Proj. No. 931 0903. (14)
PD-AAC-969-A1

AID 1025-1 (7-71) (FACE SHEET)
NONCAPITAL PROJECT PAPER (PROP)

I. PROJECT IDENTIFICATION

1. PROJECT TITLE: Grant to WHO for Malaria Control

APPENDIX ATTACHED: ☐ YES ☐ NO

2. PROJECT NO. (S.O. 1095.2): 931-11-511-903

3. RECIPIENT (specify)
☐ COUNTRY: World-Wide
☐ REGIONAL ___ ☐ INTERREGIONAL ___

4. LIFE OF PROJECT
BEGINS FY 1973
ENDS FY 1974

5. SUBMISSION
☐ ORIGINAL DATE 4/3p
☐ REV. NO. DATE
CONTR./PASA NO. ___

II. FUNDING ($000) AND MAN MONTHS (MM) REQUIREMENTS

A. FUNDING BY FISCAL YEAR	B. TOTAL $	C. PERSONNEL (1) $	C. PERSONNEL (2) MM	D. PARTICIPANTS (1) $	D. PARTICIPANTS (2) MM	E. COMMODITIES $	F. OTHER COSTS $	G. PASA/CONTR. (1) $	G. PASA/CONTR. (2) MM	H. LOCAL EXCHANGE CURRENCY RATE: $ US = (U.S. CMTE) (1) U.S. GRANT LOAN	H. (2) COOP COUNTRY (A) JOINT	H. (2) COOP COUNTRY (B) BUDGET
1. PRIOR THRU ACTUAL FY												
2. OPRN FY 1973	160											
3. BUDGET FY 1974	215											
4. BUDGET +1 FY												
5. BUDGET +2 FY												
6. BUDGET +3 FY												
7. ALL SUBQ. FY												
8. GRAND TOTAL	375											

9. OTHER DONOR CONTRIBUTIONS

(A) NAME OF DONOR	(B) KIND OF GOODS/SERVICES	(C) AMOUNT

III. ORIGINATING OFFICE CLEARANCE

1. DRAFTER: T.E.Smith/M.Mozynski	TITLE: Project Manager/Program Analyst	DATE: 3/22/73
2. CLEARANCE OFFICER: W.J.Howard, MD	TITLE: Office Director TA/H	DATE: 3/22/73

IV. PROJECT AUTHORIZATION

1. CONDITIONS OF APPROVAL

2. CLEARANCES

BUR/OFF.	SIGNATURE	DATE	BUR/OFF	SIGNATURE	DATE
PPC/	RPodol	3/22/73	GC/TA	SMevorah	
AAA/TA/PM	DMathiasen				

3. APPROVAL AAs OR OFFICE DIRECTORS
SIGNATURE: Joel Bernstein
DATE: 4/2/73
TITLE: Assistant Administrator T.A.

4. APPROVAL A/AID (See M.O. 1025.1 VI C)
SIGNATURE:
DATE:
ADMINISTRATOR, AGENCY FOR INTERNATIONAL DEVELOPMENT

931-903

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

ASSISTANT
ADMINISTRATOR

4 APR 1973

500

The Honorable Charles Edwards
Assistant Secretary for Health
and Scientific Affairs
Department of Health, Education
and Welfare
Washington, D. C. 20201

Dear Dr. Edwards:

We have reviewed the request from WHO for assistance to accelerate the completion of the epidemiological evaluation of the insecticide Fenitrothion (OMS-43).

We will be happy to make a contribution to the WHO Special Account for Health Development (Malaria) in the amount of $160,000 which we understand is the minimum amount urgently needed during this fiscal year to keep the project on schedule. The grant document is being prepared and will be forwarded to you as soon as it is completed.

We feel this project is needed for the benefit of many countries with problems of malaria and is deserving of support from other sources. We are also aware of the great effort WHO has put into the search for new and more effective insecticides and feel that a greater effort should be made to obtain contributions from many donors in order to accelerate the availability of new compounds which show promise.

Although our funds for projects of this type are very limited, we will be glad to review the project again next year in terms of status and needs and progress in obtaining other support.

Sincerely,

Samuel H. Butcher

S/r Joel Bernstein

Received 3/29/73 SHB

MEMORANDUM

DATE: March 22, 1973

TO: AA/TA, Mr. Joel Bernstein

THRU: AAA/TA/PM, David G. Mathiasen DGM *

FROM: TA/PM, Mary E. Mozynski Mary E. Mozynski

SUBJECT: Grant to WHO for Malaria Control

There are attached the following documents for your signature:

Tab A - PROP - Grant to WHO for Malaria Control

Tab B - Operational Year Budget: Program Revision Approval (OYB)

Tab C - Action Memorandum prepared by TA/H

Tab D - Letter to Assistant Secretary for Health and Scientific Affairs, HEW

The PROP will approve a two-year grant to WHO of $375,000 in support of a Malaria control program using Fenitrothion in lieu of DDT. An amount of $160,000 is required immediately for the procurement of this insecticide to assure that the spraying will begin in July 1973 as originally planned. The remainder, or $215,000 will be considered for FY 1974 funding and will be dependent on the progress made during the first year of operation and the justification for A.I.D. funding. The background and supporting justification for this grant are contained in the PROP and Action Memorandum.

PPC has requested that we process an OYB request for $100,000 to be issued with the allotment around the first week of April. The three week delay is being requested to avoid changing the control figures for the Congressional Presentation. GTS funds are available in our present allotment for the immediate signing of the grant agreement. It should be noted that of the $160,000 required, PPC included $60,000 in our current allotment of $8,262,000 which was for Malaria or other priority requirements if the Malaria grant did not materialize.

Please indicate your approval to proceed with the $160,000 grant to WHO for the Malaria program involving the use of Fenitrothion by signing the attached documents.

Attachments: a/s

* See attachment on the question bio-degradeable DDT.
-DGM

Project Narrative

Project Title	:	Grant to WHO for Malaria control
Duration	:	2 years
Estimated Cost	:	$375,000
1st year		160,000
2nd year		215,000

In July 1972 WHO initiated a 5-year program to combat the mosquito vector resistance problems encountered in many parts of the world. This program provides for an epidemiological evaluation of Fenitrothion as a residual wall spray in lieu of DDT or other insecticides. The initial phase provides for the collection of base-line data to be completed by June 1973. WHO plans to begin spraying in July followed by additional cycles every three months for two years.

WHO had originally planned to finance the total 5-year program from its own budget. However, because of currency devaluation and inflation, an additional $375,000 is required from other sources if the program is to be implemented as originally planned. Needed immediately is $160,000 for the purchase of Fenitrothion for the July spraying.

This activity is extremely important to A.I.D. as recent events emphasize the need for a new substitute for DDT. Resurgence of malaria in Pakistan has reached epidemic proportions with over 200,000 reported malaria cases in one month.

The vector mosquito in Pakistan is already resistant to DDT. The population in India living in areas where the vector mosquito is resistant to DDT and other insecticides is increasing each year. DDT is virtually useless in most of Central America. USAID Mission Directors from Pakistan and the Philippines have expressed their concern to AID/W over the threat of malaria. AID health officials for S.A. Bureau have expressed similar concern for the Indo-Chinese peninsula countries.

Another supporting factor in developing an effective substitute for DDT is that the Environmental Protection Agency or the Congress may challenge the world-wide use of DDT in the fight against malaria

and restrict or prohibit its shipment outside the U.S. This was brought out in a recent report by the Office of the General Counsel - "The Effect of the Federal Environmental Pesticide Control Act of 1972 on A.I.D.'s Use of DDT for Malaria Control". Since the U.S. is the principle manufacturerof quality DDT for Malaria control, such a restriction could seriously impede the success of the malaria program if an effective replacement is not readily available.

In the past A.I.D. has supported malaria programs in 36 countries; 26 through bilateral agreements and 10 with commodity assistance only. In addition, a malaria vaccine is being developed under a research contract. However, the actual use of such a vaccine in field programs may not materialize for five to eight years in the future. Until that time, the use of a residual insecticide will continue to be the most effective technology for malaria control and/or eradication.

WHO has requested assistance from A.I.D. to meet the short-fall of $375,000. The attached WHO budget reflects the total cost of the program and the need for the additional funds above the original budget. As stated above malaria eradication and/or control is extremely important to A.I.D. and the need for a substitute for DDT is recognized as an important ingredient to the success of future spraying programs.

