTROL IN GUYANA[1]

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ABSTRACT. Beginning in 1945 with DDT residual spraying, dramatic success was achieved in elimination of malaria from the former British Guiana. *Anopheles darlingi* and malaria were eliminated from the coast by 1951, but limited numbers of cases continued to be found in the interior. The Mosquito Control Service of the present Cooperative Republic of Guyana has been unable to control the deterioration of the situation in the interior, especially in 4 of the country's 48 operational sectors which have more than 80% of the cases. High densities of *An. albitarsis* (now correctly recognized as *An. braziliensis*) have been found, and a broad range of entomological studies of this and other anophelines is urgently needed, along with a more intensively conducted residual spraying program to determine objectively the effectivness of this measure.

A BRIEF DESCRIPTION OF THE COUNTRY

The Cooperative Republic of Guyana (British Guiana until 1966) is situated on the northeast coast of South America, bordered by Venezuela on the west, by Surinam on the east, and by Brazil on the southwest and south. Located between 1 and 8 degrees N lat. and 56 and 61 degrees W long., the country includes 214,970 sq km (83,000 sq miles). Three huge rivers—the Essequibo, the Demerara and the Berbice, running from south to north, are conspicuous features of the country's geography and affect not only the movements of the people, but the development of the country.

The population, of slightly more than 900,000, is concentrated in a limited coastal area and coastal estuaries of the principal rivers. Less than 10% of the inhabitants are scattered in the vast interior. The densely settled coastal area was subject to coastal and riverine tidal action until the development of an extensive system of dikes, canals, drains and pumping stations permitted agricultural exploitation for sugar cane and rice culture.

[1] Presented at the Annual Meeting of the American Mosquito Control Association, Sacramento, CA.

EARLY HISTORY OF ANTIMALARIA ACTIVITIES

The story of malaria and the struggle against that disease in then-British Guiana is essentially the story of the achievements of Dr. George Giglioli, who dedicated more than 50 years of his life to the conquest of the health problems in the country. His work and that of his associates was fortunately documented in numerous publications. Two papers provide an especially useful appreciation of the evolution of the highly successful antimalaria efforts. Giglioli (1964) describes achievements and setbacks during the period 1945–63. Giglioli et al. (1976), published after Dr. Giglioli's death on January 14, 1975, describes developments through the 1960's and the mid-1970's.

Intradomiciliary DDT applications were begun in February 1945. By 1948 these treatments had eliminated *Anopheles darlingi* Root and *Aedes aegypti* (Linn.) from 200 miles of the coast and estuary banks.

Dr. Giglioli's comments concerning potential vectors were very significant (1964):

> "In 1948, it was still too early to formulate a conclusive opinion on the ultimate effects of the campaign on malaria itself: in spite of obvious and drastic reduction in its occurrence, a

large reservoir of infection still survives, in spite of the disappearance of *A. darlingi*, its proved principal carrier. *A. aquasalis* and *A. albitarsis*, both exophilic and zoophilic species on our coastlands, but known malaria carriers elsewhere, had in no way been affected by D.D.T. house spraying, and continued to be as abundant as before the campaign; only time could prove if either of these species was capable of maintaining malaria transmission, even at a low level of endemicity."

Residual house spraying was stopped in the coastal area in 1951, inasmuch as malaria infections could not be found among the more than 90% of the population residing there.

Antimalaria measures in the interior presented more serious problems, including quite mobile populations and a limited health infrastructure.

In 1958, lack of rains favored the development of high *An. aquasalis* Corry populations in the brackish estuaries of rivers in the North West region, with a resultant outbreak of vivax malaria.

Between July 1961 and October 1962, 104 cases of vivax malaria occurred only 15 miles south of Georgetown, the capital, along the estuary of the Demerara River. Since *An. darlingi* could not be found, transmission was attributed to *An. aquasalis*. Dissections of 510 mosquitoes yielded 2 oocysts.

On December 31, 1960 DDT spraying was discontinued in the interior, and use of medicated (chloroquinized) salt was initiated. Problems in the effective distribution of medicated salt, and lack of a systematic malaria program across the border in Brazil, made eradication impossible. In the interior area of Rupununi, blood smears taken in 1962 from a population of 1,800 persons disclosed 293 cases, of which 251 were *Plasmodium falciparum*. Resistance of *P. falciparum* to chloroquine was reported. DDT spraying was resumed in the area in 1963 and the country-wide situation showed gradual improvement until the energy crisis of 1973–74. The numbers of positive blood smears found annually, among some 60,000 to 70,000 smears examined, were as follows for the period 1969–75: 1969–19, 1970–18, 1971–27, 1972–266, 1973–49, 1974–72 and 1975–1197 (1189 in Rupununi).

CURRENT MALARIA AND VECTOR CONTROL SITUATION

Antimalaria control activities observed in 1981 were carried out, under the Ministry of Health, by the Mosquito Control Service, which is also responsible for *Aedes aegypti* control along the coast and for some filariasis survey activities. The country is divided into 48 operational sectors, including a number of unpopulated areas in the southeastern part of the country. The North West region, the Rupununi region and the sparsely-populated west bank of the lower Corentyne River were objectives for residual DDT spraying (11,000 houses, of which only 39% were covered in the first semester and 17% in the second semester). No geographic reconnaissance has been organized to provide data for logistic and budgetary planning.

