SYMPOSIUM ON MALARIA—Part 3

MEDICAL RESEARCH, 1932-1933*

REPORT OF THE SUB-COMMITTEE

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It is quite impossible for me to gain access to or to read all of the world's literature on this subject during the past year. Furthermore, it is out of the question for me to include in a fifteen minute report an abstract of all the literature that I have been able to see. The personal factor also leads one to select for abstract those features that have held his particular attention. I, therefore, request the indulgence of those writers whose work may not be mentioned in this brief summary.

It is of interest to note that Green¹ has been able to infect Anopheles maculatus Theob. and Anopheles kochi Don with the malarial parasite of the monkey Macacus cynomolgus. Sporozoites were found in A. maculatus and A. kochi, but oocysts only were found in A. vagus. In appearance and rate of growth the oocysts were indistinguishable from those of P. vivax. The sporozoites were plentiful in the salivary glands by the sixteenth day and they could not be distinguished from those of the human malaria parasites. This is offered as a warning to those who find Anopheles naturally infected.

Taliaferro's² experimental studies on the malaria of Panama monkeys leads him to suggest the probability that relapses are due to the temporary cessation of macrophage activity. Those interested in the treatment of malaria will of course be interested in learning what features may cause a cessation or stimulation of this activity.

Davis and Philip⁶ have made a preliminary report on the identification of the blood-meal in the West African mosquitoes by means of the precipitin test. In view of Greens' warning that he could not differentiate the sporozoites of the monkey malaria from those of P. vivax, this blood-meal test may assume added significance for those who dissect mosquitoes caught in the wild state.

Wolter⁴ has added a note on the use of the dark ground illumination for rapid diagnosis of malaria, using either fresh preparations or vitally stained blood films. This can be of diagnostic use in the laboratory and hospital, but will hardly be available for mass work in the field. Denes⁵ also records a diagnostic hint for the laboratory and hospital services where large blood specimens are taken for general examination. He employs the usual 5 to 10 c. c. venous blood specimen after the serum and clot have been removed. The red cell sediment that remains provides good material for blood-film examination in searching for the parasites of malaria. Mayne and Griffiths⁷ report Anopheles atropos D and K as a new potential carrier of malaria organisms. A. strohei, A. buchimannii and A. abditaris in Panama are open to the same consideration. New subjects for study continually appear to confront those in charge of mosquito control campaigns.

Hackett and Missiroli,⁸ in discussing housing as a factor in malaria control, attempt to dispel the myth concerning "malaria houses" or quarters that are said to possess attractive features for ideal anopheline shelter and feeding. We have noticed that certain families are particularly prone to be carriers of malaria, but this condition holds true regardless of their change of quarters and regardless of the change from the river bank to near-by hilltops. The family incidence in the villages we have under observation is a question that is hard to explain.

Martini⁹ reports two interesting cases, one of long incubation period and one of a long delayed relapse. An assistant of the author was bitten by A. maculipennis which were infected with P. vivax on June 1, 1927. She remained well until May 29, 1928, when she had a rigor with high fever. There had been no possibility of infection with malaria in the interval. Her blood showed parasites (P. vivax) with many gametocytes. She was treated with plasmochin and recovered rapidly. Martini himself was bitten on July 21, 23 and 27, 1930. He felt ill on August 4-5 and 6-7, but his blood films were negative for parasites. He took quinine from August 9 to 18. There was nothing noteworthy until June 12, 1931, when he had an attack of

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⁴Editor's Note.—The Symposium on Malaria, papers and discussions from the National Malaria Committee, meeting conjointly with the Southern Medical Association at Richmond, Virginia, November 14-17, 1933, which are to be published in the SOUTHERN MEDICAL JOURNAL, is appearing in three parts: Part 1 in May, Part 2 in June, and Part 3 in this issue.
relapse. He considers that relapses are considerably influenced by meteorological conditions. Such cases are discouraging to the personnel of a health office whose business it is to attempt to locate the place where the infection was acquired. They seek a history of movements antedating the onset of symptoms by two or three weeks. No doubt the bulk of the cases do fall within this period of incubation.

Milani and Cuboni\(^9\) inoculated 145 patients with strains of *P. vivax* and three of them (2.06 per cent) resisted infection, although they had never had malaria. S. P. James\(^10\) inoculated 134 patients with no history of malaria and 14 (10.44 per cent) recovered spontaneously before the occurrence of the twelfth paroxysm. Some people, at least, for long periods of time, seem to possess a natural resistance to malaria and others acquire a respectable degree of acquired immunity, while still others may carry parasites over very long periods of time with little or no apparent symptoms. Bourgignon,\(^11\) from the Belgian Congo, reports a parasite index in children under eighteen as 82.6 per cent and in adults as 56.5 per cent. He calculated the natural rate of spontaneous recovery, without drugs, at 31.6 per cent.

Thomson,\(^12\) in writing on the question of immunity in man to protozoal diseases, states that some individuals may be completely refractory to an infection, but the most common type of immunity seems to be tolerance associated with the presence of parasites in small numbers. True immunity must be extremely rare, but it is easy to accept the term infection immunity.