TAB fully supports this WHO program for an epidemiological evaluation of Fenitrothion for use as a residual wall spray and approves the immediate grant of $160,000 for the procurement of this insecticide. The FY 1974 contribution of $215,000 will be dependent on the success of the program and the justification that additional funds are needed and should be contributed by A.I.D.

A STAGE VI/VII TRIAL OF FENITROTHION (OMS-43)

Table of contents

1. Introduction

Fenitrothion[1] (OMS-43) is an organophosphorus insecticide with residual action. The duration of residual effect for malaria control is estimated at about three months when sprayed on the interior surfaces (mud) of houses at 2g/m^2 of the active ingredient. Its record of safety to sprayers and inhabitants is good. The recent stage V trial (1969-1971) carried out in Kisumu (Kenya) showed that the use of ordinary safety measures and equipment is adequate for the safe handling and application of the 40% water dispersible powder.

At least five companies in Europe, Japan and the USA are understood to hold the patent right for fenitrothion and 40% and 50% formulations of the material in water dispersible forms are commercially available and have already been tried in a stage V trial.

2. The previous trials

Fenitrothion has already passed all but the last of the seven stages of the WHO's insecticide evaluation scheme. A stage VI trial was held in an area east of Kisumu, Kenya, during 1969-1971. The area, with a population of approximately 18,000, was sprayed four times with the 40% water dispersible powder formulations by Bayer and Sumitomo and with 50% water dispersible powder formulation by Cyanamid International; part of the area was sprayed a fifth time in 1971. Entomological evaluation showed a satisfactory control of Anopheles gambiae in the area sprayed from the first spray round until April 1971, eight months after the last spray round. Parallel to entomological studies, investigations on the safety of its use were carried out in the course of the four rounds of spraying, the first three lasting six weeks and the fourth lasting eight weeks (totalling more than 2,000 man-days of spraying). No complaints attributable to exposure to insecticide were recorded. A slight to moderate depreciation of cholinesterase activity was reported towards the end of the spraying rounds. Only two sprayers were removed from spraying due to cholinesterase levels falling below 50% of the original value. In one of the cases infection with schistosomiasis was diagnosed and was suspected as the main cause of the excessive fall of the cholinesterase. Surveillance of a sample of the village inhabitants failed to detect any effects attributable to the insecticide.

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[1] O,O-dimethyl O-(4-nitro-m-tolyl) phosphorothioate

Fenitrothion has already been tried in a stage VI/VII trial in an area in Kankiya, Western Nigeria. A 4% water dispersible powder formulation was applied during 1964-1965. The effect of the insecticide on the vector population was satisfactory but due to formulation difficulties the trial was suspended.

3. The need for a stage VI/VII trial of fenitrothion

At present there are only two replacement insecticides available for use in the areas with technical problems where vector resistance to chlorinated hydrocarbon insecticides has been encountered. Residual spraying is still the most effective, practical and economical method of attack in the malaria eradication programme. Other mosquito control methods have as yet to be assessed for larger scale application as a replacement for residual spraying.

Of the two replacement insecticides, malathion is relatively safe and costs about twice as much as DDT, but should be applied more often due to its shorter residual effect. Malathion is in larger scale use in a number of malaria eradication programmes but vector resistance has already appeared to this insecticide in some American programmes, which has excluded its use in the residual spraying in such programmes, and instead propoxur (OMS-33) has been used since 1970.

Propoxur, however, costs about ten times more than DDT and also costs more to apply due to a need for more frequent application, for protective equipment and safety measures. Vector resistance to this insecticide has already been reported in Central America.

Fenitrothion on the other hand costs about half as much as propoxur and it is expected that mass production and commercial competition will still lower appreciably the price, especially as it has been produced by at least five manufacturers in different countries. Fenitrothion at present is applied at the same frequency and dosage as propoxur using the same protective equipment and safety measures. There are however indications that the frequency of application can be prolonged to over three months. Such a possibility will be examined during the trial.

4. The proposed project

The project will combine activities of both stage VI and VII of the scheme for evaluation of insecticides. The main purpose of the project will be to make an epidemiological evaluation of the impact of fenitrothion residual spraying on malaria transmission under conditions in the project area and to

recommend regimens and operational procedures for its wide-scale use in malaria eradication and control projects.

4.1 The site of the project

The Some location with a population of 50,000 (Annex V), has already been selected. The population is relatively stable and lives in compounds scattered over the project area. There are no grouped compounds or villages throughout the area except for a few market places where a few families live and have their shops. The area is about 200 km^2 and is located about 15 kilometres to the west of Kisumu town and on the slopes north of Lake Victoria. The altitude is about 1,250 to 1,325 metres, the annual mean temperature ranges from a minimum of 14°C - 18°C to a maximum of 30°C - 34°C. The mean annual rainfall is about 700 - 1,015 mm.

The northern extremity of the Some location, a very hilly area, will be excluded and instead areas with the same number of population, from the Asembo location on the west, will be included to reduce logistic problems. In the central part of this area (treatment area) extending to the lake shores, an area with about 16,000 population will be selected where epidemiological evaluation will be carried out (evaluation area). The evaluation area will be protected from the surrounding non-sprayed area by a barrier of at least three to four kilometres width where total coverage spraying will be applied as in the evaluation area. In addition two index areas outside the treatment area will be selected, each of about 1,500 population.

The area seems to be quite homogenous and the main African malaria vector species A. gambiae (A and B) and A. funestus, are prevalent in the area.

4.2 Proposed Plan of Action

It is proposed that the treatment area with about 50,000 population will be sprayed with four rounds of fenitrothion per year at three-monthly intervals. Epidemiological evaluation including entomological studies, will be carried out before and after spraying. It is planned that geographical reconnaissance and mapping will be completed in the beginning of 1972. Concurrently preliminary epidemiological surveys will be implemented in order to determine indices of malaria endemicity and relative prevalence of parasite species. Routine parasitological surveys, consisting of :- (a) monthly infant blood surveys, and (b) a serial six-monthly survey of the 2 - 9 years age group will be carried out as soon as possible and in any case not later than 1 June 1972.

Epidemiological evaluation is expected to continue until at least six months after the completion of the last spraying round, namely until about the end of 1975.

4.2.1 Pre-operational activities (1972 - mid 1973)

Pre-operational surveys will be carried out during 1972 and the first half of 1973, before the residual spraying starts. They will consist of:-

(a) Preliminary surveys;
(b) Routine operations;
(c) The setting-up of a field station;
(d) Survey of the average sprayable area in the treatment area;
(e) Selection and training of staff, and setting-up of headquarters and field offices, and organization.

(a) Preliminary surveys

The purpose of the preliminary surveys is to complete the geographical reconnaissance and mapping and to collect some basic information on malaria endemicity and on vectors.

(i) Geographical reconnaissance and mapping

The work will start in January 1972. It will include preparation of working maps for various operations and collection of geographical reconnaissance data and numbering of houses. Survey maps at the scale of 1/50,000 for the area are available and additional copies could be obtained from the survey of Kenya. There are also available aerial photographs of the area which could be purchased from the Government Survey Office in Nairobi, each sheet costing about K £ 8. A maximum of 16 sheets will be needed to cover the area.

Tracings will be prepared at the scale of 1/12,500 each representing 3-5 km^2. From the available maps and the aerial photographs the WHO sanitarian will prepare the tracings. These will be then taken to the field by the geographical reconnaissance agents for completion of details. The tracings will be returned to the WHO sanitarian for finalization and printing.

Geographical reconnaissance including collection of census data on population and compounds, numbering of houses, assignment of house cards, etc., will be carried out concurrently by the geographical reconnaissance agents. At present there exist in the project six trained mappers and geographical

reconnaissance agents. They will be given refresher training and assigned to work under the supervision of a second WHO sanitarian, to be assigned to the project temporarily for a period of about three months. In numbering of houses a suitable standardized sequence will be followed. Such a sequence may be shown on the tracings when they are prepared and will be adjusted as they are being completed in the field. It is estimated that each agent will complete each week mapping and geographical reconnaissance in an area of 3-5km^2, with six agents a maximum of ten weeks will be needed to complete the project area including the two index areas. 50 working maps are expected to be prepared. The geographical reconnaissance and mapping may start from the east and progress westwards. Each agent will be assigned to one sector of 3 - 5 km^2 located next to each other to facilitate supervision.

