

# Forty Years of Malaria Control in Natal and Zululand

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## SUMMARY

The epidemiology of malaria in Natal and Zululand before the introduction of insecticides is discussed. The present control measures are outlined. The danger of malaria being reintroduced is always present. It is stressed that the greatest threat stems from illegal immigrants, seasonal workers, and social events along the borders. The co-operation of all doctors, hospitals, and laboratories concerned with the diagnosis of malaria is solicited.

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The area of Natal and Zululand is 35 284 square miles, it has a summer rainfall, semitropical conditions prevail along the coastal region, and much of the land is just above sea level. The winter temperature rarely falls below 4°C even in Durban, and further north along the coastal belt higher winter temperatures are recorded.

## PREVIOUS MALARIA CONTROL

It is hard to believe that nearly 70 years ago there was a malaria epidemic in Durban, of low virulence. After 4 years it disappeared from the Durban area, but pockets persisted, leaving a few endemic areas in the large valleys near the coast.

In 1928 - 29 at a number of sugar mills and plantations a large percentage—in some instances the majority—of the Black and Asian labour force was attacked and the work was in consequence delayed and disorganised. In an estimated population of 6 000 Whites at risk there were 7 deaths, in 20 000 Asians 151 deaths and in 215 000 Blacks 2 600 deaths.

Two years later the appalling death toll rose to an estimated 10 000. In 1934 malaria was reported in 41 of 45 magisterial districts.

The Government invited Professor Swellengrebel, of the University of Amsterdam, to visit Natal in 1930. He laid down the principle of species sanitation and this has been followed ever since. He recommended that no malaria control work should be done in the endemic areas among the immune indigenous Black population in the districts of Hlabisa, Ubombo and Ingwavuma, and this advice

was adhered to until after the 1952 - 53 malaria outbreak, when it became necessary to extend control measures over the whole area. Malaria committees came into active operation during the season 1933 - 34, and these replaced the considerable number of voluntary farm groups which had been established the previous year. These committees were formed in rural areas for the sole purpose of controlling malaria, having their own regulations and rating powers.

Liquid DDT (5% DDT in paraffin) was introduced into the region in 1945, and small-scale experiments with the insecticide were most encouraging. Following on this successful application of DDT, there was a gradual extension of the application of residual DDT to all huts and barrack rooms and to many White dwellings in all malarious areas under the control scheme. In many areas only one application of DDT was used, but where vector infestation occurred over 6 months of the year, a second application was given. The effectiveness of the spray was assessed after a period of 3 months. All treated huts were inspected after the use of a knock-down spray. It was observed early on that the erection of new huts by Blacks, or the replastering of the interiors of huts or barracks already (and recently) sprayed with DDT provided the main source of danger of reinfestation. To overcome this, regular contact, and observation of the local inhabitants in treated areas, plus the routine check sprays of the habitations in sprayed sections by the field staff, are necessary to ensure that new or renovated dwellings are treated with residual DDT as soon after occupation as possible. The effectiveness of the residual spray can be judged by the reduction in numbers of not only vectors captured but larvae as well. In the short space of 5 years (1945 - 1949) the catches of adult insects fell from 4 621 to 322 and there was a corresponding fall in the larvae captured as well—1 667 to 449.

During the 1952 - 53 outbreak, migration of labour from the practically uncontrolled areas in the north to the districts of Piet Retief, Nongoma, Hlabisa, Lower Umfolozi, Mahlabatini and Ngotshe was responsible for the re-introduction of malaria. The worst months were January 1953 (540 cases) and February 1953 (320 cases), mostly in the districts of Nongoma and Hlabisa. The malaria broke through the protective screen on which the region relied, the 3 malaria committee areas of Hluhluwe, Biala-Mkuze and Magut-Candover, together with the Pongola irrigation settlement (which had its own malaria organisation) and adjacent Black reserves, and spread into the non-sprayed adjacent Black reserves. It was realised then that uncontrolled areas bordering on control areas could no longer be ignored. Control measures were introduced into the Ubombo and Ingwavuma districts in 1952 - 53

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and by 1956 malaria infection had been reduced to negligible figures. That same year malaria was declared a notifiable disease.

A survey was carried out by the WHO Malaria Assessment team in Natal during the last quarter of 1959. This report was prepared on the basis of information gathered by the assessment team under the leadership of Dr Cavalié. It concluded: 'The eradication of malaria from a large part of Natal reflects the excellent work which has been carried out in the past. It may be considered necessary to establish checkpoints along the Mozambique border to intercept immigrants and to administer single-dose treatment to minimise the danger of reintroduction of infection, but the forthcoming programme in southern Mozambique will shortly overcome this difficulty. It is considered that within 3 years, the whole of the transmission zone should be under surveillance.'

