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UNITED STATES PARTICIPATION IN A GLOBAL PROGRAM FOR MALARIA ERADICATION

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Although the Malaria Eradication concept is currently popular on a world-wide basis (Russell, 1956, Williams, 1958, Soper, 1959 MMS), Americans long have been interested in the elimination of this devastating disease both at home and abroad.

Great impetus was given to an already widespread malaria control operation carried out in many of the United States (Williams, 1937) when, in 1942, the Public Health Service established the Office of Malaria Control in War Areas (now the Communicable Disease Center) in Atlanta, Georgia. Thirteen State Health Departments, working closely with MCWA, succeeded during the next few years in reducing the incidence of malaria to a very low point in areas important to the war effort. This program was extended in 1947 to prevent reintroduction of malaria by thousands of returning servicemen infected abroad into countries where it previously had been prevalent (Williams, 1945). The new insecticide DDT was utilized because of its long-lasting lethal properties. By 1953, when Federal support of insecticide spray operations

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was discontinued, malaria endemicity had been eliminated. During the period 1942 to 1953, approximately $54 million of Federal, State, and local funds were expended on the control and eventual eradication of this disease which had been costing the U. S. almost 10 times that amount annually in sickness and loss of production. (Williams, 1941).

In any discussion of the American efforts in malaria investigation and control abroad, due credit first must be given to the pioneers of the International Health Division of the Rockefeller Foundation and of commercial enterprises such as the fruit and oil companies.

Significant U. S. government participation in international malaria control started soon after our country entered World War II and the U. S. Armed Forces began to move into many malarious areas of the world. The immediate necessity of conquering this disease soon became apparent (Cushing, 1957). Principally, through the efforts of the U. S. Department of Agriculture, DDT was available in 1943 and became our most valuable ally in this historic disease control campaign. Some of these projects (e.g. Liberia, Philippines) have been carried on continuously until now they are part of the world-wide malaria eradication program. Johnson (1955) has previously presented information to this Association regarding these programs but some of the details should be repeated here.

Assistance was also given to Latin American countries in their fight against the disease in the early 40's. Malaria had long been recognized as one of the most important communicable diseases in Latin America and many countries had initiated limited control programs. When the Institute of Inter-American Affairs, now part of the International Cooperation Administration (ICA) was established in 1942, the technical and financial support of these national malaria control programs was among the first projects developed in cooperation with IIAA in 15[2] countries of Latin America at an expenditure of $9.5 million.

The need for rehabilitation of war devastated areas was uppermost in the minds of international diplomats following World War II, and the United States strongly backed the establishment and financial support of the United Nations Relief and Rehabilitation Administration (UNRRA). UNRRA was responsible for the establishment and expansion of malaria control activities in various countries of the world in the middle 40's.

The advent of the Marshall Plan for European Recovery in 1948 and subsequent actions by the U. S. created the possibility of malaria control unprecedented in the history of the world. Technical and financial resources were available to do a thorough job. The World Health Organization (WHO) had just been founded (1947) and selected malaria as one of its principal targets. The U. S. Government, through the Marshall Plan and its successor agencies (Economic Cooperation Administration,

[2]Countries and dates initiated: 1942—Bolivia, Brazil, Ecuador, Guatemala, Haiti, Honduras, Nicaragua and Peru; 1943—El Salvador, Panama, and Venezuela; 1944—Colombia, Dominican Republic, Mexico; 1945—Costa Rica.

Mutual Security Agency, Technical Cooperation Administration, Foreign Operations Administration, International Cooperation Administration) gradually expanded its bilateral assistance to malaria control programs of the world until 1957 when it provided technical and financial assistance to 21 countries at a cost of $12 million.