The geographical reconnaissance and mapping is expected to be completed at the latest by the end of April 1972.

In addition to the six existing agents there will be a need for six other agents and six labourers/painters to join the mappers, and constitute six complete geographical reconnaissance teams. A national draftsman is essential and should be recruited as a permanent staff member. As soon as possible Government should be requested to nominate a suitable candidate for training. He could gradually take over the preparation of tracings and allow the WHO sanitarian to devote more time to field supervision.

(ii) Preliminary parasitological survey

A blood survey is planned to be carried out concurrently with the geographical reconnaissance and mapping. The objective of the survey will be to obtain quickly, data on malaria prevalence in the treatment area. About 20 schools have been selected in coastal and hilly areas and around water courses or in arid areas where blood slides will be collected from the school children. In addition blood slides will be collected from the general population in the surrounding compounds. 50 blood slides (thin and thick films) will be collected from each school and 25 or more from the population in the neighbouring compounds. In all a total of 1,000 to 1,500 slides are expected to be collected from the treatment and index areas. The WHO technician will tour the schools and surrounding area and collect slides at the rate of about one school and the surrounding compounds per day. 20 working days or a month is estimated to be required to complete the collection

of blood samples in the area. It is expected that another month will be required for examination of slides and recording of the results, unless assistance of the Medical Research Council could be ensured for the slide examination.

(iii) Entomological studies

Entomological studies will begin in January 1972 and will be carried out on a routine basis from February 1972 onwards, for a full year, in the same 20 - 21 stations selected for the preliminary parasitological survey.

Day-time investigations, including pyrethrum spray collections, larval surveys, outside resting collections, and the determination of sporozoite rate, parous rate and trophic preferences will be carried out in each station on a monthly basis.

Night-time investigations, including night biting and exit trap collections, will be carried out in each station on a two-monthly basis.

At the end of the pre-operational activities the most representative of these 20 - 21 stations will be selected and followed up until the end of the Stage VI/VII trial.

The detailed programme of entomological investigations during the pre-operational period is given in Annex III. These investigations will require (including provision for annual leave and sickness), the participation of the present WHO entomological staff and the seven supervisors and laboratory assistants, two to three drivers and 15 to 17 mosquito collectors.

(b) Routine operations

These will be started not later than in June 1972 and consist of:

(i) demographic survey and up-dating of geographical reconnaissance data and mapping;
(ii) monthly infant blood surveys;
(iii) six-monthly blood surveys in a selected sample of the population of the 2 - 9 years age group;
(iv) examination of blood slides and recording of the results;
(v) entomological investigations.

(i) Demographic survey and up-dating of geographical reconnaissance and mapping

This will be carried out monthly in combination with the monthly infant blood surveys. The agents assigned to sectors of the evaluation area for

monthly collection of blood slides from infants will also bring up-to-date geographical reconnaissance data and maps. A compound record card will be used for recording movement of people and up-dating the census of the population.

(ii) Monthly infant blood surveys

The blood slides will be collected monthly in the evaluation and index areas from all infants below the age of 12 months - the infants becoming positives will be discarded from subsequent surveys. To allow the collection of pre-operational base-line data, the infant blood survey will be initiated not later than in June 1972; this will permit the assessment of the monthly level of transmission in a non-immune population in the absence of any attack measures. The post-operational infants survey will permit the level of residual transmission to be measured.

Assuming that all infants in the evaluation and index areas will be examined monthly, and that the number of infants at any given time will be 3% of the total population, it is expected that about 570 slides (420 in the evaluation area of 16,000 population, plus 90 in the index areas of 3,000) will be collected and examined every month from the infants.

A survey agent is estimated to visit 20 compounds per day of 154 persons (7.7 persons per compound). This means that there will be a need for 132 mandays or seven agents, to cover monthly (20 working days per month) the entire population of 19,000 in the evaluation and in the index areas (16,000 plus 2 x 1,500). The agents will tour monthly the compounds in the sector assigned to each of them and collect blood slides from all the infants. At the same time they record the changes in the census and GR data and up-date working maps. Particular attention will be given to the movement of the population during the month as those individuals who have left the evaluation area will be recorded and this information will be considered in the final evaluation.

(iii) Six-monthly blood surveys of the age-group 2 - 9 years

In the evaluation and index areas, children of 2 - 9 years will be examined every six months for parasite rate assessment. These surveys will be carried out during one of the non-spraying months. The size of the sample to be examined will vary according to the expected parasite rate as indicated in Table 1 (WHO/MAL.68.653) (Annex X).

Prior to first spraying in July 1973, it is expected that at least two pre-operational parasite surveys will be carried out possibly in June and December 1972. In each of these surveys 2,000 blood slides will be taken in the evaluation area and 900 in the index area. Following the first spraying coverage of the area, the size of the sample to be examined will be determined according to the expected level of the parasite rate (Annex I). The duration of each survey will be about one month.

Blood films (thick and thin film on the same slide) will be collected through compound by compound visits in order to ensure that the largest proportion of the sample due to be examined is covered. Each donor will be recorded by name, age and sex, the compound being recorded by the GR number. Blood will be taken from the ball of the cleaned third finger of the left hand, counting from the thumb. With infants the large toe will be used. A sterile disposable needle will be used and the thickness of the thick film will be maintained at standard by constant direct supervision.

A thin film will be made on the same slide for labelling purposes and examination, if required. The thin film will be made in the normal way by spreading a very small drop of blood along the slide using the next clean slide as the spreader. After collection and drying the blood film will be sent to the laboratory together with a copy of the recording forms. The methodology for blood filming is detailed in the Manual for Processing and Examination of Blood Slides in MEP (WHO, Geneva, 1961).

(iv) Examination of slides

During the first half of 1972, three qualified candidates should be selected for training as microscopists to work under the supervision of a WHO laboratory technician who is expected to be assigned to the project in July 1972. Each laboratory technician is expected to examine 750 blood slides per month (each blood slide to be examined for 200 thick films) or 2,250 blood slides for the three technicians. It is expected that the number of slides to be collected during 1972 and 1973 will be below the expected output of the laboratory theoretical output of work. However the process of developing a reliable technician is long. It will be necessary at least during the first two years to closely supervise their work and therefore their output is expected to be less than the optimum average.

Blood slides will be stained with Giemsa according to the methodology described in the Manual for Processing and Examination of Blood Slides in MEP (WHO, December 1951).

In the examination for malaria parasites only the thick film will be examined as a routine. During the first preliminary survey 100 fields will be examined, whereas during routine blood surveys 200 fields will be examined in all blood slides collected.

The densities of malaria parasites (per species and stage) will be assessed by categories in relation to the standard number of thick fields examined.

(v) Entomological investigations

The entomological activities carried out on a regular basis, during the pre-operational period will be identical to those described under 4.2.1 (a) (iii). The activities can be modified or reduced in relation to development in the epidemiological situation.

(c) The setting-up of a field station

To reduce the operational costs and transport requirements it is proposed to set up a field station at a central location in the treatment area. The station should be accessible by all-weather roads and should have communications and other living and working facilities. Availability of water is an important factor in the selection of the site. A suitable location seems to be Kombewa where the only dispensary in the area is located and where a permanent water source exists. Kombewa is about 30 kilometres from Kisumu and is connected to Kisumu by the main road. Suitable offices and storage spaces are not available and should be provided. A pre-fabricated four-roomed building costing about KE 700 is considered adequate and can be constructed in about three weeks time. In addition, provision for a water supply and waste disposal system should be made. Once the field station is set up locally recruited labour and field staff can be hired, trained and assigned to work. This will dispense with the need for transporting staff daily from Kisumu to the field, and back.

(d) Survey of the average sprayable area in the treatment area

The purpose of this survey is to determine the average sprayable area per

compound so as to enable a correct computation of the amount of insecticide required and a check on any over- or under-consumption. For this purpose, an adequate sample of compounds should be selected and measured by the surveyors. The size of the sample and procedure for measuring is described in the geographical reconnaissance manual pages 78 to 96. The survey can be carried out as soon as geographical reconnaissance is concluded or as soon as staff are available. It should be completed before the start of spraying in July 1973.

(e) Selection and training of staff, and setting-up of headquarters and field offices, and organization.