It is my belief that with a normal placenta a child is born free of malaria. It may acquire it soon after birth, but usually it reaches the age of a few months before it acquires the disease. I used to feel that these early months without malaria indicated a degree of inherited immunity, but after seeing the way these babies are bundled up the first few months of their lives, I am not sure that it may not be explained as protection by clothing against biting. At any rate, most of these children soon acquire the disease and pass many years of their lives as malaria carriers or suffer repeated attacks. Infection immunity means more to me than inherited immunity. If there is such a thing as inherited immunity it is of short duration, even though the mother's placenta may have been heavily infested with parasites during the late stage of her pregnancy.

Manalang\(^13\) reports a study of malarial infection in a construction camp in the Philippines that showed that transmission occurred four times more frequently on dark nights than when the moon was bright, and 87 per cent of the infected mosquitoes were caught when there was no moon or when it was obscured by clouds. The observations I find recorded concerning *A. albimanus* in Panama seem to indicate early evening and daybreak flights without regard to a dark night as an important factor. Manalang also noted that *A. funestus* had a flight range of more than a mile. Because of this long flight he remarks that Paris green would therefore be inefficient as a control measure.

Barber and Olinger\(^14\) report that *A. costalis* will disperse at least half a mile from a large breeding place and probably much farther. Because of its adaptation to a great variety of breeding places, its rapid development in temporary water, and long flight, they express the doubt that any larvicide campaign can by itself cope with conditions found in West Africa.

Curry's\(^15\) report before this meeting has made known to you his belief that *A. albimanus* can make interrupted flights of 12 or more miles from certain new breeding areas in Gatun Lake of the Panama Canal Zone.

It is becoming more and more apparent as time advances that mosquito control campaigns must enlarge their radius of operation. The cost of such sustained work confronts everyone with the economy phase of the question and emphasizes the importance of two other features: first, the mosquito proofing of quarters and the proper use of such quarters; second, the use of drugs in reducing the human seed-bed of the disease. Different localities will find it necessary to give more emphasis to one method of control than another, but some coordination of mosquito control, mosquito proofing of quarters properly used, and treatment of the carriers as well as the hospital and dispensary cases must be gained to keep a check on the disease. No one method can be applied with complete satisfaction from the standpoint of complete control and economic efficiency.

There is, fortunately, a growing interest in the manufacture and use of new drugs for malaria and there will no doubt be more and more satisfactory developments in such drugs, but one cannot help stating that many of the reports made on the new drugs, as well as on quinine, are over-enthusiastic and in some cases unjustified. We have a very high regard for quinine as a treatment for an attack of malaria and feel
that it provides a fine weapon, the cheapest of the series of drugs now in use, but the question of relapse following vigorous treatment is a far more vital question than most of us realize or will admit.

Komp's report read before this meeting on the use of atabrine in the Chagres River villages will show what happens under the best of personal attention. The short course of this drug makes it popular, but the rate of relapse is still an important feature and we do not yet know how frequently such courses can be repeated or need to be repeated. Nevertheless, the cost of such a drug as compared to quinine rules it out for the treatment of ambulatory cases and carriers in very large labor forces and in large rural populations.

The cost of 5 days' treatment with plasmochin and atabrine would provide more than 30 days' treatment with quinine and there is no satisfactory difference in the incidence of relapse between the two treatments. Of course evidence to lead one to believe that the index of mosquito infection has been changed enough to warrant the purchase of these drugs to replace quinine in large business enterprises.

It has been our experience, confirmed this year by Komp's work, that certain individual carriers are positive for parasites in all or nearly all monthly surveys regardless of whether they receive personal treatment. These, I believe, are people that should be hospitalized and treated in bed as if they were really sick patients and then held in isolation for a series of two or three months' study where a new infection can be safely ruled out of the discussion.

One gathers from reading the literature and listening to discussions on malaria control as well as observing the behavior of people in a malarious region that the following conditions exist:

Studies and expenditures in mosquito control, with the exception of permanent obliteration of breeding areas, are out of proportion to the stimulation of the proper use of mosquito proofed quarters and to the treatment of the ambulatory human seed-bed of malaria. The great majority of the people in rural locations who harbor malaria never appear for advice and treatment at a hospital, dispensary or private office.

A campaign launched in any region should coordinate these three features carefully if it is to be made of practical use to large business organizations in the tropics.

REFERENCES


16. Komp, W. H. W.: A Third Year's Observation on Malaria in Panama with Special Reference to Control with Atabrine. Read before the 1933 meeting of the National Malaria Committee.

**BREEDING OF ANOPHELINE MOSQUITOES AMONG AQUATIC VEGETATION OF GATUN LAKE, ACCOMPANIED BY PERIODIC LONG FLIGHTS OF A. ALBIMANUS WIED.**

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It was believed by early workers in mosquito control that the flight-range of all Anopheles mosquitoes was extremely limited, nearly as limited indeed as that of the house-breeding yellow fever mosquito, Aedes aegypti, or of the night-biting domestic pest, Culex fatigans. Evidence is accumulating, however, which indicates quite to the contrary; that at certain places and times, and

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