

Chapter 16

Future Perspectives In Malaria Control, Including Vaccine

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The various malaria control strategies available have been described in detail in Chapter 13. They are presented diagrammatically in Fig 1.

Historical perspective

Environmental sanitation works, both for health purposes and agriculture, were undertaken by the early civilisations of Mesopotamia, Egypt and the Indus Valley and are mentioned by Greek, Chinese and Roman writers. They continued during the Middle Ages into modern times. Lanusi in 1717, not only proposed a plan for the drainage of marsh lands but also formulated the theory that malaria may be caused by noxious juices insculated by insects breeding in the marshes. A well documented history is that of the marshes, eventually successfully drained during the Mussolini era.

Personal protection against insects - gnats - dates back to Herodobus (c. 484 - 425 B.C.), while bed-nets were used in colonial America as early as 1684 and widely adopted by the African explorers of the 19th century.

Antimalarial treatment with Quinghaosu was known to the Chinese for two millenia before Cinchona bark was discovered by the Spaniards around 1600 and advocated not only for the treatment, but also for the prophylaxis of malaria.

The importance of socio-economic factors in the disappearance of malaria from England was highlighted by James (1929).

The transition from global malaria eradication (1955-1979) to a strategy of malaria control (1979-1985); to the integration of malaria control as an integral part of a national primary health care system (1985) culminated, in the Ministerial Conference on Malaria in Amsterdam in 1992, which contained four basic elements:

- 1 to provide early diagnosis and prompt treatment
- 2 to plan and implement selective and sustainable preventive measures
- 3 to detect early, contain or prevent epidemics
- 4 to reassess regularly a country's malaria situation, in particular the ecological, social and economic detriments of the disease.

Early diagnosis and prompt treatment

Reduction of malaria morbidity and mortality - a comparatively modest goal when compared with Global malaria eradication - will be the main challenge for the future, and more effective measures than we have at present within the prevailing primary health systems, will have to be devised.

It is generally accepted that the majority of deaths due to malaria in children, particularly in Africa, never reach a health post.

One obvious requirement for the future, would be to increase the availability and provide competent malaria disease management at the periphery, using adequately trained health workers, or health volunteers, to recognise and treat uncomplicated cases, or refer severe cases. In the latter context, the advent of artemesxxxxxx or quinimax suppositories could have a significant impact. One could

envisage the following sequence of events - recognition of severe disease; taking a thick blood film; administration of suppository; referral of patient with blood film to a higher level health post.

The WHO/UNICEF approach to the “*Integrated management of the sick child*” provides many obvious advantages, especially when one bears in mind the overlap between severe malaria, ARI pneumonia and meningitis.

Treatment of *P. falciparum* malaria in children, in whom the antecedent history before severe disease manifests itself is short (2 days); cannot wait and requires easy accessibility of antimalarial drugs and knowledge of their proper use. Community health workers, responsible village lay people and mothers, could all be taught to recognise and refer severe cases - at least until such time as enough recognised health posts are available within very short distances of villages and in which a constant supply of antimalarials is always readily available.

Ambulatory drug sellers and owners of grocery stores, who are the commonest sources for self-medication, could be taught to provide a full course of reliable antimalarials and advise mothers accordingly. Self-medication is a very common practice in most malaria endemic countries (Derning et al, 1989; Louis et al, 1992; Ruebush et al, 1992), every effort should be made to improve its quality, since this practice is likely to continue, or even increase.

The improvement of the diagnosis and treatment of malaria will require reorientation of existing practices to take into account the above considerations.

Reduction of man-mosquito contact

Sir Ronald Ross, in 1911, commenting on personal protection, wrote as follows “I have had experience on this point during many years and in many different countries, and have only once been infected I always rely upon the possession of four articles, namely, a good bed net, a small hand net for catching mosquitoes, a palm leaf fan, and a bottle of quinine. With these articles, the chances of becoming infected are reduced enormously - especially if a little common sense and care are added to the stock”.

The use of impregnated bed-nets with residual pyrethroids, e.g. permethrin and deltamethrin, is likely to increase, once their value in reducing malarial morbidity is more widely established. Collective action by communities with (possibly) government support would be needed to organise periodical regular reimpregnation of the bed-nets and ensure sustainability. It has been shown that the success of bed net programmes was dependent on a variety of factors - vector susceptibility to pyrethroids, high coverage of the population at risk, high malaria incidence, good community participation, high mosquito densities when people go to bed and a high prevalence of *P. falciparum* (Kroeger et al, 1995; Alonso et al, 1991; Lyrimo et al, 1991).

Vaccination

The present concepts of malaria control envisage that primary health care is expected to assume an important role; yet the world-wide implementation of primary health care is progressing at a much slower pace than was envisaged, due to financial, administrative and technical difficulties.

The widespread resistance of anopheline vectors to insecticides; the exophilic behaviour of some of the anopheline vectors; the virtually global spread of chloroquine resistance; the increasing development of multidrug resistance of *P. falciparum*; the relative paucity of new antimalarial drugs; economic, social and behavioural factors, have significantly diminished the traditional

antimalaria areas. It is therefore in the context of this depressing scenario that vaccination has got to be considered.

The first significant breakthrough in the production of a malaria vaccine against *P. falciparum* was made by Patarrayo et al, (1988). His multivalent synthetic vaccine gave encouraging results in human volunteers in Columbia. This prompted WHO/TDR to embark on further field trials in the Gambia, Tanzania and Thailand. Unfortunately, when tested in an area of perennial transmission in Tanzania, a 31% efficacy was reported for the “spf 66” or Patarrayo vaccine, as it is generally known (Alonso et al, 1994); while in the Gambia, only a 3% efficacy for the same molecule was found (D’Alessandro et al, 1995).

Vaccine development is progressing at a very fast pace and the tendency is towards producing a “cocktail” vaccine which will include a combination of multiple epitopes from different malarial antigens and from different stages of the parasite life-cycle.

Full trials with these improved vaccines will take place in the foreseeable future and the results will be awaited with great interest.

Once the efficacy of a vaccine is proven in well-designed field trials, a variety of other important questions will have to be considered, e.g. (1) how long is the duration of protection ? (2) at what age should it be given in endemic malarious areas ? (3) how frequently ? (4) do genetic factors affect the immune response ? (5) is the vaccine equally effective in various areas of the world ? (6) what will the cost of the vaccine be ? (7) will it protect against severe disease ? (8) will resistance forms to the vaccine develop ? Although most efforts are directed justifiably against *P. falciparum*, vaccines against *P. vivax* are also being developed for countries where this is the predominant parasite. They have not yet reached the stage of development that *P. falciparum* vaccines have attained.

Once an effective vaccine is found, and the efforts that are being put into accomplishing this, are in my view, highly commendable, as well as worthwhile, it is predictable that it would play a significant role in the control of malaria; not necessarily on its own, but more likely in combination with the other elements of an integrated malaria control strategy.

Meanwhile, our only alternative in the pursuit of this new weapon for continuing the fight against malaria, is to follow the Ulyssian call; “To strive, to seek, to find and not to yield !” (Bruce-Chwatt, 1956).

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