The staff, supplies, equipment and transport requirements are listed under 5, Requirements and costs. It is essential that in accordance with the timetable all the requirements are processed in time so that no delay in the execution of operations occurs. Of utmost importance is the selection, recruitment and training of the necessary staff, which requires contacts with the national authorities. It is also important that the supplies, equipment and transport required are ordered sufficiently in advance so that their timely arrival and assignment to the project is not unduly delayed. Provision should be made for adequate storage spaces for insecticides, spraying equipment and other project requirements, both in Kisumu and at the field station. Contacts should be made with the Government as early as possible to secure the adequate storage space.

4.2.2 Spraying and evaluation operations (mid 1973 - mid 1975)

As of July 1973 the regular operations will commence in the project area. These operations will include (a) spraying operations, (b) epidemiolgical evaluation, and (c) entomological investigations.

(a) The spraying operations

The first round of spraying will be applied during July - August 1973. The records of the last 28 years of rainfall in the Kisumu area is presented in Annex IX. From this it can be seen that the greater rainfall is during March - June, and that July-August, October-November and January-February are the months of lower precipitations, and thus most suitable for spraying operations. There are no data to indicate that the period of higher rainfall namely March-June, is related to a period of higher transmission. The data on malaria

cases collected from the dispensary in Sema, though based on clinical diagnosis, nevertheless shows a lower number of malaria cases during June (13% of all patients) than during July (17%) and December (25%).

During 1973 two rounds of spraying will be applied at three-monthly cycles, each round lasting about two months (July-August and October-November). The month of September will be used for the carrying out of the six-monthly parasite survey of the 2 - 9 years age group and the month of December for repair of transport and equipment, and for other necessary preparations for the spraying operations.

The spraying will be carried out at 2g/m^2 of the actual fenitrothion applied as a 5% suspension (the actual ingredient) of the wettable powder formulation. The dosage and frequency of application may be changed as of the second year following the results of the epidemiological evaluation.

The interior of all structures, including walls, ceilings, poles, underneath furniture, behind doors and windows, will be sprayed, except for the granaries, the underneath of which only may be sprayed. Simultaneously cattle sheds and other covered spaces or huts should be sprayed. The exterior of doors and windows and underneath of eaves should be sprayed.

The Hudson X-pert sprayer provided with pressure regulator and HSS 8003EC nozzle tips will be used. The pressure regulator will be set at about 1.26 kg/cm^2 (18 psi). At this pressure the nozzle tip will produce nearly the standard discharge rate of 757 cc/minute, and therefore no changes in the standard speed of spraying (18.9 g/m^2/min.) will be necessary.

Every week on Saturdays, all the sprayers will be recalibrated at the field station and the pressure regulators will be readjusted. Nozzle tips will be replaced only when the spray pattern deteriorates. To check this a sample of about 10% of the nozzle tips will be tested each week for distribution pattern.

The insecticide will be weighed in advance and bagged each for one pump charge. All the spraying equipment and supplies will be distributed to the field and sub-stations in advance of spraying so that no delay will occur in the execution of the operations.

Working procedures and field organization

The 50,000 population to be covered are estimated to live in 7,000 compounds and experience in the previous project area demonstrated that the

spraying can be done at five compounds per man-day spraymen. There will be a need therefore for 35 spraymen to spray the entire area in two months time, or in about 40 operational days. There will be also a need for 12 squad chiefs at the rate of one for each three spraymen, three field inspectors, and one operational assistant.

The spraymen should be carefully selected from amongst physically fit individuals from the area and trained for at least one week, not later than during June 1972. Squad chiefs and field inspectors should also be recruited in advance and receive about a month of training in spraying techniques, in care and repair of spray equipment and in safety measures.

Work assignments for each squad and each sprayman will have to be prepared in advance, and for better supervision the squads and the spraymen should work in nearby compounds. If the compound is large enough, a squad should work together in the compound, otherwise in two nearby ones. If all spraymen work in one compound they should each be assigned a number of huts which they will mark upon completion.

For transportation, spraymen and squad chiefs will use their private bicycles for which they will receive an allowance. To expedite operations some squads may use Land Rover Pickups on the main roads and to the nearest point where spraying operations are to take place. For this for every two squads one Land Rover Pickup will be necessary. These in addition to the existing truck is considered to cover sufficiently the requirements.

The mixing of insecticide will be done by the spraymen and where water is not available, provision should be made for transportation of water from the field station. It is advisable that, in the morning, the spraymen carry water in their sprayers so that the first charge can be made immediately.

Advance notice should be given to the compound owners by field inspectors and operational assistants. At the same time the inhabitants should be instructed on the safety measures that should be followed and on the removal of furniture and food-stuff from the huts.

Supervision should be both direct and indirect. Squad chiefs should supervise the spraymen directly and correct their spraying technique and watch that the spraying equipment is in proper condition and the setting of the pressure regulator is not altered. They should also supervise directly the mixing of the insecticide and see that the recommended safety measures are

followed by the spraymen and the inhabitants. They should keep records of sprayed compounds and huts and those that have not been sprayed or partially sprayed. The field inspectors and operational assistant will help the squad chiefs in direct supervision and will carry out indirect supervision.

Toxicological studies and safety precautions

1. Shortly before the start of spraying operations, estimation of the cholinesterase levels should be made of the field staff and a sample of village inhabitants. The tests are to be repeated during and after spraying in accordance with the protocol to be developed later by the toxicologists.

2. All staff should undergo intensive training on the use of safety measures and equipment. An intensive programme of health education, including safety aspect should be carried out in the villages prior to spraying.

3. Physically unfit men should not be recruited for field and bagging operations. Also those showing low haemoglobin levels should be excluded.

4. The insecticide bagging should be done with care and in adequately ventilated premises.

5. The spraymen, mixers and baggers should use the special safety equipment recommended. They should also be provided with washing facilities so that they can wash at intervals as necessary. They should not eat, drink or smoke during the working hours.

6. All huts to be sprayed should be emptied of all moveable furniture and possessions, cooking utensils, food and water. Granaries should not be sprayed.

7. Working hours should not exceed five hours a day at least during the first round of spraying.

8. All headmen and staff should be instructed in the technique of artificial respiration, including the use of mouth-to-mouth resuscitation, and how to use an automatic atropine injector.

9. Supervision should be complete and strict in the field as well as during bagging operations.

(b) Epidemiological evaluation

This will include activities already described under 4.2.1 (b) "Routine operations", namely: (i) demographic survey and up-dating of geographical

reconnaissance and mapping, (ii) monthly infant blood surveys, (iii) six-monthly blood surveys of the age-group 2 - 9 years, (iv) examination of slides.

While there will be no change in the procedures of the monthly infant blood surveys, nor in its requirements, the six-monthly blood survey will be extended to a larger sample of the population in accordance with the rate of decline of the parasite rate.

In the evaluation areas the parasitological surveys proposed under (ii) and (iii) will be carried out till the parasite rate in the age group 2 - 9 years decreases to about 3% - 4%. At this rate and lower the methods suggested are not sensitive enough and it would be necessary to set up a system of malaria case detection for the epidemiological evaluation.

In the early stages of post spraying period the evaluation of the impact of OMS-43 on malaria will be based on:

- the slope of fall of the six-monthly parasite rates among the age group 2 - 9 years (first one to take place in September 1973)
- on the monthly infant parasite rates. The percentage of new infections to the total number of infants examined and previously found negative will permit the establishment, on a monthly basis, of the rate of residual malaria transmission.

Similar parasitological surveys will be carried out in the index areas to permit the follow-up of changes in the epidemiological situation under natural conditions.

There will be no change in the requirements nor in the methodology of laboratory work during the period 1973-1974 as compared to those previously described for 1972. The increased number of slides especially in 1974 is expected to be handled by the three national and one international microscopists. The demographic survey will be continued as before by the personnel engaged in the infant blood surveys.

(c) Entomological investigations

Entomological studies during this period will consist of monthly investigations in fixed catching stations, supplemented by random surveys in other parts of the evaluation area. Three of the fixed catching stations will be in index-untreated area and seven in the evaluation area.

Day-time investigations will include pyrethrum spray collections in ten fixed and ten random catching stations, outside resting collections, and when needed, larval collections. Bio-assays of treated surfaces will also be carried out in fixed and random stations, using preferably laboratory bred females A. gambiae "A".

