

## THE DISTRIBUTION OF MALARIA IN SOUTH AFRICA AND A MOSQUITO SURVEY OF MILITARY HOSPITAL AREAS.

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THE following information in regard to the distribution of malaria in South Africa has been compiled chiefly from the reports of Government Medical Officers and Health Officials who were circularised by courtesy of the Union Public Health Department in March, 1918, in regard to the following points:

- (1) The areas affected in each district.
- (2) The type or types of malaria existing.
- (3) The incidence of the disease, whether endemic or epidemic; and
- (4) The types of anopheline mosquitoes identified.

The information available from these sources indicates the necessity for a considerable amount of further work to provide a more complete and accurate knowledge of the incidence of malaria in South Africa.

### I. CAPE PROVINCE.

Malaria is practically unknown in the Cape Province. A severe epidemic of malaria occurred in the Northern districts of the Cape Colony, especially along the course of the Orange River in the districts of Gordonia and Kenhardt during 1909, following a period of unusually heavy rainfall. At the same time the disease was reported to be prevalent in Namaqualand and even in the Kalahari, and to a less extent the districts of Vryburg, Mafeking, Taungs, Hay and Barkly West.

This constitutes the only serious recognised epidemic of malaria which has been reported in the Cape Province, cases of Malaria in this Province usually being recorded as being imported from other districts.

Lieut.-Col. Robertson, S.A.M.C., Government Bacteriologist for the Cape Province states that:

The prevalence of malaria in Cape Province is certainly not marked as in my 20 years in Government service I have no record of smears having been submitted from any indigenous case, with the exception of 57 from an outbreak of malaria in the districts of Gordonia, Kenhardt and Upington after extensive flood in 1909. I can find no definite records as to the identification of the mosquitoes in this epidemic and no particulars to show what was the variety of the malarial infection, but as far as I can recollect some of the slides showed Benign Tertian parasites. No information of any kind regarding the types of mosquitoes prevalent in this province is available either in this office or in that of the Government Entomologist.

Captain Ernest Hill, M.C., S.A.M.C. (M.O.H., East London), states that:

In regard to the neighbourhood of East London, I had not prior to my going on military service at the end of 1915 heard of any indigenous cases of malarial fever, and so far as I have been able to learn none have occurred since that time, despite the fact that a good deal of infective material has been introduced. Anophelinae are not common in the municipal area. I have searched for larvae frequently and have found only *Myzorrhynchus paludis*, which I consider to be identical in species with *A mauritanus*. On one occasion I found a single imago of *Myzorrhynchus natalensis* but did not locate the breeding place.

## II. ORANGE FREE STATE.

The Medical Officer of Health for the Free State (Major Targett-Adams, S.A.M.C.) reports that:

Of 134 medical practitioners approached with a view to obtaining information as to the prevalence of malaria, 36 doctors report that they have met with cases of malaria in their practices, and those who give figures show a *very rough* estimate of some 132 cases; of the 36 medical practitioners who have reported to have seen cases of malaria during their professional work in the Orange Free State, 24 definitely state that the infection was received from places situated *without* the borders of the state, thus leaving 12 doctors who are of the opinion that the source of malarial infection was *within* our boundaries, or that the "fons irigo" was open to doubt. Personally, I am of opinion that if all the factors and their proper correlation do exist for malarial infection to take place within this Province, they are apparently present only to a very slight degree, and are mainly, if not entirely, confined to the immediate vicinity of rivers, such as the Vaal, Vet, Riet and Caledon.

## III. NATAL.

Suitable conditions for the breeding of malarial transmitting anopheles appear to exist throughout a considerable area in Natal, especially the northern areas adjoining Zululand and the coast belt. In Zululand malaria is endemic.

The extensive epidemic of malaria which occurred in Natal in 1905 described by Hill and Haydon (x. 1905, *Journ. Hygiene*, v. 467) drew attention to the presence of suitable conditions in Natal for the spread of malaria. The increased incidence of malaria in Durban in the same year was clearly reflected in the number of cases notified, as malaria had been a compulsory notifiable disease in Durban since 1902.

Year	Cases in Durban	Deaths
1902-1903	47	1
1903-1904	73	1
1904-1905	4314	16

Captain Murison, S.A.M.C., M.O.H. Durban, reported that in February, 1905, malaria became an epidemic disease in Durban. This outbreak of malaria was, in the opinion of the Durban members of the medical profession, the first time, as far as their knowledge goes, that this disease had been of local origin. Had malaria existed in Durban at any time during the past 30 years it could not fail to have been detected.

In a report dated Sept. 1918, Captain Murison, S.A.M.C., states that:

Until the beginning of 1918 no cases of malaria had been reported in Durban for the past ten years.

In December, 1917, a number of Indians returned from East Africa were temporarily accommodated at an Indian Labour Depôt, in Durban. The camp was situated in a locality in which stagnant water was abundant and anopheline mosquitoes had frequently been found in the area.

Within 50 yards of this Depôt there are a number of buildings occupied by Indians employed in the Sanitary Department, and within 100 yards a cottage in which two European nurses resided.