Medicated salt distribution was programmed for the North West region, where only vivax malaria has been found. Limited amounts of medicated salt were also provided for the "balata bleeders" who enter the forest to harvest latex from native trees. Salt distribution was incomplete in both of these areas.

Much emphasis was given to active case detection by permanent employees of the Mosquito Control Service. This activity, as well as detailed case investigation and treatment, are scarcely justified in active attack areas, and evidently distract the personnel from their more urgent spraying and salt distribution efforts.

Program reviews carried out by Pan American Health Organization/WHO consultants in 1977, 1980 and early 1981 highlighted the differences in endemicity among the various districts in the coun-

try. The late 1981 review permitted analysis of positive blood smears by sector, indicating that 4 of the 48 operational sectors (all 4 in the Rupununi district) had 82% of the cases in 1980, and 80% of the cases through August of 1981. Unfortunately, these four sectors had received no special attention. Coverage was gravely affected by lack of transport; a factor especially serious in view of seasonal inaccessibility following the onset of the heavy rains.

Formal entomological studies have not been carried out in recent years. Adult insecticide susceptibility tests attempted in 1976 and 1977 gave very inconclusive results due to high mortality among controls.

There has been no follow-up of Dr. G. Giglioli's early work (1938) which presented arguments to incriminate *An. darlingi* as the malaria vector, while discarding *An. tarsimaculatus*[2] and *An. albitarsis* Lynch-Arribálzaga, although the latter species made up 90% of the anophelines captured in the savannah areas.

Entomological field work was not the objective of my 1981 assignment in Guyana, but opportunistic collecting of anophelines was inevitable. Dr. M. E. Faran of the Walter Reed Biosystematics Unit at the U.S. National Museum kindly identified the material. Faran and Linthicum (1981) had just published their analysis of Amazonian species of *Anopheles (Nyssorhynchus),* in which they showed *An. albitarsis* as limited to southern Brazil, Paraguay, Uruguay and northern Argentina. What was being called *An. albitarsis* in Guyana should evidently be *An. braziliensis* (Chagas). It was therefore interesting to find that, among the 94 anophelines captured biting, or attracted to human bait, 86 were *An. braziliensis,* plus 4 *An. peryassui* Dyar and Knab) 1 *An. nuneztovari* Gabaldon, 1 *An. aquasalis,* 1 *An. intermedius* (Peryasso) and 1 undetermined specimen of the Albimanus Section. In one instance, specimens were captured at dusk in the savannah area as they followed (by flight or suction) and fed upon passengers in a Land Rover traveling a track across the savannah.

Entomological studies urgently needed in Guyana include insecticide susceptibility testing of anopheline adults, bioassay tests of residues in native houses, searches to determine whether *An. darlingi* can again be found in coastal areas, and distribution and vectorial potential studies of other anopheline species. Inasmuch as *An. nuneztovari* has been taken in Guyana, its distribution and densities merit attention in the light of studies by Panday (1977) in neighboring Surinam.

In view of the serious short-falls in meeting residual spraying targets, and the non-use of medicated salt in the Rupununi area due to chloroquine-resistant *P. falciparum,* refresher training courses in residual spraying techniques were given in the North West Region and in the Rupununi. Locally there has been some doubt as to the effectiveness of residual spraying in the Rupununi. However, there is no recent evidence that the measure has been properly applied to the point of permitting an objective judgment.

SUMMARY

The current malaria situation in Guyana resembles the "national emergency" status mentioned by M. Giglioli (1976). The fact that more than 90% of Guyana's population lives along the malaria-free coast invites no complacence as long as the malaria time bomb is ticking away in the interior, waiting until the nation's development projects provide communication routes to the coast, soon negating the laudable achievements which have marked the country's struggle against malaria.

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[2] Probably *An. aquasalis* Curry (editor).

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OPERATIONAL PROGRAMS IN DEVELOPING COUNTRIES[1]

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INTRODUCTION

The well documented resurgence of malaria and yellow fever, the spread of dengue and its associated acute syndromes, clearly show the progressive failure of vector control programs in developing countries. In the final analysis the occurrence of an epidemic in a country said to be conducting a vector control program is proof of that program's failure (Giglioli 1979a).

In spite of repeated resolutions by politically orientated international assemblies, there are few success stories, the most notable being Singapore, and lately Cuba (PAHO 1982), but many failures, each one attesting to the payment of lip service to the doctrine of eradication at the international level, and the national practice of inadequate abatement measures.

This dangerous state of affairs at the national level is increased by the international organizations imposing changes in strategy and target nomenclature (often wrapped in trendy slogans), when more success might be achieved by giving realistic scientific and technical leadership, and by stressing the fundamental needs of organized integrated vector control after ensuring that the country has a genuine need and the intention of supporting the collaborative effort. So far, we have progressed from the concept of world-wide eradication in 1955, through basic polyvalent health services to "Health for all by 2000"—in 27 short years. Having failed to control the major tropical diseases during the last quarter of a century, how are we to achieve Utopia in 22 years?

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