Night biting and exit trap collections will be carried out in each fixed catching station. Random night biting collections in other stations of the evaluation area could be planned, if needed, at the rate of one to two random stations per month.

The detailed programme of entomological investigations during this period is given in Annex IV. These investigations will require, (including provision for annual and routine sickleave), the participation of the present WHO entomological staff and the seven supervisors and laboratory assistants, two to three drivers and about 15 mosquito collectors.

4.2.3 Post spraying observations and follow-up activities

The last spraying round will be completed in May 1975. It is considered essential that the evaluation activities will continue for at least until the end of 1975 in order to record changes in endemicity and in vector population. At the end of 1975 and based on the results of epidemiological evaluation, a decision will be made as to whether the observation period is to be extended for a further period of time. The evaluation operations during the second half of 1975 will be essentially a continuation of the evaluation activities of the spraying period. These however may need to be modified and reduced towards the end of 1975 and in case an extension into 1976 is decided upon.

Whether an extension is decided upon or not, some antimalaria measures need to be planned so as to provide protection to population in the treatment areas and to avoid a resurgence of malaria amongst the inhabitants. The Government, at the completion of the project may wish to continue anti-mosquito activities using possibly other suitable residual insecticides, especially as trained personnel and some facilities will be available for this purpose. Otherwise a system of administration of antimalaria drugs through Government services and the on-project staff can be planned instead.

	Qu. or No.	US $
6 x $3,000/Land Rover Pickup = $18,000		
In addition at least one Pickup will be needed for use by the WHO sanitarian and the operational assistant. It can serve also as a reserve ($3,000)		
Total requirement 7 Pickups at $21,000	7	(21,000) (available)
b) Parasitological surveys		
One Land Rover Station Wagon is needed for the operational assistant to collect slides and for the WHO technicians to supervise the work and to carry out epidemiological investigations ($3,000)	1	(3,000) (available)
The agents (for infant survey) use motorbikes. 7 agents using each one motorbike and three for reserve (or 10 x $150 = $1,500)	10	1,500
The agent (six-monthly survey) will use transport of the spraying operations during the non-spraying months.		
c) Entomological investigation		
3 Land Rover Pickups will be needed which will be marked and used specifically for various entomological investigations, 3 x $3,000 = $9,000.	3	(9,000) (available)
d) The Project Leader and administration need one Land Rover Station Wagon ($3,000)	1	3,000
The available transport and needed replacements		
At present the project has, or has ordered, 10 vehicles:		
Land Rover Pickups — 2 (3 months old)		
Land Rover Pickups — 3 (ordered, available beginning 1973)		
Land Rover Pickups — 4 (more than 6 years old)		
Truck — 1 (more than 6 years old)		
Total — 10		
The truck is in good condition, very low mileage, and can be used for hauling supplies and for transportation of at least four squads and thus together with the two available (new) and 3 ordered Pickups will suffice the spraying needs, (7 Pickups). The available 4 old Land Rovers will be used as long as possible and one new Station Wagon will be bought to make up the balance. Four replacements may have to be ordered for 1973.	4	12,000
e) Spare parts and tyres at 10% of the total cost/year		12,000
Total 5.2.3		$ 28,500

	Qu. or no.	US $
5.2.4 Laboratory supplies and equipment		
a) Parasitological laboratory		
4 Olympic microscopes (4 x $270 = $1,080). These will be required - have already been ordered and expected to be available in the first half of 1972.	4 (available)	1,080
b) Entomological laboratory		
All the equipment required is available (some replacements and parts may be needed)	-	-
c) Laboratory supplies		
These are estimated at about $500/year or 4 x $500 = $2000	-	2,000
Total 5.2.4.	-	2,000
5.2.5 The shipping cost estimated at 25% of the total value Total 5.2.5.	-	48,300
Total Imported commodities		$ 239,800
5.3 Personnel		
5.3.1 International staff		
The international team will consist of one team leader, one entomologist, one sanitarian and two laboratory technicians (parasitology, entomology) $100,000/year or $400,000 for 4 years)	5	400,000
Consultant (epidemiologist, toxicologist, etc.) estimated at about $15,000/year or $60,000	-	60,000
Duty travel	-	1,000
Total 5.3.1.		$ 461,000

5.3.2 National staff

		K £
a) Spraying and 6-monthly blood survey		
Spraymen (x 35) x 8 months x 350 shillings*/month x 2 yrs.	35	7,000
Helpers (x 12) x 8 months x 250 sh./month x 2 years	12	2,400
Squad chiefs (x 12) x 24 months x 300 sh./month*	12	4,320
Field inspectors (x 3) x 42 months x 350 sh./month	3	2,205
Operational asst. (x 1) x 42 months x 400 sh./month	1	840
Driversman (x 1) x 42 months x 350 sh./month	1	735
Pump repairman (x 1) x 24 months x 250 sh./month	1	300
Incidental labour (x 2) x 42 months x 250 sh./month	2	1,050
b) Infant blood survey		
Survey agents (x 7) x 42 months x 300 sh./month	7	4,410
c) Microscopists (x 3) x 42 months x 300 sh./month	3	1,890
Laboratory cleaner (x 1) x 42 months x 250 sh./month	1	525

* wages include a bicycle allowance

		Qu. or No.	K £
d)	Entomological investigation		
	Lab. & field asst. (x 7) x 42 months x 300 sh./month	7	4,410
	Mosquito collectors (x15) x 42 months x 250 sh./month	15	7,875
e)	Administration and recording		
	Chief Clerk (x 1) x 42 months x 350 sh./month	1	735
	Clerks and secrs. (x 3) x 42 months x 300 sh./month	3	1,890
	Drivers (x 11) x 24 months x 450 sh./month	11	5,940
	Drivers (x 8) x 18 months x 450 sh./month	8	3,240
f)	Incidental personnel		
	The sum provided is for recruiting personnel of all categories mainly to help in 6-monthly surveys during observation period (1.7 - 30.12.1975) and for the extension of the present staff and other incidental activities, e.g. training.		2,500
g)	A lump sum estimate - contingency fund for the local personnel - costs during the pre-operational period (up to 1.7.72)		3,500
	Total 5.3.2.	K£	55,765
	or	US $	156,142
	Total - Personnel - 5.3	US $	617,142
5.4	Local supplies, equipment utilities and running costs including maintenance and repair of transport and provisions for the first half of 1972.	K£	16,000
	Total - Local Supplies - 5.4	US $	44,800
	Grand total requirement $901,742	or US $	902,000
	+ 10% contingencies		98,000
		US $	1,000,000
	To be deducted K£ 3,000/year or K£ 12,000 (government contribution) or US $ 33,600	US $ 33,600	
	WHO already allocated for each year, 1972 and 1973, US $ 145,242 and $ 148,735, respectively. Provided the same annual contribution will be forthcoming during 1974 and 1975 it will represent $ 591,450	US $ 591,450	625,050
	or a total requirement of	US $	374,950
	or	$	375,000

(1 K£ = US $ 2.8)

Table 1

BREAKDOWN OF ANNUAL REQUIREMENTS (IMPORTED COMMODITIES)
1972 - 1975

Type	1972		1973		1974		1975		Total	
	Qu. or No.	US $	Qu. or No.	US $	Qu. or No.	US $	Qu. or No.	US $	Qu. or No.	US $
5.2 Imported Commodities										
5.2.1 The insecticide Fenitrothion 50% w.d.p.	4CMT	80,000	4CMT	80,000	-	-	-	-	8CMT	160,000
5.2.2 Nozzle tips & spare parts	200	500	200	500	-	-	-	-	400	1,000
5.2.3 Transport										
a) Spraying Pickups	7	available	-	-	-	-	-	-	-	-
b) Infrnt surveys Pickup	1	available	1	3,000	-	-	-	-	2	3,000
Motorbike	10	1,500	-	-	-	-	-	-	10	1,500
c) Entomological investigation Pickup	3	available	3	9,000	-	-	-	-	6	9,000
d) Project leader Station wagon	1	3,000	-	-	-	-	-	-	1	3,000
e) Spare parts	-	3,000	-	3,000	-	3,000	-	3,000	-	12,000
Total cost Transport	-	7,500	-	15,000	-	3,000	-	3,000	-	28,500
5.2.4 Lab.supplies & equipment										
a) Microscopes	4	available	-	-	-	-	-	-	-	-
b) Entomological	-	-	-	-	-	-	-	-	-	-
c) Lab.supplies	-	500	-	500	-	500	-	500	-	2,000
5.2.5 Shipping cost		12,075		12,075		12,075		12,075		48,300
Total cost imported commodities		100,575		108,075		15,575		15,575		239,800
5.3 Personnel										
5.3.1 International staff	5	115,250	5	115,250	5	115,250	5	115,250	5	$461,000