The results of all these efforts were rapidly diminishing malaria incidence in the areas where the work was being carried out. In some areas, such as the United States, Puerto Rico and Italy, the work was sufficiently thorough to accomplish eradication. In others, such as Venezuela, eradication was achieved in certain areas. It was, therefore, inevitable that the concept of wide-scale malaria eradication began to develop in the minds of malariologists. A proposal to eradicate malaria from the Western Hemisphere was made in the form of a resolution at the 14th Pan American Sanitary Conference at Santiago in 1954. The following year (1955) the Eighth World Health Assembly in Mexico City considered the mounting evidence concerning the feasibility of eradication and adopted resolution WHA 8.30 which:

> 1. "REQUESTS governments to intensify plans of nation-wide malaria control so that malaria eradication may be achieved and the regular insecticide-spraying campaigns safely terminated before the potential danger of a development of resistance to insecticides in anopheline vector species materializes;
> "2. AUTHORIZES the Director-General to request those governments in whose countries malaria still exists to give priority to malaria eradication projects in their requests for assistance under the United Nations Expanded Programme of Technical Assistance, and to provide the locally available resources which are required to achieve malaria eradication;"

Following this directive, WHO has provided the organization and leadership which is stimulating countries to convert never-ending control programs to an all-out eradication effort, is coordinating the activities of all participating countries and is providing much of the technical advisory services, training of personnel, investigations of special problems, evaluation of results and other such functions necessary for world-wide malaria eradication. WHO regularly convenes Expert Committees to recommend standards and guidelines.

The United Nations Children's Fund (UNICEF) is strongly supporting this program through the allocation of approximately $10 million per year which is more than 35 percent of its total budget.

Early in 1956, the President's International Development Advisory Board studied the feasibility of eradication of malaria and in collaboration with the Public Health Service and with the help of Dr. Paul F. Russell of Rockefeller Foundation prepared a proposal that the United States Government provide technical advisory and financial assistance to a world-wide effort. It was estimated that eradication could be achieved in much of the world, although Africa, Borneo, New Guinea, the Amazon Valley and some similar areas had to be excluded from consideration at that time. The proposal was presented to Congress by the International Cooperation Administration early in 1957 (Congressional Presentation,

FY 1958). President Eisenhower gave the proposal a strong endorsement in his message to Congress on May 21, 1957, when he said, "I should like to note especially one of these anticipated requirements (for special assistance funding). I refer to a program — malaria eradication — which will appear separately in the bill proposed to the Congress but will be financed from the special assistance fund.

"Malaria is today the world's foremost health problem. Each year it attacks 200,000,000 people, bringing death to 2,000,000 and causing enormous suffering and economic loss in many areas. Today it is practicable to end this scourge in large areas of the world. I propose that the United States join with other nations and organizations which are already spending over $50,000,000 a year on anti-malaria activities . . ." The proposal received favorable consideration and the Mutual Security Act of 1954 was amended with the insertion of Section 420, as follows:

> Sec. 420. *Malaria Eradication* — The Congress of the United States, recognizing that the disease of malaria, because of its widespread prevalence, debilitating effects, and heavy toll in human life, constitutes a major deterrent to the efforts of many peoples to develop their economic resources and productive capacities and to improve their living conditions, and further recognizing that it appears now technically feasible to eradicate this disease, declares it to be the policy of the United States and the purpose of this section to assist other peoples in their efforts to eradicate malaria. The President is hereby authorized to use funds made available under this Act (other than chapter I and title II of chapter I) to furnish to such nations, organizations, persons or other entities as he may determine, and on such terms and conditions as he may specify, financial and other assistance to carry out the purpose of this section: PROVIDED, that this section shall not affect the authority of the Development Loan Fund to make loans for such purposes, so long as such loans are made in accordance with the provisions of title II of chapter II.

This legislation was backed by an authorization to utilize $23.3 million of Mutual Security funds in converting control programs then being supported by the U. S. to eradication, to undertake support of a few additional bilateral eradication programs and to provide financial support to the special malaria accounts of the World Health Organization and the Pan American Sanitary Bureau. Presidential authorization was secured during the year for the expenditure of additional funds for this purpose to make a total of $27.24 million expended on a world-wide basis (see table).

