

# Recent Events in the Field of Malariology

C. V. FOLL

*S. Afr. Med. J.*, **48**, 1389 (1974).

Writing on the policy of malaria prevention in 1947, George MacDonald wrote: 'Our technical knowledge is, and has been for a long time, adequate to prevent malaria under any circumstances; most of our failures and disappointments are due to weaknesses of administration and not of technique'. In 1953 Paul Russell gave the Heath Clark lecture at London University, entitled 'Man's mastery of malaria' and in 1956 he wrote: 'Of the many plagues that affect mankind, malaria has long been a leader. Today, it is under attack so widespread and determined that one can safely predict an early end to its supremacy'. This was exactly one year after the 8th World Health Assembly had decided that the WHO should take the initiative, provide technical advice and co-ordinate a programme with the objective of world-wide eradication of malaria. In 1959, Fred Soper gave the Charles Franklyn Craig lecture to the American Society of Tropical Medicine and Hygiene on 'The epidemiology of a disappearing disease: malaria'.

What has happened? How is it that these men, who were at the times of these declarations pre-eminent in their profession, could be so wrong? And why is it that

---

**Wellcome Foundation, London, UK**

C. V. FOLL

---

Paper presented at the Malaria Symposium held at Nelspruit, Eastern Transvaal on 27 January 1973 under the auspices of the Lowveld Division of the Northern Transvaal Branch of the Medical Association of South Africa.

after all this confidence we are having to hold a seminar on malaria here today? During the course of the last 15 years there have been two major developments with regard to malaria: first, a general realisation that the original approach may have been too simplified, and secondly, the enormous impetus to research, particularly in the USA, as a result of chloroquine-resistant malaria in Vietnam.

Already in 1963 the then President of the ASTM & H, Clay Huff, warned in his presidential address that the job of eradicating malaria was not finished. And again, in the following year, at the Charles Franklyn Craig lecture, gave 3 main causes of difficulty: insecticide resistance in vector mosquitoes; resistant malarial parasites; and reduction in malaria research and in the number of personnel being trained in malariology.

In 1968, Galbaldon sounded a warning about the duration of various stages of eradication programmes being too short. And, finally, the 22nd World Health Assembly in 1970 adopted a resolution recommending the review of programmes in order to adapt a strategy to local epidemiological conditions, existing resources and available attack measures. In other words, various control activities would be required where eradication was at present impossible.

I thought it might be of interest to make some mention of the more important meetings which have been held since May 1969. These are as follows:

Conference on Anopheline Biology and Malaria Eradication: Walter Reed Army Institute of Research, Washington, May 1969;



Health and Disease in Africa — the Community Approach: Proceedings of the EAMRC Scientific Conference, Nairobi, 1970;

Proceedings of the Inter-American Malaria Research Symposium, San Salvador, November 1971;

Basic Research in Malaria at the Walter Reed Army Institute of Research, Washington, June 7-9 1972;

WHO Expert Committee on Chemotherapy of Malaria, Geneva, October 1972;

Interregional Malaria Conference for countries where time-limited malaria eradication is improbable at present, Brazzaville, October 30 - November 10 1972.

Reports have already been published on the first three, so I will just touch on these and spend more time on the last three. These meetings should be set against the background of why programmes have run into trouble, and these reasons were summarised by Colonel Altman of the Walter Reed Hospital in the following words: 'These failures have been caused by many factors, including lack of resources and mismanagement of resources; inadequate public health service; divorce of malaria eradication from public health programmes; lack of trained personnel; an ill-informed, non-co-operative, and occasionally even hostile public; drug resistance or misuse of drugs; improper surveillance methods; habits of different ethnic groups; differences in mosquito vector populations; insecticide resistance; changes in human populations; political and military disruptions; and many other factors. Entomology problems undoubtedly have contributed to the failure of eradication programmes'.

The objectives of the 1969 Walter Reed conference were clearly set out: to assess the present status of the entomological aspects of malaria control; to identify the problem areas in entomology; and to define methods for resolving these problems.