560,00

Table 2

BREAKDOWN OF ANNUAL EXPENDITURES (1972-1975)

Type	1972 (Jul-Dec)		1973		1974		1975		Total	
	Qu. or No.	K £	Qu. or No.	K £	Qu. or No.	K £	Qu. or No.	K £	Qu. or No.	K £
5.3.2 National personnel										
a) Spraying operations										
Spraymen	-	-	35	1,750	35	3,500	35	1,750	35	7,000
Helpers	-	-	12	600	12	1,200	12	600	12	2,400
Squad chiefs	-	-	12	1,055	12	2,210	12	1,055	12	4,320
Field insp.	3	315	3	630	3	630	3	630	3	2,205
Opera. asst.	1	120	1	240	1	240	1	240	1	840
Draftsman	1	105	1	210	1	210	1	210	1	735
Pump repairman	-	-	1	75	1	150	1	75	1	300
Incidental labour	2	150	2	300	2	300	2	300	2	1,050
b) Infant surveys										
Survey agents	7	630	7	1,260	7	1,260	7	1,260	7	4,410
c) Microscopists	3	270	3	540	3	540	3	540	3	1,890
Lab. cleaners	1	75	1	150	1	150	1	150	1	525
d) Entomol. inv.										
Lab. & field assists.	7	630	7	1,260	7	1,260	7	1,260	7	4,410
Mosquito coll.	15	1,125	15	2,250	15	2,250	15	2,250	15	7,875
e) Admin. & records										
Chief clerk	1	105	1	210	1	210	1	210	1	735
Clerks & secs.	3	270	3	540	3	540	3	540	3	1,890
Drivers	8	1,080	8&11	2,565	8&11	2,970	8&11	2,565	8&11	9,180
f) Incidental personnel		625		625		625		625		2,500
g) Contingencies		3,500		-		-		-		3,500
Total national pers.	K£	9,000		£14,260		£18,245		£14,260	K£	55,765
Total national pers.	US$	25,200		$39,928		$51,085		$39,928	US $	156,142
Total personnel	US$	140,450		$155,178		$166,336		155,178	US $	617,142
5.4 Local costs	K£	3,000		K£ 4,000		K£ 5,000		£ 4,000	K£	16,000
	US$	8,400		$ 11,200		$ 14,000		$11,200	US $	44,800
Grand total	US$	249,425		$274,453		$195,911		181,953	US $	901,742

TABLE 1.** RECOMMENDED SIZES OF SAMPLES WHEN MAKING COMPARISONS OF SUCCESSIVE PARASITE RATES AT SIX-MONTH INTERVALS[1]

(5% probability level of statistical confidence)

1st sample[2]		2nd sample[2]		3rd sample		4th sample		5th sample	
PR%	N_1	PR%	N_2	PR%	N_3	PR%	N_4	PR%	N_5
90	(25)	36.0	(455)	14.4	1 070	5.8	4 930	2.3	6 590
85	(35)	34.0	(495)	13.6	1 140	5.4	5 230	2.2	6 980
80	(50)	32.0	(540)	12.8	1 220	5.1	5 580	2.0	7 430
78.125	(55)	31.25	(560)	12.5	1 260	5.0	5 720	2.0	7 610
75	(80)	30.0	(415)	12.0	2 250	4.8	3 050		
70	(110)	28.0	(460)	11.2	2 420	4.5	3 290		
65	(140)	26.0	(510)	10.4	2 630	4.2	3 550		
60	(170)	24.0	(565)	9.6	2 870	3.8	3 860		
55	(210)	22.0	(635)	8.8	3 150	3.5	4 240		
50	(255)	20.0	(715)	8.0	3 480	3.2	4 680		
45	(315)	18.0	(815)	7.2	3 900	2.9	5 230		
40	(385)	16.0	(940)	6.4	4 420	2.6	5 900		
35	(475)	14.0	1 100	5.6	5 080	2.2	6 780		
31.25	(560)	12.5	1 260	5.0	5 710	2.0	7 620		
30	(415)	12.0	2 260	4.8	3 040				
28	(460)	11.2	2 440	4.5	3 270				
26	(510)	10.4	2 640	4.2	3 540				
24	(565)	9.6	2 890	3.8	3 840				
22	(630)	8.8	3 170	3.5	4 210				
20	(715)	8.0	3 520	3.2	4 650				
18	(810)	7.2	3 940	2.9	5 190				
16	(935)	6.4	4 460	2.6	5 860				
14	1 100	5.6	5 140	2.2	6 720				
12.5	1 250	5.0	5 780	2.0	7 530				

[1] For each sample the first column shows the expected general parasite rate (PR%) and the second column the recommended corresponding sample size (N).

[2] In practical use of the table all sample sizes shown in brackets should be replaced by 1000.

TABLE 1. RECOMMENDED SIZES OF SAMPLES WHEN MAKING COMPARISONS OF SUCCESSIVE PARASITE RATES AT SIX-MONTH INTERVALS[1] (continued)

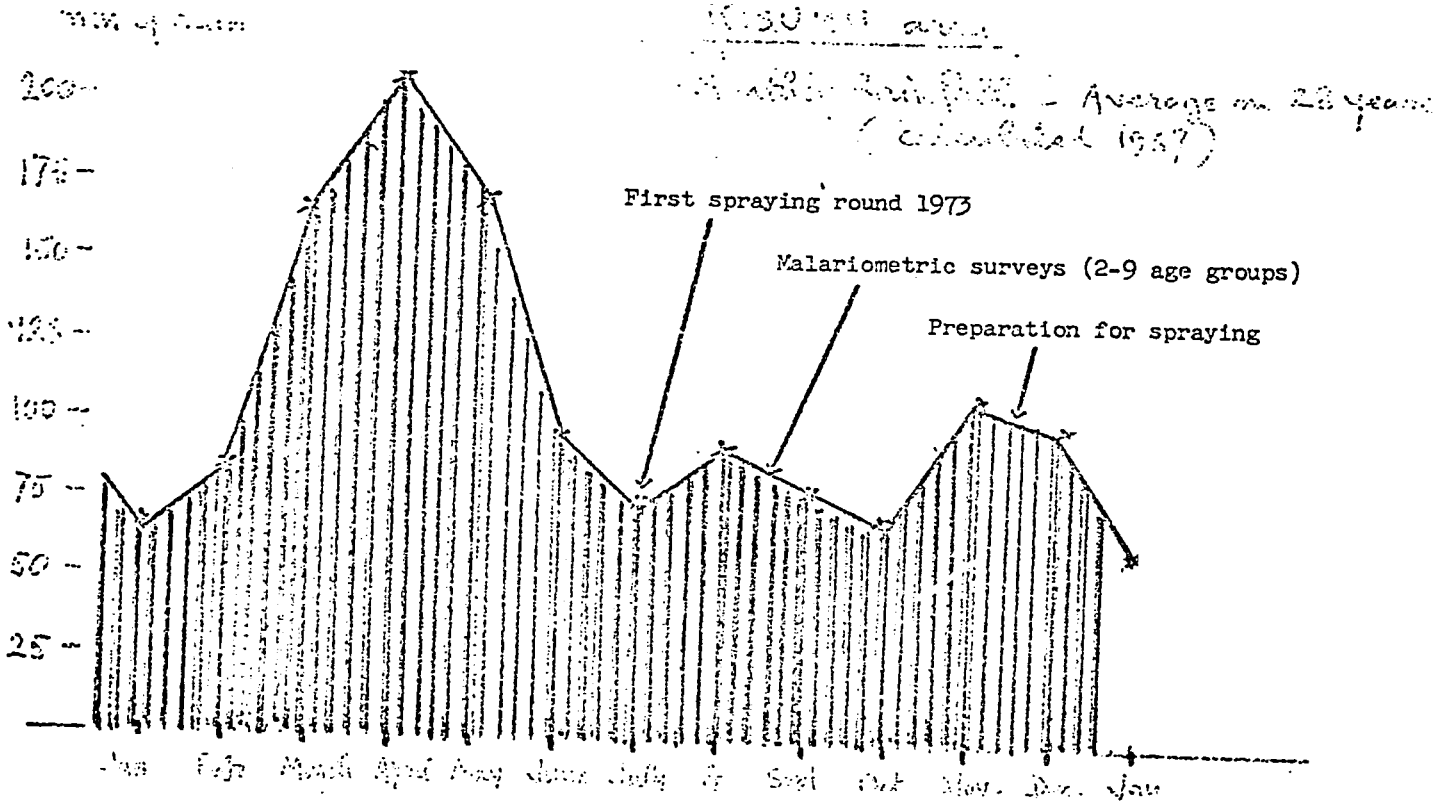
(5% probability level of statistical confidence)

