

## STATUS REPORT ON MALARIA ERADICATION

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Even though malaria has been eradicated as an endemic disease from the United States for more than a decade, we still are spending somewhere in the neighborhood of \$30,000,000 a year for eradication of this disease elsewhere in the world. Relatively speaking, however, this is a minute amount to spend for such a tremendous program—and one which has such far-reaching effects on every family, community, and nation having malaria.

Most of us are familiar with the background of this world-wide malaria eradication program. Last year at the AMCA meeting in California, Dr. Louis L. Williams led a panel discussion on global malaria eradication, with participation by Roy F. Fritz, Rene Rachou, and G. Robert Coatney. It is not necessary at this time to repeat what was said there, but a transcript is available in the Proceedings and Papers of the 29th Annual Conference of California Mosquito Control Association (16 pages). Briefly, however, the United States has been active in malaria *control* work overseas principally since the early 1940's. Malaria *eradication* was started as a United States Assistance program in 1958.

During the first four years of this eradication program (1958-1961), the United States Government through the Agency for International Development (AID)<sup>2</sup> spent \$118,707,000 for malaria eradication activities. This money was expended in a variety of ways as follows:

1. American entomologists, engineers, physicians, parasitologists, and sanitarians are employed to give technical and administrative guidance to the program. Some 80 persons now utilized by AID for this

program are located in the 24 countries being assisted by the United States Government. We are always on the lookout for well-qualified persons with certain specialties and backgrounds for interesting and challenging overseas assignments which are usually two years in duration. We would be pleased to discuss this with interested individuals.

2. Training of national government personnel is an important segment of the program. Obviously, the United States Government alone, or even with other agencies, cannot accomplish eradication of malaria for all other nations. This is a self-help program and we assist where possible. For this reason, many well-trained national specialists must be available to each country having a malaria eradication program. Training may be provided particularly at United States colleges or universities, when academic coursework is indicated. However, the principal United States assistance in training is through the Malaria Eradication Training Center (METC) in Kingston, Jamaica, with another international training Center being established in Manila, Philippines. At the Jamaica METC, 280 persons from 57 countries have been trained in malaria eradication techniques since its inception in 1958. This cooperative venture between AID, the Pan American Health Organization (PAHO), and the Government of Jamaica has done much to alleviate the world shortage of both senior and junior officials for malaria programs.

3. The greatest portion of U. S. malaria program funds is expended for commodities. Although sprayers, vehicles, laboratory equipment and drug are purchased in sizeable quantities, insecticides account for the most significant portion of the budget. More than 74 million pounds of 75 percent DD Water Dispersible Powder were pur-

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<sup>2</sup> Formerly International Cooperation Administration (ICA), or Point IV program.

chased by AID during fiscal year 1961 for applying as residual insecticide to the inside of houses. This was nearly one-third of all the DDT manufactured in our country and 70 percent of its export.<sup>3</sup> The quality of the DDT formulated for this program has been exceptional. The U. S. insecticide industry should be commended for its excellent cooperation in producing a product with such high performance capabilities. Not only was 1961 a record year, both for DDT consumption and high quality, but the price has come down steadily. The most recent bids for DDT were quoted at less than 19 cents per pound, packaged in 100-pound drums, formulated according to the AID specification.

4. Local expenditures of national governments are sometimes supplemented by the United States. Although we ordinarily expect the national government of each country to bear the cost of salaries of their own personnel, as well as all other local costs, in a few cases AID has provided a portion of the local funds where programs would have collapsed due to lack of financial resources.

5. Research and development studies have been an important aspect of the AID activities. Actually, most of this work is done by the Communicable Disease Center (CDC) of the Public Health Service under a contract with AID. Two of the most significant results of this research include: (a) the development and field trial of DDVP as a residual fumigant, one of the most promising scientific breakthroughs by which the problem of resistance of adult anophelines may be partially solved; and (b) the pressure regulator disc, which maintains a constant insecticide discharge or the hand compression sprayers used in the treatment of dwellings, thereby permitting uniform application and large potential savings in insecticides. Other studies include improved packaging of insecticides,

studies of insecticide application equipment and better specifications for insecticide formulations. Additional work also has been started on the study of chemosterilants. AID is very grateful to CDC for its highly significant participation in this program.

6. Support of the World Health Organization (WHO) and the Pan American Health Organization special malaria funds has been coming principally from the United States AID budget. About 90 percent of the total WHO and PAHO funds being used at present are provided by AID. Last year, a total of \$5.5 million was contributed to these two organizations by AID in order that they could carry out their world-wide program. There is very close cooperation maintained between WHO, PAHO, and AID at all levels in the malaria eradication program. The United Nations Children's Fund (UNICEF) activities also are coordinated with those of these same agencies, in order that the most effective program possible can be carried out with the total available resources.

