In the unusual event of failure to remove a foreign body with a bronchoscope, a thoracotomy will be necessary; bronchotomy, segmental resection, or lobectomy may be necessary. Complications of inhaled foreign bodies include asphyxia, cardiac arrest, life-threatening dyspnoea, laryngeal oedema, and pneumothorax. Late complications such as pneumonia, lung abscess, or bronchiectasis may occur when a foreign body has been retained for a number of weeks. Early bronchoscopy may, indeed, be life saving and may prevent permanent disability; but the first requirement is a high index of suspicion that the patient may have inhaled something into his lungs.


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**Why not vaccinate against malaria?**

A recent review of malaria worldwide pointed out that over one-fifth of the people living in the historical endemic areas (2128 million or 65% of the total world population) were still exposed to the risk of infection. Matters are worst in Africa, where nearly three-quarters of the population is at risk, and where the main species is the potentially lethal malignant tertian parasite *Plasmodium falciparum*. A gradual collapse of malaria-control operations led to the resurgence of transmission (at first mainly *P. vivax*) in India to an annual total of over six million cases in the mid-1970s. The malaria eradication campaign sponsored by WHO in the 1950s did succeed in virtually eliminating malaria from Europe, the Asian part of the USSR, North America, and Australia. In other areas a variety of problems, some socioeconomic, others technical, had led to incomplete success and forced a major change in the strategy of controlling this disease.

Malaria remains a prime obstacle to progress in many developing countries and a source of morbidity and mortality even in non-endemic countries—in England, Wales, and Northern Ireland 1670 cases of imported malaria were recorded in 1980, with nine deaths. Among the technical problems facing the health authorities is resistance of malaria vectors to insecticides and of the parasites (especially *P. falciparum*) to antimalarial drugs. Considerable effort is being put into developing new insecticides and drugs and into research into the mechanisms of action of and resistance to such compounds: partly under the auspices of the WHO/UNDP/World Bank Special Programme for Research and Training in Tropical Diseases.

The remarkable success of the WHO campaign for eradicating smallpox has prompted many people to pose the question “Why not vaccinate against malaria?” Unfortunately, the two conditions are utterly different. Unlike the virus of smallpox, the protozoal organisms causing malaria undergo a complex series of metamorphoses both within and outside the human host. The infective stages that are injected when a female *Anopheles* mosquito bites do stimulate an immune response during the brief period that they remain in the circulation, but this response appears to be largely humoral and lasts only a few months. People living in endemic areas who are continuously exposed to infected mosquitoes remain susceptible to infection. Nevertheless, volunteers can be protected against homologous challenge for a few months by inoculation with irradiated sporozoites. The use of adjuvants does not apparently improve this protection. The failure of thymus-deprived mice to survive such challenge suggests that cell-mediated effector mechanisms are also concerned, but whether these observations are relevant to human disease remains open to question. In practical terms, the problems in the mass production of sporozoites for a vaccine are probably insurmountable, quite apart from the difficulties of conserving and transporting such a vaccine.

Most attention has been focused, therefore, on the mechanisms of immunity against the stages of malaria parasites in the blood. Both humoral and cellular effector mechanisms operate against the different stages of the parasites. IgG and IgM have been shown to block the invasion of fresh erythrocytes by the merozoites that are liberated when the plasmodial schizonts mature and burst from their host red cells. Merozoites are the logical forms to use for vaccination since they are free of contaminating host-cell substance that might induce an autoimmune response. New techniques have been developed for the laboratory cultivation of *P. falciparum* and, while these are not yet at the stage of mass production that would be required before a merozoite-based vaccine could be exploited, they have opened the way to extensive studies on vaccine development. Several workers have now been able to protect animals (especially the South American Owl Monkey, *Aotus trivirgatus*) against otherwise lethal challenge with *P. falciparum*. Nevertheless, as was found in earlier attempts to protect rhesus monkeys against blood stages of *P. knowlesi*, use of an adjuvant together with the antigentic parasite material is essential, and up to now the best results have come from substances, such as Freund’s complete adjuvant and saponin, that are unacceptable for human use. Moreover, in these studies on animals protection has rarely been complete even with the use of modern adjuvants, and the outcome has been unpredictable from one animal to another. A major problem facing all attempts to develop malaria vaccines is our ignorance of the relevance of data obtained from work on the available animals (mainly rodent and simian hosts and parasites) to the response that might be expected in man.

These are only a few of the difficulties in the development of a malaria vaccine before we even reach the major questions that must be posed before clinical trials. Clear guidelines have been laid down for the criteria that a vaccine must meet before...
it is first given to volunteers. The drawback with all approaches made is that they have been based on the use of complex organisms and not pure antigens. Other than one parasite protein that has been found to protect ducks against P. lophurae, few data are available from research in vivo to indicate whether single antigens could be of value. Fortunately, attention is now being directed to the use of monoclonal antibodies to identify immunogenetic antigens in malaria parasites, and several have recently been described both in rodent parasites and in P. falciparum. Future efforts will probably be focused on the application of this new technology and the production of protective sporozoite or merozoite antigens by DNA recombinant procedures. Indeed, this is the most likely route to a practical vaccine for use in man. There is, however, a long way to go, and we should be deceiving ourselves if we believed that a vaccine was, as some have suggested, just round the corner. It would also be a great mistake to assume that malaria will ever be controlled in whole populations (as distinct from individuals) by any single measure. Control programmes need to take into account the best available antivector measures, drugs, vaccines (including, perhaps, an antigame component to interrupt further transmission), and health education tailor made for any given area. The biggest need may still be for well-trained malarialogists.