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EXPERT COMMITTEE ON MALARIA

The Secretary of the Expert Committee on Malaria has the honour to communicate herewith a digest of the Report of Dr.G.GIGLIOLI the Honorary Government Malariologist of British Guiana, for the year 1947 on

MOSQUITO CONTROL OPERATIONS BY RESIDUAL DDT IN BRITISH GUIANA

as well as a personal communication from the same Dr.G.Giglioli, with acknowledgments.

The aggregate population of the Colony, according to the 1946 census, was 375,819. The inhabitants of the coastland and the river estuaries - regions of hyperendemic malaria - number 332,075 (88 per cent of the population of the whole colony), of which 248,956 live under village conditions on sugar estates or in scattered rural settlements. Endemicity is particularly high where agriculture is most flourishing, on account of extensive irrigation. Only the poorly cultivated section of the Berbice coastlands are free from malaria. In cities, the inner quarters are not affected but the suburbs and peripheral districts are subject to endemic or hyperendemic malaria; the coastal population exposed to endemic malaria, including Georgetown and New Amsterdam, totals 292,832. Malaria is transmitted by A. darlingi which finds ideal breeding conditions in the more intensively cultivated areas in which irrigation exists and rice and sugar cane are the prevailing crops. A. aquasalis and A. albitarsis are potential vectors and are very common. They are zoophilic and non-domestic.

In British Guiana, work with DDT has been carried on for over three years. By the end of 1946, experimental work on the control of A. darlingi (and Aëdes aegypti) had sufficiently progressed so that in January 1947 the Mosquito Control Service came into being as a result of the amalgamation of the Yellow Fever Service and the Malaria Research Unit; a single DDT residual spraying operation proved that by this method it would be possible to control the mosquito-borne diseases; and plans were made for mosquito control organized on a colony-wide scale.

Also, in July 1947 a law was passed amending the previous Mosquito Control Regulation so that spraying of premises is now compulsory in all localities declared control areas by the Director of Medical Services.

For residual spraying, DDT is used mainly in the form of a 5 per cent solution in kerosene; wettable powder suspensions are employed for mud or thatch huts. To facilitate transport in some localities Xylol-Triton-X-100 emulsion was found useful. The average residual deposit is estimated at 150

milligrammes of technical DDT per square foot. An eight months cycle was adopted in large-scale experiments, but according to experimental evidence further sprayings will probably follow a ten or even a twelve months cycle. The 1947 work was carried out by the DDT Section of the Mosquito Control Service working in close co-operation with the Central Medical Control Laboratory of the British Guiana Sugar Producers Association. The latter was entirely responsible for bringing under control all the Sugar Estates situated in the endemic belt, aggregating a population of 53,421. The whole campaign was supervised by GIGLIOTI.

The organization of spraying units is as follows:

(a) Mosquito Control Service

Personnel:	Supervising Inspector	1
	Senior Operators	5
	Field Technician	1
	Operators	54
	Porters	9
	Drivers	3

When working at full pressure this personnel could man 16 pumps, each operating two spray nozzles. Three men are necessary for each pump and one Senior Operator supervises three pump crews, i.e. nine men. The porters are employed to transport DDT solution, keeping the pump crews constantly supplied. These crews are distributed into two gangs: one, comprising in the aggregate 46 men and 10 pumps, mounted on 2 trucks, carries out the larger and more accessible jobs, while the other, which consists of only 17 men with 4 pumps, mounted on one light truck, is currently used for more distant and less accessible areas.

A mosquito squad of five trained men, supervised by a Senior Operator, carries out systematic mosquito surveys before spraying operations and at intervals thereafter to check the duration of the effectiveness of DDT on various domestic mosquito species.

(b) Sugar Estates' DDT Unit

Consists of 12 sprayers and one foreman.

(c) Spraying Equipment

Cooper stirrup pumps and, for the spraying of pit-latrines, Mayer Knapsack sprayers. On all sprayers the Cooper No. 2 conical spray nozzle was used but now a more satisfactory nozzle has been developed.

The 1947 campaign has progressed very satisfactorily. By the end of December 1947, 88 per cent of the coastal population living under

endemic malarial conditions, and 70 per cent of the total population of the colony were already protected by DDT; at the time of writing, the whole endemic coastal area and all the larger settlements in the interior are under control. In the cities of Georgetown and New Amsterdam, the suburbs and the peripheral quarters exposed to A. darlingi invasion have been sprayed to form a protective barrier. All the sugar estates (total population 53,421) have been sprayed at least once. In the interior a very considerable amount of routine DDT spraying has been carried out by mining companies.

