CORRESPONDENCE

The return of malaria to India

SIR — In their article on malaria resurgence, Chapin and Wasserstrom[1] claim that the agronomic use of DDT led to the development of DDT resistance in mosquitoes and hence to a resurgence of malaria in India. However, the main cause of the rapid increase in the consumption of insecticides in India since 1970 has been their greater public health use *in the wake of* malaria resurgence[2], and agricultural use of DDT has remained fairly constant during the past several years (see table). So the correlation between increase in DDT use and rice production (Fig. 1 of Chapin and Wasserstrom) is superficial and does not imply a cause–effect relationship. Similarly, noting static cotton production and increasing total DDT consumption, Chapin and Wasserstrom are incorrect to conclude that "more and more DDT must be sprayed simply to maintain a fixed yield".

Insecticide consumption in India, 1973–1979

Insecticide	1973–74	1975–76	1977–78	1978–79
		Public health		
BHC	5.0	6.7	12.0	17.0
DDT	7.0	7.2	6.0	10.2
Malathion	0.5	1.0	1.1	5.5
		Agriculture		
BHC	15.4	18.6	16.6	20.0
DDT	2.9	2.9	2.5	3.0
Malathion	0.4	0.6	1.0	1.5
Carbaryl	2.5	3.5	2.0	3.0

Values are in millions of kilogrammes. The figures for 1978–79 are for projected consumption.

The public health use of DDT in India has always exceeded its agronomic use, so although the agricultural use of insecticides has contributed to the resistance problem, blame must be shared by both agricultural and public health applications. And moreover, as multiple resistance in Indian mosquitoes to DDT, BHC and malathion is not cross-extending[3], correlation between the use of a single insecticide (DDT) and malaria cases (Fig. 2 of Chapin and Wasserstrom) can only be spurious.

When seeking reasons for the present problems for malaria control in India, administrative lapses are a factor which must be considered. Under the World Health Organization (WHO), moves in the 1950s to reduce *Plasmodium* transmission by attacking female mosquitoes via insecticide spraying, and to deplete the *Plasmodium* reservoir in human beings by treating patients with antimalarial drugs, were successful. However, this success was nullified because mosquito populations in the forests of Assam, Madhya Pradesh and Orissa were not taken into account. These populations were not affected by spraying of dwellings, so remained infective and gradually reintroduced *Plasmodium* to the now resistant mosquito population. Here it should be noted that Chapin and Wasserstrom use "resistant mosquito populations" and "malaria" as synonyms, when in fact resistant mosquito populations existed harmlessly in India for a decade becoming a hazard only in the presence of *Plasmodium*.

In attempting to find ways of overcoming India's malaria resurgence, an example to learn from is that of California, where use of physical, cultural and biological techniques as adjuncts to chemical control has both prevented malaria resurgence and reduced insecticide use to about a third of the levels used a decade ago[4]. Such techniques have substantially cut the costs of mosquito control in California, and if they were adopted in developing countries, savings could be used to replace DDT with the alternatives which have not been used before because of the high costs.

Although what appears clear with hindsight may in fact have been difficult to foresee, it seems fair to say that WHO was slow to recognize the limitations of residual insecticides. WHO placed prime reliance on chemical control and gave low priority to non-chemical control measures so that when malaria control began to deteriorate, no proven alternatives were available to supplement insecticides. A review of literature on mosquito pest management strategies[5] reveals that WHO's efforts in this line started in the 1970s, by which time mosquito resistance to insecticides had become rampant. Though it is difficult to differentiate between the residues from insecticide use in agriculture and public health, preliminary studies[6,7] indicate that DDT and BHC use in malaria control may be responsible for the serious pollution by these components in malarious developing countries[7-9]. This side effect of malaria control with persistent insecticides has also received limited recognition from WHO.

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Helical liposomes

SIR — Lin *et al.*[1] have recently described the "induction of helical liposomes by Ca^{2+}-mediated intermembrane binding", and the two types of helical liposomes discovered by Lin *et al.* were displayed on the cover of *Nature* of 11 March. The authors acknowledged the independent observation of tubular and helical liposomes by another contemporary scientist. But it may be of further interest to your readers that two types of helical liposomes were in fact described some 78 years ago[2] (see figure).

The book by Lehmann[2] and a more recent review[3] may serve as guides to the extensive studies made after 1854[4] on tubular and

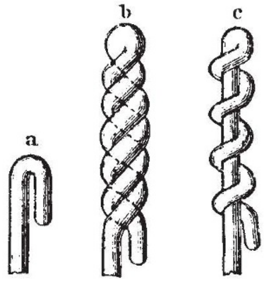

Fig. 477.

helical myelin figures (*zopfartige Flechtwerke*). Lehmann[2] also offers a mechanism for the formation of the two types of helical liposomes.

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French freedom

SIR — With reference to your important issue, *Science in France* (25 March), may I highlight one crucial advantage that French scientists enjoy over their British counterparts? Applicants for a research grant, which may be rejected, have the statutory right of access, under France's freedom of information laws, to the case-file concerning their application, including referees' reports and other attendant reasons behind the decision, which they may then openly contest and indeed reverse[1].

British scientists who feel that they order this matter better in France, compared, that is, with the closed and secretive system of administration in Britain, would do well to make strong representations to their MPs and trade unions[2,3].

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