In a brilliant review, Bruce Shwatt traced the story of vector attack measures from the time of Walter Reed's and Ronald Ross's epoch-making discoveries of the transmission of yellow fever and malaria up to the present time. In view of the very great importance of carrying out adequate entomological investigations at all stages of malaria control programmes, I was dismayed to find no mention of entomology in our programme. However, I reckoned without the epidemiological expertise of Professor Gear and Brigadier Gilliland, who quite rightly stressed that entomology is an integral part of the epidemiology of malaria.

Hamon and his colleagues reported on studies of the responses of anopheline vector populations to malaria control, and Hamon himself has stressed the importance of assessing all basic data about the vector before undertaking antimosquito measures, and states: 'If we do not know the behaviour and the relevant importance of the vector before beginning the control programme it will be much more difficult to understand the changes of behaviour and the relative importance of these later'. There were many other excellent papers read at this conference, and the report is very strongly recommended as essential reading for malariologists who may lack an entomological background. Their final recommendations were prepared by a committee chaired by Botha de Meillon.

The Nairobi conference had a much broader approach and was concerned with the delivery of medical care and the planning of health services as well as specific control of *Anopheles gambiae*, the use of various drug combinations, the absence of chloroquine-resistance in tropical Africa, and pregnancy. I do not propose saying any more about this meeting since we are due to discuss a number of similar topics here. However, as someone who has long been interested in communicable diseases, I was delighted and intrigued to read of 'the suggested approach to pregnancy as a communicable infection with the male as a more or less asymptomatic carrier'.

That the San Salvador meeting was sponsored by the Government of San Salvador, the Pan American Health Organisation and the Centre of Disease Control, Georgia, gives a clear indication of the importance attached to the subject. The comprehensive report (240 pages) opens with a quotation from Abraham Lincoln: 'If we could first know where we are and whither we are tending, we could better judge what to do and how to do it', which set the stage for a review of 'The troubled scene in the field of malaria'. Six main sessions were held — on the extent and impact of malaria, serological tests for malaria, host response to malaria infections, antimalarial drugs, vector ecology and biological control, and chemical control of vectors, respectively. Two out of the 6 sessions were devoted to the vectors.

I believe that David Sencer, Director of CDC, in his welcoming remarks, gave an indication of the solution to many of the difficulties. His words were: 'I think it is significant that we are meeting to discuss research needs for malaria control eradication. This indicates that we have come to recognise that we need more knowledge before we can achieve our goals of control and eradication. We recognise that we can no longer place reliance on insecticides and blame any failures on inadequate programme operations or insecticide resistance. We now must once again redevelop the scientific techniques of malariology and approach the problem of malaria as malariologists and not as spraymen'. A veteran malariologist from Venezuela, Arnaldo Gabaldon, described some of the difficulties confronting malaria eradication, and his actual words about epidemiological problems are worth quoting in full: 'The parasites, the first of the three primary epidemiological factors, do not represent by themselves an obstacle to the eradication of malaria. As soon as transmission is interrupted they die spontaneously in a relatively short period. In some areas, resistance to drugs has appeared, but even though this event is a problem for the infected person, it is not a problem for the community when the vector is intercepted by the insecticide.

'The vector, the second primary epidemiological factor, is responsible in certain areas for the presence of refractoriness of the disease towards the insecticide. The study of this problem has been partially neglected for almost 20 years, and now requires careful consideration.

'Human beings, the third primary epidemiological factor; the healthy as well as the infected ones, constitute more often than expected an important obstacle to eradication. In some cases, the inaccessibility of dwellings to spraying is caused by human behaviour.



'Since our objective depends on adequate indoor application of DDT, and the programme presupposes responsiveness of the disease to this measure, it is essential to determine where in a given country refractoriness or inaccessibility may exist. This should be the first action taken to determine the principal difficulties which may be confronted in the development of the work, in any malaria eradication programme.'

He also defined 3 types of malaria, i.e. responsive, refractory, and inaccessible. Earlier, I mentioned a list of different factors responsible for the failures of programmes, and Galbaldon adds another — the 'human factor'. He subdivides this into 3 groups: higher health authorities being ill-advised by public health administrators or health planners who lack knowledge of malaria; younger malariologists who fail to acquire a sound knowledge of the epidemiology of malaria, and tend to be desk men who fear that there is no future in malaria; and personnel policy, in that there is a poor selection of staff and unattractive salaries.