1st sample[2]		2nd sample[2]		3rd sample		4th sample		5th sample	
PR%	N_1	PR%	N_2	PR%	N3	PR%	N_4	PR%	N_5
12	2 200	4.8	3 090						
11	2 430	4.4	3 390						
10	2 690	4.0	3 750						
9	3 020	3.6	4 190						
8	3 430	3.2	4 740						
7	3 950	2.8	5 440						
6	4 650	2.4	6 390						
5	5 630	2.0	7 700						

[1] For each sample the first column shows the expected general parasite rate (PR%) and the second column the recommended corresponding sample size (N).

[2] In practical use of the Table all sample sizes shown in brackets should be replaced by 1000.

ANNEX II



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Annex III

ENTOMOLOGICAL STUDIES DURING THE PRE-OPERATIONAL PERIOD

Work around 20 to 21 "School Stations"

Exit traps - night biting collections (one team)

2 supervisors (one Kenyan, 1 WHO)
1 driver
6 night collectors
1 exit trap attendent (helped by the early night supervisor)
1 Land Rover (+ trailer or gallery)

10 night catches a month (so 20 stations covered in a two month period,) with two available nights for other studies. 6 to 10 exit traps per station, according to hut availability.

Exit traps (abdominal conditions
(survival rates

Night biting collections (sporozoite rate/abdominal conditions
(physiological age

Monday Wednesday Friday (once every two weeks.

Pyrethrum Spray Collections - outside resting places - larval surveys

1 supervisor (Kenyan) (one team)
1 driver
1 Land Rover
5 mosquito collectors (pyrethrum)
2 mosquito collectors (outside resting + larval breeding places)

Operations PSC in 2 huts/boma simultaneously 8-10 bomas/day according to boma availability. 20 full working days per month, with monthly collections around each selected school station + 4 free Saturdays for other studies, catches at random, etc.

PSC (density/hut
(sporozoite rate/abdominal condition
(freshly fed: A/B grouping + blood meal identification
Outside resting - idem -
Larval collection : species abundance (StageIII/IV) per type of breeding place

Monday Tuesday Wednesday Thursday Friday

Laboratory work (one team)

Mr Joshi
Mr Pradhan (after returning from leave)
Mr Thymakis (i.p. after 1 July 972)
Dr Fontaine (i.p.)
4 laboratory assistants (identification - sorting according to abdominal conditions - dissections for ovaries and salivary glands - larvae preparation)

- age-grading (night biting catches)
- sporozoite rate (night B.C. - PSC - outside resting)
- trophic preferences (PSC - outside resting)
- A/B (ditto - with Service as SNC in UK)
- larval identifications
- survival rates from exit traps
- susceptibility to OMS-43 and DDT
- special studies (ingress traps - eaves traps)

Cleaning - replacement during leaves and sickness

3 to 4 national staff including at least one fully qualified for laboratory and field work.

Numeric targets

Sporozoites : 100 to 200 females/station/month

Age grading : 25 to 100 females/station/two months

A/B : 10 females PSP + females outside shelters/station/month

Trophic preferences: ditto A/B

Susceptibility to DDT and OMS-43 : 4 tests for each in different parts of the area

Larvae : the best possible coverage, Stage III/IV only.

ANNEX IV

ENTOMOLOGICAL STUDIES DURING THE SPRAYING PERIOD

A. Day-time work

Pyrethrum spray collection
outside resting (larvae)

20 groups of 8 - 10 bomas/month
(320 - 400 huts)

1 supervisor (Kenyan)
1 driver
5 mosquito collectors (pyrethrum)
1 mosquito collector (outside resting)
1 mosquito collector (larvae) once every three months, if there is any evidence it could be needed

1 Land Rover

Monday Tuesday Wednesday Thursday Friday - every week

B. Night-time work

Night biting collection
exit traps

10 groups of bomas

2 supervisors (1 Kenyan - 1 WHO)
1 driver
6 night collectors
1 exit trap attendant

1 Land Rover

Monday afternoon - Tuesday morning
Wednesday afternoon - Thursday morning
Friday afternoon - Saturday morning

C. Bio-assays

up to 10 areas in a month
Monday morning - Wednesday morning - Friday morning

1 supervisor (WHO)
1 driver
1 - 2 assistants

1 Land Rover (the same as that for night collections)

D. Insectary work - laboratory work

4 laboratory assistants
1 mosquito collector
Messrs. Joshi, Pradhan, Thymakis, i.p., Fontaine i.p.

E. Cleaning - Replacement during leaves and sickness

1 laboratory assistant (or squad chief)
2 - 3 mosquito collectors
1 - ½ driver

ANNEX V

POPULATION CENSUS

1969

Location	Sub-Location	Population 1969	
SIAYA (49 977)	Koker Kajulu	2 800	
	Kaila	2 049	
	Kolunje	3 771	
	Kadienga	3 236	
	Ngere	1 962	
	Konyuera	5 280	
	Kaniadkora	2 871	
	Angoga	2 686	
	Alungo	1 788	
	Othany	3 030	
	Kombewa	3 973	
	Katieno	3 601	
	Kowe	2 445	
	Rata	5 088	
	Kitmikaye	3 347	
	Kadero	2 050	49 977
KISUMU (22 675)	Kanyowegi	5 711	
	Kadongo	3 396	
	Marara	5 921	
	Karateng	4 373	
	Ojola	3 274	22 675
ASEMBO (15 941)	Ramga	6 119	
	Onia-Malo	4 387	
	Onia-Mwalo	2 070	
	Onia-Miere	3 365	15 941
	Total		88 593

ACTION MEMORANDUM

March 23, 1973

TO: AA/TA, Joel Bernstein

THRU: TA/PM, David G. Mathiasen

FROM: TA/H, Lee M. Howard, M.D.

Problem: A request from WHO for AID assistance through a one-time grant of $375,000 to accelerate the epidemiological evaluation of Fenitrothion (OMS-43) for use as a residual wall spray where needed in place of DDT (see Tab A).

Discussion: In most countries of the world, after twenty years of use in malaria programs, DDT is still the cheapest, safest, and most effective insecticide available. However, in parts of some countries the mosquito vectors are completely resistant to DDT and in some areas they are partially resistant. Of the countries where malaria programs have been assisted by AID, mosquito vector resistance problems are present in a large part of Pakistan, several states of India bordering Pakistan, and the Central American countries of El Salvador, Guatemala, Honduras and Nicaragua. In India Malathion is being used at a cost sixteen times that of DDT. The Central American countries are using Propoxur (OMS-33) donated as a grant from the West German Government. Cost, if purchased, would be ten times that of DDT. Cost of Fenitrothion (OMS-42) has been estimated at half that of Propoxur. Cases of mosquito resistance to Malathion and Propoxur have already been reported. AID assistance to these countries has been approximately 172 million dollars. If solutions to these problems are not found, much of this investment may well be lost.

AID research efforts in the field of malaria are being concentrated on the development of a malaria vaccine. However, actual use of a malaria vaccine in a field malaria program may be five to eight years in the future. In the meantime, the most effective technology for malaria control/eradication is still the use of residual insecticides. Since DDT is decreasing in effectiveness each year, it is of vital importance to expedite and accelerate the testing and evaluation of new insecticides such as Fenitrothion (OMS-43) in order to make them available for use in the field as soon as possible.