Granted that the ways in which AID expends its funds are important, what has been achieved by all of this? Without going into great detail and at the risk of oversimplification, suffice it to say that the participation of our government in this program has, to a large extent, made the world-wide campaign possible. In the 24 countries where AID now has malaria projects, 544,000,000 people were protected against malaria last year. The following countries had AID malaria eradication projects in FY 1961: *Africa*: Ethiopia, Liberia, Libya; *Far East*: Cambodia, China (Taiwan), Indonesia, Philippines, Thailand, Vietnam; *Near East and South Asia*: Ceylon, India, Iran, Jordan, Nepal; *Latin America*: Bolivia, Brazil, Colombia, Ecuador, Guatemala, Haiti, Honduras, Jamaica, Nicaragua, Paraguay. This is nearly one-half of the total world population which is exposed to this disease. Table 1 gives the total malaria picture as of October 1, 1961. WHO estimates that although 1,381,000,000 persons recently

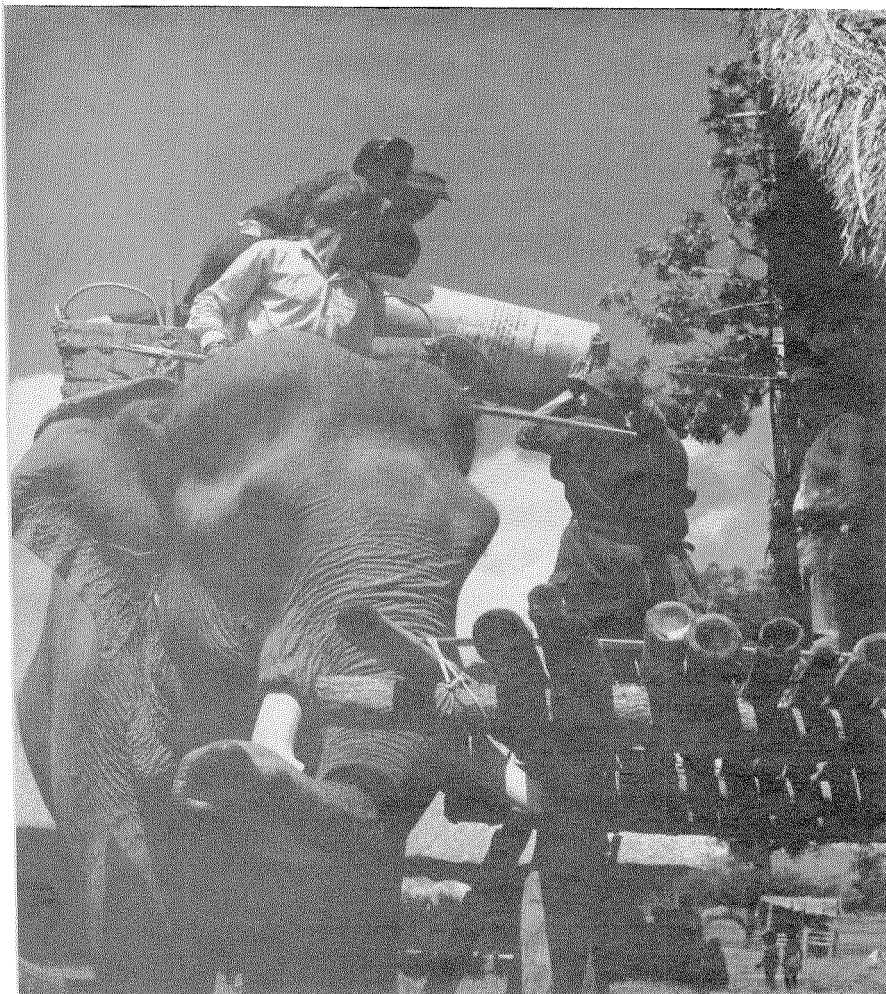
<sup>3</sup> For the year ending September 30, 1961, 71,000,000 pounds of technical DDT were manufactured in the United States and 77,000,000 pounds of this were exported as concentrates of 5 percent or higher.