Research as related to malaria is really a subject about which we could hold a seminar lasting many times longer than the present one, and I would refer you to the really excellent review of this subject by Dr Lepes, Director of Malaria Eradication, Geneva. He concludes with a statement of priorities, i.e. 'Research on immunisation and whatever may support it, development of new antimalarial drugs including the understanding of their mode of action and of resistance, further development of more sensitive techniques in epidemiological evaluation and, of course, development of attack measures'.

My final comment about this meeting is to mention the summing up of my old chief in WHO, Carlos Alvarado. This included a great deal of rhetoric, but also expressed the hope that a multidisciplinary approach, particularly taking laboratory findings into the field of operations, could well be successful.

The panel workshop, 'Basic research in malaria', Walter Reed Army Institute of Research, June 1972, was a high-powered conference dealing with both human and non-human plasmodia and their associated chemotherapy, and also separate sections on physiology, entomology, immunity and serology. A full report will appear in the *Proceedings of the Helminthological Society of Washington*. This meeting was set against information received from Vietnam, where during the period 1965 - 71 nearly 82 000 cases of malaria were reported, and which resulted in a cost of some \$60 million. In 1964, a malaria control programme in South Vietnam was estimated to cost \$2 million a year.

At the meeting of the 2nd WHO Scientific Group on the Chemotherapy of Malaria in Geneva in October 1972, 5 main factors formed the basis of discussion:

(a) The role that the 4-aminoquinolines may still play in the prevention and treatment of malaria, and this applies particularly to Africa.

(b) The main techniques that have been developed for evaluating the response of malaria parasites to drugs: there have been improvements in the use of the *P. berghei* model in mice, and other models in rodents, birds and monkeys are being increasingly used. With regard to the latter, the use of the owl monkey, *Aotus triovirgatus*, has been the most important advance.

(c) A critical appraisal has to be made of the geographical distribution of resistance to the 4-aminoquinolines.

(d) A review was made of all promising antimalarials currently being evaluated. These fell into 4 main groups: (i) the 9-phenanthrenemethanols; (ii) 4-quinolinemethanols; (iii) 4, 6-diamino-1-substituted-dihydrotriazine (this is a DHFR inhibitor); (iv) naphthoquinones.

(e) Agreement for continuing effort in this field.

Much of what was discussed at this meeting concerned chloroquine resistance and, fortunately, as yet this does not concern the continent of Africa. However, malariologists in this continent should be aware of the steps that are being taken elsewhere. Tribute was paid at this meeting to the tremendous work being done by the US Army through the Walter Reed Institute, where they have already screened over 214 000 compounds as antimalarials.

The meeting at Brazzaville in November 1972 was an interregional malaria conference for countries where time-limited malaria eradication is improbable at present. In the African region, more than 200 million people live in areas without any specific antimalarial measures, and about 95% of these are exposed to malaria. It was estimated that the direct effects of malaria in tropical Africa are responsible annually for about one million deaths of infants and children below the age of 14 years.

Only one year after the launching of malaria eradication programmes (1956), difficulties were noted with regard to Africa, where it was suggested in the 6th Report of the WHO Expert Committee that in Africa 'it seems premature to plan in terms of continent-wide eradication' and advised increased emphasis on assistance to pilot projects. In 1960 no change was made to pre-eradication programmes, and a further year after that far more accent was put on the development of a rural public health infrastructure, and malaria control really went by the board. A number of recommendations were made at this conference:

(a) since malaria is recognised as being an extremely serious disease in Africa it must be given the highest priority in any plans aiming at improvement of health;

(b) the necessity to develop a malaria nucleus (malariologist, entomologist and sanitary engineer experienced in malariology) at the central level of health structure;

(c) the need to increase teaching in malariology for all basic health staff;

(d) that rural communities be encouraged and helped to improve their own health conditions, and far more heed paid to health education measures;

(e) WHO and national scientists to co-operate in malaria research;

(f) malaria control should be made a priority in the functions of the basic health services to concentrate on the application of DDT and administration of 4-aminoquinolines — discourage DDT as an agricultural pesticide;

(g) encourage information from neighbouring countries in planning implementation, assessment, etc. of control programmes, particularly in the frontier areas;

(h) make special provision around large engineering schemes, dams, etc. and

(i) encourage the practice of teaching in entomology.