During Fiscal Year 1959, $26.2 million was expended and $32 million is available for Fiscal Year 1960 ICA assistance to 25 countries[3] and the multilateral organizations WHO and PAHO (see table).

Although the United States is the major contributing government to this global effort, financial contributions have also been made to the special malaria funds of WHO and Pan American Health Organization

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[3]Far East — Cambodia, Indonesia, Laos, Philippines, China, Thailand, Vietnam; Near East — South Asia-Ceylon, India, Iran, Jordan, Nepal; Africa-Ethiopia, Liberia, Libya; Latin America-Bolivia, Brazil, Colombia, Ecuador, Guatemala, Honduras, Jamaica, Nicaragua, Paraguay, Peru.

Table.—U. S. Government (ICA) Funding of World-wide Malaria Eradication Program Fiscal Years 1958-1960.*

(In thousands)

	FY 1958	*FY 1959*	*PLANNED FY 1960*
Far East	4,802	4,438	6,842
Near East, South Asia	12,337	11,011	13,663
Africa	451	347	689
Latin America	2,512	4,233	5,578
Admin. & Technical Support	138	176	228
WHO Grant	5,000	3,000	3,000
PAHO Grant	2,000	3,000	2,000
TOTAL	$27,240	$26,205	$32,000

*Not shown is $1.5 million contributed to the Special Malaria Fund of PAHO in FY 1957 for malaria eradication. In addition to the dollar funding shown for the individual countries, the equivalent of several million dollars is provided through the use of U. S. owned or controlled local currencies in various countries.

by 37 other countries. It is expected that several additional countries will contribute funds this year.

The financial support, exclusive of grants to WHO and PAHO, is utilized in a variety of ways for prosecution of the global malaria attack. Approximately 75 ICA specialists such as entomologists, parasitologists, epidemiologists, sanitary engineers, sanitarians and administrative personnel are utilized in the program. The greatest single expenditure, however, is for insecticides. It is estimated that more than 60,000,000 pounds of DDT 75% water dispersible powder, the principal weapon in the attack against malaria, will be purchased during 1960 by ICA. Anti-malarial drugs, particularly chloroquine, amodiaquine, pyrimethamine and primaquin are being purchased to supplement the use of insecticides. Other expenditures are for the purchase of laboratory equipment, vehicles, and hand compression sprayers.

Training is an important function of ICA support to malaria eradication projects. ICA technical specialists work closely with their counterparts in the various countries in training the large number of workers of various categories needed. In some countries, Indonesia for example, the training task is so large that it requires the full-time efforts of an American technician and of a number of nationals. Training of key national personnel generally is accomplished at one of the international malaria eradication training centers supported by the WHO, PAHO and/or ICA. One of these centers, located at Kingston, Jamaica, is supported cooperatively by the Pan American Sanitary Bureau, the International Cooperation Administration and the Government of Jamaica. Since its establishment in 1958, approximately 160 persons from 33 countries have attended courses in malaria eradication techniques. The Philippine Government has a training center in Tala, Luzon which is assisted jointly by WHO and ICA. Other international training centers where the subject matter is presented in Spanish, Portuguese, French,

Arabic and/or English languages are supported by the PAHO, or WHO jointly with national governments.

An important phase of the global program is ICA's financing of investigations of technical problems by the Technical Development Laboratories, Communicable Disease Center, Public Health Service, Atlanta, Georgia. Since the beginning of this project in 1954, valuable contributions have been made in investigations leading to 1) better specifications to insure that water dispersible insecticides will withstand the varied conditions of transport and storage without loss of potency or suspensibility; 2) improvement of the hand compression sprayer to withstand the continuous daily use in residual spraying; 3) development of a cheap, effective pressure regulator (Lonergan and Hall, 1959); and 4) development of alternate insecticides such as malathion, DDVP and others for use in areas where chlorinated hydrocarbon insecticide resistance has developed among the vectors of malaria.