Rapid progress was made during the next 4 years and the number of cases detected by active surveillance dropped from 522 in 1963 to 36 in 1965. Routine spraying with 75% wettable DDT was discontinued in 1965, but a cyclone appeared that year in Mozambique, the fringe of the cyclone being also experienced in the districts of Ingwavuma and Ubombo, and this was followed by further frequent falls of rain. The following year 265 cases were detected on active surveillance, and so it was decided to spray a limited number of huts in those districts and also in the Pongola settlement. The first spray operation took place in October/November, and the second one in February/March. Although all the malaria committees south of the Tugela River were disbanded in 1952, the remaining 11 were disbanded in August 1968. The number of cases detected on active surveillance dropped rapidly again over the next 4 years, and in 1970 no cases were detected at all—in fact no cases were detected for 16 months. The control measures were not relaxed as a result of this very successful season. The following year 73 cases were detected on active surveillance, and in 1972, although there was an above average rainfall in the region, only 35 cases were detected.

## THE PRESENT POSITION IN THE REGION

### Organisation of Control

The responsibility for the control of malaria is borne by local authorities in the urban areas and by the Department itself in Black areas and on State lands. The South African Railways and the Natal Game and Parks and Fisheries Board are responsible for control in the areas falling under their jurisdiction.

The regional office is in Durban, and although there are 5 sub-offices we are only concerned with the offices in Eshowe and Jozini. There are 7 mission hospitals in the control areas. The Eshowe office is responsible for health matters, including all malaria control work, in 5 districts, and Jozini for 6 districts. The areas controlled by Eshowe in recent years have been consolidated zones, i.e. field staff have been engaged in collecting adult vectors and larvae and visiting farms, estates and Black

areas to take blood smears from all imported labourers, and smears from any Blacks who at the time of the visit are suffering from an illness suggestive of malaria. There is close liaison between staff and the farming community, especially in the Hlabisa district. It is becoming increasingly difficult for the sugar farmer to recruit local labour and he tends to recruit foreign labour. The illegal recruit is a potential source of danger in areas where the vector mosquito is still found. The farmers have been requested to contact the Eshowe office and supply the names of all newly-recruited foreign labourers and foreign labourers who return to work after visiting their homes. On receipt of this information, field staff are despatched to the farm, blood smears are collected from all foreign labourers and they are dosed with chloroquine and pyrimethamine. This service has also been extended to farmers in the Pongola irrigation area and the Ubombo district.

Five cases of malaria were detected in the Hlabisa district last year as a result of this service to farmers. Surveys in the Hlabisa district over the last 18 months have indicated the presence of *A. gambiae* in greater numbers. As a precautionary measure it was decided to spray a section of the district with 75% wettable DDT once a year in November and December.

The Jozini office has a potentially explosive area to administer. Four rivers, namely the Mkuze, Pongola, Ingwavuma and Usutu, flow through the districts, large areas of which are low lying. A new threat has been introduced in more recent years, namely the J. G. Strydom Dam at Jozini. It is proposed to irrigate 60 000 hectares of land. Although it will take some years to complete all the channelling, vast volumes of water are periodically released for 10-20 days, not only in the rainy season but during the dry season. This results in flooding of the numerous pans in which many species of fish breed. It seems likely that ideal new breeding grounds for *A. gambiae* will result from this.

Over a period of years valuable maps have been prepared by the field staff. Each area is given a name, and this is divided into 10 sections. Each hut is numbered. A special card has been in use for many years; this is placed under the eave just above the door. The name of the kraal owner and number of people in the hut are recorded on the card, as well as details of visits by the malaria assistant and date of last spray.

There are 8 White technical assistants in this area. Four of them actually live in their areas; the other 4 are stationed in Jozini. Each technical assistant will be responsible for several areas. In each area one, sometimes two, Black assistants reside, depending on the size and population of the area. Over a period of 10-12 weeks he visits all the kraals in his area, takes blood smears from sick people, and searches for vector mosquitoes after the use of knock-down sprays, in treated, untreated and outdoor resting places in the kraal area. If any vectors are recovered these are pinned and placed in a special box and sent to Jozini for final identification.