AID has in the past provided assistance to 36 country malaria programs (26 through bilateral agreements and 10 with commodity assistance only). Nearly all of these countries would benefit from the WHO certification of the use of Fenitrothion in malaria programs.

An interim reply was sent to HEW for transmittal to WHO indicating that AID would give careful consideration to the request (see Tab B). TA/H has now obtained additional information on the project.

The project started in July of 1972 and is scheduled to be completed by July of 1975. The first year was devoted to gathering of the base line data in preparation for the start of the spraying in July of 1973 with additional cycles every three months for two years. The total budget required is one million dollars. The shortfall is $375,000, however only $160,000 is urgently required in this fiscal year with a commitment as soon as possible in order to assure the procurement and delivery of commodities for the initial spraying in July of 1973. WHO had expected to finance the project from their own budget, but currency devaluation and inflation have made it impossible. Although the original request was on the basis of accelerating the project, it is now clear that without an immediate commitment of $160,000 the project will have to be terminated or reduced so drastically that it will not be possible to accomplish the objective of certifying Fenitrothion for use in malaria programs.

Recent events have emphasized the need for early certification of Fenitrothion by WHO. Resurgence of malaria in Pakistan has reached epidemic proportions with over 200,000 reported malaria cases in one month. The vector mosquito in Pakistan is already resistant to DDT. The population in India living in areas where the vector mosquito is resistant to DDT and BHC is increasing each year. DDT is virtually useless in most of Central America. USAID Mission Directors from Pakistan and the Philippines have expressed their concern to AID/W over the threat of malaria. AID health officials for S.A. Bureau have expressed similar concern for the Indo-Chinese peninsula countries.

Another factor indicating the need for developing substitutes for DDT is brought out in a recent report prepared by the Office of the General Counsel on "The Effect of the Federal Environmental Pesticide Control Act of 1972 on AID's Use of DDT for Malaria Control". The pertinent section is as follows:

> "In the years to come it is possible that the EPA or the Congress might challenge our use of DDT in the fight against malaria. This could result in amendments to the Federal Insecticide, Fungicide and Rodenticide Act which would limit the use of certain pesticides for export purposes, for both crop and public health uses or which effectively remove the exclusion of pesticides for export from the act. This raises questions of possible substitutes, which the Agency should continue to vigorously explore. While DDT remains the most effective means of controlling malaria, its days may be numbered and we should continue planning for that contingency."

Recommendation: That you sign the attached letter to HEW informing them of AID's intention to make a contribution of $160,000 to the

WHO Special Account for Health Development (malaria) to assist in the completion of the epidemiological evaluation of the insecticide Fenitrothion (OMS-43).

Enclosures:

(A) Request from WHO for AID assistance
(B) Interim reply to HEW
(C) Proposed AID response agreeing to contribute to WHO Special Account

Clearances:

GC/TA:. SMevorah _____ Date 3/2 /73
IO/HDC:CJNee (Phone) Date 3/23/73
PPC/IA:MGallop (Phone) Date 3/23/73

Subj: HLS

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

OCT 13 3 28 PM '72 OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20201

AID
EXECUTIVE SECRETARIAT

OCT 6 1972

ek Due 10/~~26~~/72
ACTION: ~~AA/ATR~~ for Williams sig.
INFO: Hannah log
Williams log
AA/TA, AA/PPC

John A. Hannah, Ph.D.
Administrator
Agency for International Development
Department of State
Washington, D. C. 20523

Dear Dr. Hannah:

As you know, the World Health Organization conducts a program for the development of new insecticides to control vector-borne diseases. It has, over the past 20 years, tested some 1,500 compounds, of which two have been approved for operational use in malaria eradication. The development of resistance of certain species of Anopheles to DDT makes the further accelerated testing of new insecticides imperative.

In recent years, WHO has successfully tested a third insecticide -- Fenitrothion (OMS-43). Through six stages of testing, it has been found to be exceptionally promising for the control of Anopheles gambiae. An epidemiological evaluation, however, is necessary. To undertake this evaluation, WHO has developed a detailed protocol jointly with the Government of Kenya and an area with approximately 50,000 population has been selected. A copy of the protocol is enclosed for your information.

The expected allocation of the World Health Organization for insecticide testing for the period 1972-1975 amounts to about $591,450. An additional amount of $375,000 will be required for the period 1972-1975 in order to accelerate the completion of the epidemiological evaluation of OMS-43. Due to the pressing heavy demands on WHO's budget, this would not appear feasible without external aid.

It is our understanding that the Agency for International Development is interested in this particular project and would be willing to consider financial assistance in order to accelerate the epidemiological evaluation. Dr. Candau, the Director-General of WHO, therefore has requested that we explore with you possibilities for AID assistance through a one-time grant of $375,000 toward the realization of this project.

We strongly share Dr. Candau's conviction that this project is of vital importance for the further progress of the global malaria eradication program, and would urge your favorable consideration of his request.

Sincerely yours,

for Merlin K. DuVal, M.D.
Assistant Secretary for
Health and Scientific Affairs

Enclosure

NOV 2 1972

The Honorable Merlin K. DuVal, M.D.
Assistant Secretary for
Health and Scientific Affairs
Department of Health, Education
and Welfare
Washington, D. C. 20201

Dear Dr. DuVal:

Dr. Hannah has asked me to reply to your letter of October 6 regarding possible A.I.D. assistance, in collaboration with WHO, to a malaria research project in Kenya.

As you know, A.I.D. has a long history of cooperation with WHO in assistance to malaria control and eradication programs in many countries of the world and has a continuing interest in the success of these programs.

We will be happy to review the request from WHO for early positive assistance to accelerate [illegible] of the entomological evaluation of [illegible] Dendrobium (DDT-43). However, additional information will be required before any decision can be made. It is not clear to us just how much additional funding will be required or if the entire amount will be needed at one time. The nature and degree of personal participation of the technical people possible by this additional funding is not indicated. In the interest of obtaining a better background and perspective, it would be well to have the status of testing of other candidate insecticides in the WHO scheme.

Mr. Edgar J. Smith of our Technical Assistance Bureau/Office of Health will be attending a WHO malaria conference in Brazzaville in [illegible] and will be visiting the Dendrobium Testing Project in Kenya after the meeting. He will be discussing the project with WHO officials and will obtain the additional information required to make a decision.

The new cost will then be reviewed in light of this additional information, current policy and other priorities. You may be sure that it will receive our careful consideration as early as possible. In this regard I must point out that A.I.D. research funds are very tight at present.

Sincerely yours,

for Joel Bernstein

TA/H:EASmith-AA/TA:SHButterfield:raf/mab:10/26-11/1/72

Development and Testing of Residual Pesticides as Alternatives for DDT where Vector Resistance is a Problem

I. The development and testing of bio-degradeable DDT should be supported because:

1. Testing so far shows effectiveness against DDT resistant mosquitos.

2. It has great potential against the black fly for onchocerciasis control since it is non-toxic to fish.

3. The bio-degradeable property would make it more acceptable in other countries. However, bio-degradeable DDT will not replace DDT under normal circumstances because of the cost factor. Bio-degradeable DDT is undergoing stage I and II testing in the VII - stage WHO scheme for evaluation of pesticides for public health use. WHO approval would normally take 6-7 years but may be shortened to 3 years. It is not being produced commercially as yet. Vector resistance may become a problem within a few years.

II. The testing of fenitrothion should be supported and completed as soon as possible. Fenitrothion is already in Stage VII, or the final stage, of testing and is now commercially produced. Hence, it would be available for country programs as soon as approved by WHO.

Fenitrothion is in a different chemical family than DDT. Hence, vector resistance would not be a problem for some years to come.

Fenitrothion is effective as a residual wall spray against mosquito vectors which are resistant to DDT, BHC and dieldian and is less persistant than DDT. Hence, more acceptable from the environmental

impact point of view.

In the past 20 years with over 400 compounds tested in the WHO scheme, only two alternative pesticides are now approved by WHO for use in malaria programs -- malathion and propoxair. In certain areas mosquitos have already been reported as being resistant to these pesticides. It is obvious that the future success of the malaria program will depend in large part on the availability of a selection of different pesticides to provide maximum flexibility in meeting the existing vector problems as they arrive.

The testing of fenitrothion and bio-degradeable DDT should be supported. But at the present time fenitrothion has the highest priority since it can be made available for use in the field much more quickly.