ANOPHELES ERADICATION IN CYPRUS

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The history of the malarial fevers in Cyprus has been long and tragic, and over the centuries these fevers have cost the island much in human life and have been the major cause of chronic ill-health and invalidism. It is on record that "fevers and bad air" were a source of much trouble in the year 1394, and in a letter written by Namik Kemal, who was a Turkish poet of national reputation, a few years before the British occupation of the island in 1878 it is stated that "the hum of noxious pests sounds like that of the most modern weapons, and the diseases, the mildest of which is fever, are capable of killing a person much quicker than bullets." In the early days of occupation the British Army suffered severely from malaria, and steps were taken to reduce the breeding places of mosquitoes by draining and filling of swamps and planting of trees, particularly in the vicinity of the main towns. These operations brought some improvement, but the villages remained open to the same menace as previously.

In the year 1900 the District Medical Officer, Larnaca, Dr. G. A. Williamson, discovered malaria parasites in the blood of 470 out of 503 patients diagnosed clinically as cases of malaria; infestations were divided almost equally between *Plasmodium falciparum* and *P. vivax*, plus an occasional *P. malariae*. The three main species of parasite were thus proved to be present in the island. During 1912 the High Commissioner, Sir Hamilton Goold-Adams, informed the Secretary of State that he had recently ascertained the widespread prevalence of malarial fever in the inhabitants of the island, and that, though steps had been taken by Government to combat the menace, he considered that more could be done, and requested that an expert malariologist be sent to Cyprus to study the disease and advise concerning necessary preventive measures. In reply to this request Sir Ronald Ross visited the island in 1913 and found that 25.4% of the children had splenic enlargement. On his recommendation certain marshes were drained and a special staff was trained to undertake mosquito-control work. These drainage works were carried out in various places which were ideal breeding-centres for *Anopheles elutus*, a known vector of malaria. It was noted that coincident with these measures the incidence of enlarged spleen and active cases of malaria underwent a great diminution, and conditions remained apparently much improved until after the 1914-18 war, when they rapidly deteriorated for various causes and remained unsatisfactory until the beginning of the Anopheles Eradication Campaign in 1946.

There were three principal vectors of malaria in Cyprus: *A. superpictus*, breeding in shallow collections of water exposed to full sunlight; *A. elutus*, breeding in temporary collections and marshy collections of water; and *A. birfurcatus*, breeding in heavily shaded and cool water, including both wells and surface collections.

In 1935 Dr. Barber, of the International Health Division, Rockefeller Foundation, found a parasite incidence of 70% in certain village children, and sickness due to malaria at times assumed almost epidemic proportions. Careful dissections of *A. superpictus* indicated a sporozoite rate seven times greater than that of *A. gambiae* in certain malarial regions in Africa.

From the above information it is obvious that the problem of anopheles eradication in Cyprus was both complicated and urgent; nevertheless Dr. R. E. Cheverton, a former Director of Medical Services in the island, strongly believed in the possibility of obtaining the total eradication of anopheles vectors of malaria, and he therefore arranged for one of us (M.A.) to visit Egypt in 1945 and to study the campaign for the eradication of *A. gambiae* being carried out in the Nile Valley. Later Dr. F. L. Soper, of the Rockefeller Foundation,

visited Cyprus and expressed the view that there was every possibility of eradicating the anopheles from the island.

In 1946, working on this basic advice, an experimental area was chosen about 500 square miles (1,295 km.²) in extent and the species eradication carried out with vigour and with complete success; it was thus considered justifiable to extend the campaign to the whole island. Funds for the experimental work in 1946 came from the Colonial Development and Welfare Scheme. It was estimated that £310,000 would be the approximate cost of securing island-wide freedom from anopheles vectors.

Organization of Campaign

After the preliminary selection and training of staff and a comprehensive survey of breeding-places the island was divided into six districts, subdivided into 39 sections, 111 zones, and 556 blocks. One block was the area which could be covered by one man in twelve working days. A group of blocks constituted a zone under a zone officer, and a group of zones constituted a section under a section officer. Each section officer was assisted by special checkers of larvae and adult mosquitoes. Each district was under the direct administration of headquarters through the medium of the district officer, and in order that close and accurate supervision could be maintained the executive officer had under his immediate direction independent checkers, who could be sent to any district, section, zone, or block as considered advisable.