In 1947, a total of 31,298 houses, 1,077 other buildings and 83 stables were sprayed once.

Total individuals protected (Residents) 179,709

Total spraying days, 547

Average consumption per house of 5 per cent DDT kerosene solution, 2.68 gallons

Average consumption per individual of 5 per cent DDT kerosene solution, 0.540 gallons

Average cost per house $2.86 (ranging from $2.30 to $3.67)

Average cost per individual $0.58 (ranging from $0.49 to $0.68)

Moreover, also in 1947: a total of 4,729 houses, 116 other buildings and 20 stables and cowpens were sprayed twice.

Total spraying days 115

Average consumption 5 per cent DDT solution in kerosene, per house, 2.13 gallons

Average consumption 5 per cent DDT solution in kerosene, per individual, 0.511 gallons

Average cost per house $2.51

Average cost per individual $0.58

Results of DDT control on anopheline and malaria incidence

Residual spraying of houses alone has achieved eradication of A. darlingi (and Aëdes aegypti) over approximately 200 miles of formerly heavily infested inhabited coastland.

Adult A. darlingi disappears from villages immediately after the spraying; its larvae disappear from the surrounding canals, rice fields and flood fallows from 2 to 3 weeks after. During 1947, in the controlled area, 5 adult specimens and no larvae of this species were collected by a five-man whole-time mosquito squad. The incidence of

A. aquasalis, A. albitarsis and A.triannulatus larvae was not affected, as was to be expected in the case of these non-domestic species. As GIGLIOLI states, A. darlingi appears "to be made to order" for DDT control; also in the savannah and forest districts of the interior this mosquito can be specifically weeded out by the spraying of human habitations.

The sugar estates, with their large population and their 21 estate hospitals are an ideal set up for studying the generaleffect of control on malaria morbidity. Now the number of malaria cases admitted to these hospitals has fallen to an insignificant figure. For all estates this morbidity curve has followed an uninterrupted downward trend, devoid of "spikes" or irregularities, entirely different from anything seen during the past 10 years, including the exceptional natural remission caused by the 1939-40-41 drought.

The spleen rate in all treated localities has shown an equally uninterrupted reduction, from rates of 50 to 90 per cent down to 3 to 12 percent. The fall in the average size of the spleen is even more spectacular. The following results from Lodge Village can be accepted as typical:

Date of Survey	Children Examined	Spleen Rate	Average Spleen	Parasite Rate	
(a) Before DDT Control					
Jan. 1939	86	51.2	0.62	-	BOYD
Apr. 1940	143	27.4	0.34	26.0	(Height of
Mar. 1943	139	30.2	0.25	32.3	(1939-40
July "	175	38.3	0.60	33.1	(drought
Jan. 1944	210	57.6	0.95	82.3	
July 1945	276	43.8	0.54	55.4	
DDT applied in June-July 1945					
(b) After DDT Control					
Apr. 1946	328	21.9	0.25	32.9	
Sep. "	341	17.9	0.20	16.4	
Mar. 1947	304	9.0	0.11	19.7	
July "	240	9.5	0.09	29.1	
Dec. "	158	3.1	0.016	11.3	

Reduction of the parasite rate is a much slower process, but the change in the parasitological picture is characteristic: typical subtertian infections are the first to disappear; the usual positive finding from prolonged examination of thick films consists of only one or two large ring forms. Quartan infections, as the most resistant, tend to account for a much higher proportion of infections than they did before DDT control. In conclusion, though as many as thirty to forty per cent of the children may be returned as positive in a village one to two years after treatment, the total parasite count for the examination of the whole group may not exceed fifty or sixty parasites. Little or no information is available on the time required for malaria to burn itself out from such a massively infected population as one finds in British Guiana.

As regards the future, it is expected that a form of mild endemic malaria will persist in the colony, due to A. aquasalis. Against the main vector, A. darlingi, DDT control will have to be a recurrent measure with such local modifications as experience may dictate.

A monograph on "Mosquito-borne Diseases in British Guiana" by Dr. G. GIGLIOLI is to appear shortly. It will contain the results of three years' investigations on DDT work.