Most of the technical assistants in this area drive landrovers, which have proved to be most reliable and essential. A water trailer with a capacity of 750 litres is drawn by the vehicle when spraying operations are in progress. A spray team consists of a White technical



assistant, a runner who notifies the locals in advance of the team's visit, the malaria assistant for the area and 6 sprayers.

The Eclipse pump has proved to be very successful, since spare parts are easily obtainable, and extensions for spraying eaves and ceilings are also supplied. The use of a runner to warn the inhabitants permits a minimum waste of time. Before a hut can be sprayed, all the household belongings have to be removed. In 1972 1 307 rooms and 69 878 huts were sprayed with DDT. In the search for vector mosquitoes 36 234 treated huts, 35 293 untreated huts and 16 715 outdoor resting places were inspected. No vector mosquitoes were recovered from treated huts, but 2 107 *A. gambiae* and 90 *A. funestus* were collected from untreated huts and outdoor resting places.

It has become increasingly difficult to find vector mosquitoes over the years, and so during 1972 pit shelters were constructed in suitable areas. The site for a pit is carefully selected, preferably shaded by natural shrubs or trees, and in the vicinity of water and human habitation. The mosquitoes resting in the small side chambers of the shelter are sucked through a glass tube into a small transparent container. In 1972 159 *A. gambiae* and 711 *A. funestus* were collected. The vector mosquitoes are pinned and despatched to Jozini for final identification. Trap nets and test huts have also recently been introduced. A net can be set in any desired place, and a man and an animal, usually a goat, spend the night under the net. Vector mosquitoes are identified and samples of meals are placed on filter paper and sent to Tzaneen where the precipitin test is done to determine the nature of the mosquito's meal.

In 1971, 29 761 smears were prepared, of which 73 were positive. Towards the end of May 1971, several blood smears were positive for *P. falciparum*, and 2 hospitals in the area also reported several cases of malaria. Focus investigations were immediately undertaken in the affected areas. Blood smears were taken from all Blacks in the area, and all huts were first sprayed with a knock-down insecticide and later with DDT. Chloroquine and pyrimethamine were administered to all in the area. Ten days after treatment repeat smears were taken. All these were negative.

The area worst affected in 1971 was Lake Sibaya. It was last sprayed about 8 years ago, and during the investigations only one specimen of *A. gambiae* was recovered. As a result of this outbreak in 1971, certain areas which had not been sprayed for years were sprayed once with DDT and again in 1972. Only 2 cases of malaria were reported from the area in 1972. There is

one border post at Muzi, through which Shangaans enter the Republic. A Black assistant has been posted at Muzi. All immigrants are dosed with chloroquine and pyrimethamine, and blood smears are prepared, 5 of which were positive in 1972.

A refresher course for all people engaged in malaria control work is undertaken in the autumn. This course extends over several days and all aspects of malaria control are discussed and field demonstrations are arranged.

Many entomological problems still face this region, but during the course of the next few years much valuable information will accumulate. *P. falciparum* is the parasite responsible for malaria in this region, and all malaria cases have responded to chloroquine and pyrimethamine. The vector mosquitoes, much reduced in number, are unlikely to be exterminated altogether.

The golden year of 1970 is a tremendous tribute to the field staff, who over the years, and in spite of numerous difficulties, have performed their work so well. I would like to pay tribute to the man who pioneered all this, Mr D. G. van der Wagen, who officially retired 4 years ago after 35 years' service, but decided he was still fit to continue.

The danger of malaria being reintroduced is always present, and the greatest threat stems from illegal immigrants, seasonal workers and social events along the border. This challenge is accepted by the field staff, but they alone cannot achieve miracles. They search out malaria cases in their surveillance work, but they need assistance from all doctors, hospitals and laboratories who diagnose malaria. As soon as a case is diagnosed it must be notified, since a delay may have far-reaching and disastrous consequences.

A simple health education pamphlet warns travellers to malarious areas that they should take precautions against the disease. The recently introduced Health Alert Notice is handed to all on arrival at airports, seaports and border posts. This notice draws the attention of new arrivals to the fact that they may have been exposed to some dangerous infectious disease or that, if a malarious area has been visited, a dangerous form of malaria may have been contracted.

The potential threat of malaria spurs on the field staff, and with the co-operation of the public, doctors, hospitals and laboratories, the spread of the disease can be effectively halted. Although the chances of contracting malaria in this region are very small indeed, the danger still exists. The endemic districts at the present time are Piet Retief, Ngotshe, Ingwavuma and Ubombo.