In February, 1918, 16 Indians and one nurse contracted malaria.

Six cases also occurred in four houses in the neighbourhood occupied by Europeans and other cases also occurred in the same part of the town.

The parasites discovered in the blood of those examined were of the Benign Tertian type, but not more than 20 per cent. of the cases were so examined prior to the administration of quinine. For the past month no fresh cases have been notified.

The mosquitoes identified from the Indian Camp and its neighbourhood were *Pyrethophorus costalis* and *A. mauritianus*.

A mosquito brigade is maintained constantly by the Durban Corporation, special attention being directed to those areas in which malarial transmitting anophelines (commonly *Pyrethophorus costalis*) are found from time to time.

#### IV. TRANSVAAL.

In the Transvaal, malaria occurs in the eastern and northern portions and is prevalent in what is known as the low veldt, the high veldt being generally free. Both Benign Tertian and Malignant Subtertian Malaria are found.

In regard to the Eastern Transvaal, Major Spencer, S.A.M.C., of the Middelburg District, reports as follows:

This district is partly highveldt and partly lowveldt, the latter somewhat predominating.

As regards altitude it lies between 4000 feet or somewhat lower in parts of the lowveldt, and 6000 feet in parts of the highveldt. The terms high and low veldt are, however, misleading as representing marked differences in altitude, for an aneroid barometer has shown parts of what is known as the lowveldt to be as high as many parts of the highveldt though each has its special characteristics apart from altitude.

Shortly these characteristics, which are sharply defined, are:

##### *Highveldt:*

More or less Tableland.

Few, small and sparsely scattered streams, with dams, Vleis, and Springs predominating.

Poorly treed and bushed; vegetation sparse.

Subject to fresh breezes which blow for weeks at a time with but slight intermissions.

Climate temperate in summer with frosts of from 10 to 20 degrees for nearly three months of the winter.

##### *Lowveldt:*

Sheltered country falling away from mountain ranges, having the appearance of subsidences and tracts of country washed out by large rivers through the centuries.

Well watered by large and medium-sized rivers, mostly running throughout the year, summer and winter. Well treed, bush often thick and extensive.

Atmosphere more stagnant and evaporation of the earth's surface slow.

Climate almost tropical in summer, mild in winter with few and slight frosts—if any.

Vegetation often luxuriant.

The lowveldt is thickly populated by natives, thousands of whom are continually moving up to the highveldt to work, carrying with them malarial parasites with which they are all heavily infected.

Many tours of inspection have been made during the epidemics of malaria which occur periodically in this district during which the numbers found to be affected have been kept and embodied in reports to the Public Health Department. The estimated population of the parts visited has been supplied by the Police in charge of these parts.

During these tours many scores of blood-smears have been taken by myself from those affected and forwarded to the Government Laboratory, Johannesburg, for examination and report.

The estimates and figures quoted are founded upon these investigations and reports.

- (1) Malaria occurs over the highveldt as well as throughout the lowveldt every summer when the rains have set in, but the incidence in the lowveldt is much higher.
- (2) In ordinary seasons Benign Tertian Malaria is endemic throughout the district with an incidence of 10 per cent. of the population of the highveldt and probably 30 per cent. over the lowveldt. In unusually wet seasons Malignant Subtertian Malaria predominates and occurs in epidemic form, with an incidence of from 50 per cent. to 80 per cent. of the population throughout the lowveldt. At such times this infection also occurs over the highveldt with an incidence of 25 per cent. to 30 per cent. It is certain from reports upon the blood-smears taken during these epidemics that to some extent Benign Tertian Malaria is associated with the Malignant infection. Small rings and parasites have invariably been reported in the blood-smears of those affected.

#### NORTHERN TRANSVAAL.

In regard to the Zoutpansberg and Waterberg districts, Dr Robert Kay, District Surgeon, Port Elizabeth, reports as follows:

In 1911 I was appointed M.O. for Northern Transvaal and had the Zoutpansberg and Waterberg districts under my charge. I saw little malaria in either of these two districts during 1911 among the natives—say about 200 cases in all, all of the Benign variety—no deaths. These cases occurred chiefly to the west of Zandrivers Poort—some 40 miles north-west of Nylstroom, and south of Warmbaths. In 1912 there was a considerable outbreak of malaria in Zebedelas Location and along Olifantsriver, along the Zoutpansberg and Middelberg borders. The varieties were of Malignant type and the mortality was considerable. The disease in this outbreak was of an epidemic type—out of say 6000 males, about 200 were fit to walk in Zebedelas Location before treatment, and my arrival on the scene—this sounds rather high, but I do not think it is far short of the facts—malaria was rather rampant all over the Waterberg that year, but no where as bad as the above-mentioned areas. In 1913, as soon as the cold weather commenced, there were further outbreaks in the same areas—but not to any extent so severe as the previous year, the same type—(Malignant)—I found in blood. However, every year malaria—chiefly of Benign type—is to be found along the different rivers in these two districts. As far as I can recollect the anophelines responsible were *Myzomyia*.