As anticipated (Johnson 1956), a number of technical problems have been encountered during the slightly more than two years that ICA has been participating in the global malaria eradication effort; it is considered that none are of sufficient magnitude to prevent achievement of eradication. The most serious — insecticide resistance — has not become a critical problem. Seven species of anophelines have been reported as resistant to DDT and its analogues and 20 species are recorded as being resistant to dieldrin and BHC (A.W.A. Brown, 1959 MMS). Fortunately, the areas where such resistance occurs is limited and dual resistance (to DDT and dieldrin) occurs only in a few areas. In such areas, alternate insecticides are being given field trials and anti-malaria drugs are being utilized.

More critical to the achievement of eradication are the administrative problems. Many of the developing countries where malaria is a problem, do not have administrative organizations and procedures allowing the flexibility needed for successful operation of such an intensive time-limited program as malaria eradication. The lack of trained personnel is also a critical problem.

The final evaluation of the program, of course, is the actual accomplishments in eradication. At the end of 1959 WHO reported on the status of malaria eradication. Of the 2.8 billion inhabitants of the world, 1.3 billion live in areas which are or have recently been malarious. Malaria eradication already has been achieved in areas where 279,458,000 (21.5%) of this population reside. Malaria has been completely eradicated from 17 or probably 18 countries or other political units (Barbados, Byelorussia, Chile, Corsica, Cyprus, Gaza Strip, Italy, Latvia, Lithuania, Moldavia, Martinique, Netherlands, Puerto Rico, Singapore, Tobago, Ukraine, U.S.A., and probably Hungary.) An additional population of 63,213,000 live in areas where it is believed that eradication has been achieved but the three years of thorough surveillance needed to confirm the elimination of malaria have not yet been completed.

Active spray operations are protecting 504,949,000 people of 66 countries and such operations are planned (preparatory phase) for areas where another 137,039,000 live. In summary, it can be seen that malaria has already been eradicated or is actively being attacked in areas in which reside more than two-thirds of the population at risk. The progress achieved is truly gratifying.

At this point it is appropriate to mention a few specific examples of current operating programs, such as Taiwan, Mexico and India.

Data available at this time indicate that eradication of malaria has essentially been achieved in Taiwan, although three years of intensive surveillance without finding locally acquired cases will be required before official claims of total eradication are acceptable.

During 1950 approximately 1,200,000 cases and 12,000 deaths were attributed to malaria in Taiwan. A control program started in July 1952 with the assistance of the United States and WHO was extended to the whole island in 1953 and converted to an eradication effort in 1955. Malaria incidence was greatly reduced by these efforts and only 167 cases and no deaths were recorded for malaria in 1959. More than three-quarters of a million blood smears were examined in the search for cases. Approximately 9 million people of Taiwan live in areas where there has not been an indigenous case of malaria for three to five years and the remainder of the population live where no such cases have been found in one to two years. Taiwan is the first country of this part of the world to accomplish virtual eradication of malaria.

Prior to the eradication effort, more than 10 percent of the persons residing in malarious areas of Mexico were infected with the disease annually. After two and a half years of spray operations, less than one-half of one percent are found infected. As a consequence the Government of Mexico is now planning extensive economic development of Southeast Mexico. This was not possible prior to the malaria eradication program there.

All of the 390 million persons who live in malarious areas of India will be protected during 1960 by spray or surveillance operations. Spraying has been discontinued already due to absence of malaria transmission in areas in which reside 1.5 million people. According to Indian malariologists, epidemiological evidence indicates that spray operations can be discontinued during 1961 in additional areas containing a population of 50 million.

Some 95 countries and other political entities which still have a malaria problem are participating in the global eradication effort. In general, these countries finance the local costs of eradication and must depend upon the international agencies for those supplies and equipment which must be imported. The recipient governments are financing approximately one-half of the total cost of eradication.

Although it is not possible to predict at this time when malaria

eradication will be achieved on a global basis, a group of 12 internationally known American technical experts have recently reviewed the progress achieved to date, and the obstacles to be surmounted and have reaffirmed that malaria eradication is feasible. To accomplish this goal, however, there must be continued and expanded resources and coordination of the nations of the world.

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