The executive officer (M.A.) was in entire charge of the whole operation, including the purchase and issue of stores, equipment, and larvicides, and the maintenance of records, and it was only necessary for him to approach the Director of Medical and Health Services in case of difficulties necessitating extra assistance and advice and to report progress.

The larvicides used during most of the campaign consisted of a 3 to 4% solution of D.D.T. in gas oil. "Malarial," Paris green, and simple fuel oil were used on certain occasions, and during 1948-9 D.D.T. and gammexane smoke were utilized in the case of buildings with high ceilings and in certain inaccessible places. Major drainage schemes were not attempted, though several marshy areas exist. Spraying was carried out with locally made or imported "fit guns," preference being given to those with a long handle.

The campaign proper started in April, 1946, with a direct attack on all breeding-places, the results being noted with particular care and the presence of one larva being sufficient to declare a block still positive. A protective zone about ten miles wide, situated between the eradication area and the rest of the island, was subjected to intense mosquito control with the object of preventing any reinfestation of the eradication area. During the winter months of 1946-7, and also in subsequent years, hibernating adult anopheles were attacked by subjecting all human and animal shelters to light treatment with D.D.T., the object being to destroy any adults and thus reduce the possibility of any widespread breeding in March and the later months.

It has to be appreciated that, as not all species of anopheles in Cyprus are necessarily frequenters of houses, search and attack had to be made in caves, both natural and artificial, tombs, tree trunks, etc., and checking could not be limited to villages and other settlements but had to extend over every part of the island. This needed both courage and ingenuity on the part of those concerned, who had on occasion to be lowered by ropes to deal with breeding- or sheltering-places which could be approached only from the perpendicular heights of cliffs or mountains.

Results

The effect of the campaign on the incidence of malaria has been remarkable. During 1944, two years previous to the opening of the scheme, 7,686 cases were reported, and this figure was reduced during 1948 to 406, of which number only three were considered to be recent infections.

In 1944 the percentages of school-children examined who had splenomegaly and parasitaemia were 32.4 and 51.9 respectively, figures which by 1948 had fallen to 10.6 and 1.3 respectively. In 1948 blood films from 655 infants (under 2 years) living in formerly highly malarious villages were examined and found negative for parasites.

At the time of writing this account not a single anopheles larva or adult had been discovered in the whole island for thirteen weeks, and it is anticipated that, apart from maintenance work, the campaign proper will end within two months.

It is not possible in a brief article to detail the numerous and unexpected difficulties which were encountered. At one stage the political situation in the Near East caused an interruption in the regular supply of oil, which for a period had serious repercussions on the task in hand. Delays also occurred in the receipt of essential larvicides and other items, but fortunately these difficulties were gradually overcome.

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THE RED CROSS UNDER REVISION

[FROM OUR CORRESPONDENT IN GENEVA]

A diplomatic conference for the establishment of new international conventions for the protection of war victims was opened in Geneva on April 21, and is expected to last for six weeks. Forty-five States, including Soviet Russia and the Vatican, are participating. The United Kingdom delegation is headed by Sir Robert Craigie and consists of representatives of the War Office, Admiralty, Ministry of Transport, Home Office, and Foreign Office. Several international organizations, including WHO, are observers. The first meeting was held at the Hotel de Ville, in the same room in which the Red Cross was established in the middle of the last century.

Three draft conventions are under consideration. Two of them, for the relief of the wounded and sick in the armed forces in the field and for the treatment of prisoners of war, are proposed revisions of the conventions concluded at Geneva in 1929. The third is a convention for the protection of civilians in time of war. All three were considered at the eighteenth International Red Cross Conference held recently at Stockholm, and now they are being critically reviewed by the representatives of Governments.