**PIETERSBURG DISTRICT (NORTHERN TRANSVAAL).**

In reporting on the Pietersburg district (Northern Transvaal), Captain P. A. Green, S.A.M.C., states:

(1) The whole of the Northern Transvaal is liable to outbreaks of malarial infection to a varying extent in different areas, but I have seen no area that has not been infected one year or the other.

(2) Benign Tertian occurs in what is called the Middleveldt, or area above 3000 feet, but also exceptionally Malignant Subtertian. In the Lowveldt, the Benign and Malignant types are about equally prevalent.

(3) There is no question that we get every few years a typical epidemic of Malaria, either spread over a wide area or confined as I have seen it, to one location in a comparatively small area.

**SWAZILAND.** Malaria is endemic.

**BASUTOLAND.** Major Macfarlane, S.A.M.C., states:

After 24 years' experience in Basutoland I have only seen a few cases of malaria and these were in natives who had immigrated from Zululand or the Northern Transvaal. I have also seen a few cases in ex-policemen who had been serving in the Bechuanaland Protectorate. My own experience and that of other medical officers of the Basutoland Medical Staff, is that malaria is neither endemic nor epidemic in that territory.

**BECHUANALAND.** Malaria is endemic along the river beds in the rainy season.

**NORTHERN AND SOUTHERN RHODESIA.** Malaria endemic and liable to become epidemic during summer rains.

**BELGIAN CONGO.** Dr Arthur Pearson, who has practised in the Katanga for nearly 20 years, reports as follows:

(1) All parts of the Katanga are affected. There is, however, more malarial infection in the low lying country north of parallel nine degrees than in the mining districts. Infection in the newly sprung up towns and villages has been especially bad hitherto owing to insufficient carrying out of anti-mosquito work.

(2) The type of malaria is invariably Subtertian Malaria. One individual who had been living on the east coast and came to the Katanga for two years, went on holiday to London where he had fever. I then found Benign Tertian parasites. This is the only time I have seen Benign Tertian parasites in any one from the Katanga.

(3) Malaria is endemic. During one rainy season in Elisabethville, it appeared to intensify with epidemic character, but this was due to excessive mosquito breeding in holes dug for ornamental trees, which were not attended to nor filled up.

#### A MOSQUITO SURVEY OF MILITARY HOSPITAL AREAS IN SOUTH AFRICA.

In view of the number of sick concentrated in Military Hospitals heavily infected with malarial parasites the question of the presence or absence of malarial transmitting mosquitoes in those areas became a matter of the first importance.

Accordingly arrangements were made at each area laboratory for the collection of local mosquitoes which were subsequently identified by Mr G. A. H. Bedford, F.E.S., whose valuable services became available owing to the kind co-operation of Sir Arnold Theiler, K.C.M.G., Director of the Government

Veterinary Research Laboratory. The majority of the mosquitoes were collected in the larval stage and bred out in the laboratories.

In addition to the material forwarded for identification from military laboratories, specimens were received from Dr Warren, Director of the Natal Museum and Dr Peringuey, Director of the South African Museum.

The following list shows the area in which specimens were collected, the number of specimens identified, and the classification of the different species.

*Classification of species identified.*

Area	No. of specimens	Malaria transmitting	Non-transmitting
Roberts Heights	187	Anopheles costalis	Anopheles " Stegomyia Ochlerotatus caballus Theobaldia longiareolata Culex tipuliformis " tigripes " fatigans
Potchefstroom	102	—	Anopheles squamosus B. lineatopennis Ochlerotatus caballus Theobaldia longiareolata Culex fatigans
Cape Town	1542	—	Anopheles cinereus " mauritianus Theobaldia longiareolata Culex tipuliformis " tigripes " pipiens " fatigans " salisburyensis
Durban	286	—	Anopheles mauritianus " squamosus Stegomyia fasciata " simpsoni Culex fatigans
Total ...	2117		

Only two specimens of *Anopheles costalis* were obtained at Roberts Heights. The majority of the specimens from the Cape Town area were *Culex fatigans* and *C. pipiens*. *A. costalis* is also found in certain areas in Durban, but was not found among the mosquitoes collected in the hospital area at Durban.

This paper is included in a report by the Director of Medical Services to the Minister of Defence, Union of South Africa, on "Malarial Research in South Africa during the War."

Acknowledgments are due to Col. P. G. Stock, C.B., C.B.E., Director of Medical Services, Col. G. H. Knapp, D.S.O., Deputy Director of Medical Services, Dr Arnold, M.O.H., Union of South Africa, Lt.-Col. A. Mitchell, Lt.-Col. Haydon, Major Targett-Adams (Assistant Medical Officers of Health, Union of South Africa), Lt.-Col. C. Porter, A.D.M.S., Defence Headquarters, Majors Kenneth Gilchrist, M.C., J. C. Venniker and D. Pullon, and Captains Luke, Impey and Pearson, S.A.M.C., and the Government District Surgeons, without whose ready co-operation it would not have been possible to prepare these records.