

resistance, there is no malaria left for them to carry.

Another and very serious difficulty is that many insect-borne diseases appear to exist more or less permanently among wild animals which thus provide a reservoir of infection that may suddenly spread to start epidemics among domestic animals and human beings.

Yellow fever is known to be firmly entrenched in the jungles among monkeys and other animals; plague smoulders in many places among wild rodents whence it can easily spread to the rats that live with men; the trypanosome that causes sleeping sickness exists permanently in wild game in Africa and is carried to men and cattle by the tse-tse fly. There are many other examples among diseases caused by viruses and "rickettsiae".

It would be a serious mistake to

underestimate these ancient enemies of mankind. It is already clear that the residual insecticides, powerful weapons though they be, do not provide the final answer to the disease-carrying insect. Nor is there at present any prospect of eradicating those diseases that have become permanently established among the domestic and wild animals. There they remain, a constant threat calling for constant watchfulness.

World Health Day this year served, I hope, to make people everywhere realize that, although the insect-borne diseases are being increasingly held in check, they are not yet conquered. To achieve that final victory man will need all his intelligence and resourcefulness. Above all, he will need to act in concert, for this group of diseases constitutes one of the greatest challenges to international health action.

The Unwanted Travellers

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The march of civilization, with ever faster travel by ships and aircraft, has also helped the disease-carrying insects to colonize new territories and launch fresh epidemics. To stamp out the intruders often takes years of tedious struggle.

In his upward progress *homo sapiens* has relatively quickly gained mastery over most living things. The only creatures to resist him, except perhaps for a few of the rodents, have been

the insects. They continue to destroy man's crops and his food reserves, to live on him as parasites and in some cases to act as carriers of the viruses and microbes of disease.

It is only 60 years since the first proofs were obtained of the role played by certain insects in the transmission of disease, and as a result of this knowledge, enormous progress has been made in medicine. The fact

that malaria is transmitted by mosquitoes of the *Anopheles* genus, yellow fever by the *Aedes* species, plague by rat fleas, typhus and relapsing fever by lice, are all discoveries without which modern methods of control of these diseases could not have been developed.

Growing knowledge of the breeding places, habits and behaviour of insects together with the use, for the past 10 years, of new and powerful insecticides (DDT, dieldrin, HCH, lindane, chlordane) enables us at the present time to think in terms of the complete eradication of some of these dangerous insects.

However, the extermination of any one species of disease-carrying insects in certain regions does not necessarily mean that the diseases they transmit have gone for ever, particularly those diseases which are harboured by animals. An example is the new aspect given to the problem of yellow fever by the suppression of the "domestic" mosquito, *Aedes aegypti*, in the towns and in vast regions of America and Africa. The virus of this disease now persists only in the tropical forests, particularly among the monkeys, where it is carried by "wild" mosquitoes. There is no doubt, however, that the frightful yellow fever epidemics of the last century can no longer occur as long as *Aedes* is absent from the towns and seaports.

The growth of land, sea and especially air transport has also created a new problem, through the more and more rapid transport of the disease-carrying insect which may find on arrival at its destination suitable breeding conditions.

It was undoubtedly on board a fast boat that *Anopheles gambiae* crossed from West Africa to Brazil in 1930. This malaria vector of African origin is particularly dangerous since it is essentially "domestic", prefers biting

human beings, and breeds easily near human habitations.

The intensification of air traffic demands constant vigilance in order to prevent the introduction, or re-introduction, of *anopheles* into regions where they do not now exist.

Two blood-sucking insects, the louse and the flea, deserve particular mention in view of the important role they played in the past in spreading epidemics.

The body louse, man's inseparable companion throughout his history, has been responsible for the fatal epidemics of typhus which in the past were almost invariably associated with wars and famine. The use, during the last war, of DDT powder for rapid delousing of large numbers of people, made it possible to prevent the renewal of the epidemics of typhus which caused so many deaths after the 1914-18 war.

Fleas (or at least some species) can transmit, through their bites, certain diseases, the most important of which, for man, is plague. Plague, legendary cause of terrible epidemics, is essentially a rodent disease. It is the rat flea which, leaving its sick or dead host and transferring its attentions to man, also infects him with the plague bacillus. The adoption of measures for the control of rats and limitation of the number of their parasites has made it possible today to prevent plague infection at least in the towns and in land, sea and air transport. Nevertheless, the persistence of plague among wild rodents maintains the danger of infection in rural areas in a number of countries.

Fortunately, the regular deratting of ships, and the rational use of insecticides on board ship and aircraft, or for passengers and their luggage, have proved to be effective in preventing any epidemic of pestilential disease in the past 25 years.