Already the United Kingdom delegation has put forward some criticisms of the International Red Cross proposals. It has suggested that certain passages in the draft convention for the relief of the wounded and sick, while appropriate to the circumstances of war as it was waged in the middle of the nineteenth century, bear no evident relation to the conditions of war usual in the middle of the twentieth century. The International Red Cross, in the view of the British delegation, appears to consider that all those who are charged with caring for the wounded and sick are outside the combatant forces altogether and can therefore be regarded as neutrals in any conflict. In fact medical services now form an integral and necessary part of the whole fighting machine, and their primary purpose is to ensure the fitness of combatant personnel to carry on the conflict. Here, of course, there is a distinction between the medical services of an army and of a humanitarian organization like the Red Cross. "The United Kingdom Government recognizes that, in the presence of wounded and sick, medical personnel should behave in the tradition of the Red Cross and should treat without distinction, except on grounds of need, the personnel of their own forces and those of the enemy." But the delegation goes on to urge that this fact should not be allowed to obscure the fundamental change which has taken place since the Red Cross emblem first appeared on the battlefield—namely, that the medical services of military forces are now organized with positive duties designed to maintain and increase the fighting efficiency of such forces. It presses strongly the view that all personnel, whether "protected" or not, falling into the hands of an adverse belligerent should be prisoners of war; that among prisoners of war all those required to care for the sick and wounded in the hands of the enemy should have the necessary freedom and facilities for carrying out their work, and that surplus doctors and nurses should be repatriated.

The draft convention for the protection of civilians in time of war is a document of 140 articles. It deals largely with the care of internees. It is laid down that every place of internment must have an adequate infirmary under the direction of a qualified doctor. Isolation wards must be set aside for contagious disease. Where special treatment, surgical operation, or hospital care is necessary, internees must be admitted to institutions where such treatment is given, and the care they receive must not be inferior to that provided for the general population. Internees, says one article, shall have the attention preferably of medical men or women of their own nationality. The costs of treatment, including those of any apparatus necessary for the maintenance of internees in good health, particularly dentures and other prostheses, and spectacles, shall be borne by the detaining power. Medical inspections of internees are to be made at least once a month, with the object of supervising their general health, nutrition, and cleanliness, and detecting contagious diseases, especially tuberculosis, malaria, and venereal conditions. These inspections are to include, wherever possible, periodical radiological examination and checking of weight. It is also provided that international standards of nutrition may be applied to the quantity, quality, and variety of food for internees, with additional food for expectant and nursing mothers and children.

This important conference has hardly yet got into its stride. The first days, as is usual in these big international assemblies, were frittered away over exasperating points on procedure, objections, validity of credentials, and admission of observers.

A HEALTH SERVICE FOR CHILDREN CHADWICK PUBLIC LECTURE

A lecture under the auspices of the Chadwick Trust was delivered at Westminster Hospital Medical School on March 22 by Dr. HELEN MACKAY.

Dr. Mackay said that a hundred years ago there were no children's hospitals in this country and general hospitals discouraged the admission of children; half the inmates of work-houses were children. Eighty years ago the forerunners of infant-welfare centres made their appearance, but not until 1924 was the first chair in paediatrics established. Nowadays every child had a doctor, but there were still some deficiencies in the service. Undergraduates received a minimum of training in child care, and were often in difficulties when confronted with the sick child. Before last July doctors in most clinics could treat minor ailments. Now in many areas they had to say that they were not allowed to do so, and the mother must take the sick baby to some overcrowded surgery or outpatient department. School medical work varied in different areas, some school doctors showing initiative, others being tied up by regulations which were not to the benefit of the child. In many hospitals there was no specially trained nurse in charge of the children's ward; in others children were scattered throughout the wards for adults; and in some hospitals wards were overcrowded with children who could have been nursed at home. The selection of cases for hospital should be controlled by doctors with experience of paediatrics.

The first essential in planning a health service for children was a well-trained staff with good facilities working as a team. A few fairly large hospitals were more economical in staff than numerous small ones. It was important to build up a small number of really adequate hospital units as quickly as the financial position allowed. Each region should have an overall plan, and the people on the spot must get together not only on principle but on detail. It was important also that the general practitioner should have adequate paediatric training. A large part of the clinical work in schools and welfare centres should be done by general practitioners interested in paediatrics, their numbers being augmented by those who took service as child-welfare and school medical officers.

Hospital Planning

The hospital service, Dr. Mackay continued, should have paediatric units in large hospitals, and regional centres for teaching and research. In most hospital areas the paediatric