TABLE 1.—Status of world-wide malaria eradication programs  
October 1, 1961<sup>a</sup>

Aid regions	Population of Areas (Thousands)								Malarious but no program
	Total population (1)	Recently malarious (2)	In maintenance phase (3)	In consolidation phase (4)	In attack phase (5)	In preparatory phase (6)	Total (col. 4-5-6) (7)	(8)	
Far East	1,040,636	211,174 <sup>b</sup>	14,215	7,285	82,629	16,620	106,534	90,425	
Near East-South Asia	652,902	590,404	4,752	33,484	427,529	101,889	562,902	22,750	
Africa	215,190	182,922	2,773	1,624	1,215	2,066	4,905	175,244	
Americas	402,706	147,438	54,765	25,007	38,196	5,338	68,541	24,132	
Europe	630,297	249,109	228,365	15,334	5,410	..	20,744	..	
Total	2,941,731	1,381,047 <sup>b</sup>	304,870	82,734	554,979	125,913	763,626	312,551	
Percent	..	100.0	22.1	6.0	40.2	9.1	55.3	22.6	

<sup>a</sup> Data from WHO Document EB29/3, Oct. 1, 1961.

<sup>b</sup> Excludes Mainland China, North Korea, Mongolian People's Republic, and North Viet Nam because no information available concerning populations living in malarious areas.



Elephant-mounted DDT spray team in Vietnam



Spraying team in Bolivia transported by boat

were subject to risk of malaria infection, only about 313 million of these still are not included in any eradication scheme. Approximately 305 million of those recently subject to risk are already living in areas where malaria is no longer endemic and where the program is now in the maintenance phase.

The job ahead is still tremendous. Even though the accomplishments have been heroic, the problems are great. Many countries, such as a large number in Africa have not yet initiated eradication programs. There are shortages of properly trained personnel, despite the above-mentioned Training Center activities. Administration is woefully inadequate in many countries and the funds available at the moment are not sufficient to finish the job.

Technical problems are serious, too.

Monkey or "simian" malaria is a possible threat which now is being studied in Malaya and other places. We believe, however, that this is not a real obstacle in most malarious areas, although it will continue to receive priority attention to determine whether transmission from monkey to man can occur in nature. Parasite resistance to the anti-malarial drugs continues and has spread to a few new areas. Brazil apparently has *Plasmodium falciparum* resistant to chloroquine, and Thailand may have a similar problem. Studies on alternate drugs are continuing. Some species of anophelines have become resistant to insecticides. Some interference with the program has occurred in Central America where *Anopheles albimanus* is resistant to DDT and dieldrin, and in southern India where *Anopheles stephensi* has developed resistance. Larviciding is being attempted

in Central America, along with studies of carbamate and phosphorus insecticides as residual adulticides. In Iran, monthly drug distribution is being used to suppress malaria in the areas of double resistance.

Technical problems will continue to arise, but we are confident that research and development studies will produce new ideas and new products to solve them. So far as administrative obstacles are concerned, they too will be eliminated by the

national and international personnel working together. Malaria eradication is being achieved in ever-expanding areas which constantly are coalescing. As these areas expand into nation-wide coverage, expert personnel are made available to work in other countries which, in turn, receive more and more attention. By continuing to give this disease high priority attention, it will be eliminated forever as a public health problem.

## WATER MANAGEMENT ON THE SALT MARSHES OF NEW JERSEY

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In New Jersey, approximately 80 percent of our control methods may be classified as "water management." Because of the economic importance of usable wetlands in our state we realize the feasibility of control in conjunction with recreation, wildlife management and the possibility of land reclamation.

Tried and tested methods over a great number of years have given us some guides for the most practical and beneficial types of control. There are several control measures used, remembering that all methods will not work on all marshes. They are listed as follows:

1. Drainage on open salt marsh.
2. Dikes and tide gates.
3. Dikes and pumps.
4. Tidal outlets.
5. Vertical drainage.
6. Dredging and filling.
7. Outlets through barrier beaches.
8. Experimental impoundment, with water level and water quality control, by the New Jersey Agricultural Experiment Station.

1. DRAINAGE ON THE OPEN SALT MARSH follows much the same pattern on all firm marshes. Most ditches are installed paral-

lel, spaced 100 to 200 feet apart depending on the soil permeability in the area to be treated. These ditches should not be more than 2500 feet long, with outlets at each end, and, if possible, they must also be connected to a band ditch which is installed at the low area of the marsh near the upland to insure circulation. This also allows the natural enemies of the mosquito to circulate throughout the entire marsh and assist in the control measures. These ditches are from 10" to 40" in width. The depth depends on the depth of the sod roots in the area concerned. Ditch size should be kept at a minimum to assure the lowest possible maintenance costs. If this procedure is followed the vegetation on the open marsh changes very little. Pollution should be separated from salt water in all cases and not allowed to spread over the marsh area. The principal reason for band ditching is to intercept upland run-off waters and keep them from covering the marsh. Secondly, they serve as a receptacle for upland weed seed and traveling vegetation, and promote greater circulation of water. This is done by separate outlets to deep water, and if necessary, by dikes.