

~~PD-AAJ-093~~  
XD-AAJ-092-A

931006800 01  
~~17~~

### Site Visit Review

#### Development of Environmentally Acceptable Replacement for DDT (WHO - Indonesia)

Grant No. AID/ta-g-1210 and Grant No. AID/DSPE-EGC-0017

Dr. Donald C. Weldhass, Director  
Insects Affecting Man and Animals  
Research Laboratory  
U.S.D.A. Gainesville, Florida  
A.I.D. Consultant

Dr. Norman G. Gratz, Chief  
Ecology and Control of Vectors  
Division of Vector Biology and Control  
W.H.O., Geneva

Mr. Edgar A. Smith  
Malaria Section  
Office of Health  
Development Support Bureau  
A.I.D., Washington, D.C.

The team conferred with Government of Indonesia officials in Jakarta, Bogor, Semarang, and Den Pasar; visited the project laboratory and field stations at Semarang; and inspected a potential field station site for malaria vector control research on the north coast of Bali near Singaradja.

In addition to the Team Report the following are attached:

1. Project Appraisal by external consultant
2. Overview of Research Activities of the Semarang Sub-unit
- ~~3. Itinerary~~
- ~~4. List of persons contacted by the team.~~

Not  
Attached

## TEAM REPORT

### Background

The Vector and Rodent Control Research Unit (VRCRU) was established in Jakarta in 1972 to conduct research on all aspects of the ecology and control of important insect vectors of disease and of urban and peri-urban rodent populations with special emphasis on dengue haemorrhagic fever, filariasis, malaria, rodents and their ectoparasites. During the first two years, research was started in all of these fields except malaria.

In 1974, VBC of WHO/Geneva sent a consultant to Indonesia to review the research program and make recommendations as to the nature of malaria research appropriate for the Unit to carry out. At the same time, AID/Washington sent two specialists on malaria research and training to Indonesia to consult with the Government of Indonesia malaria officials on the training and research needs of the malaria control program in connection with the proposed USAID loan for support of the Indonesian malaria control effort. The reports of both WHO and AID consultants indicated that in light of the wide spread development of DDT resistance in Anopheles aconitus the highest research priority of the Indonesia malaria control program was for the development and testing of alternative residual insecticides to be used in place of DDT.

In late 1975, a sub-unit was established in Semarang, Central Java, supported primarily by a two-year grant from the US Agency for International Development, and was later extended for a further three years until September 29, 1980.

Significant inputs have also been made by the WHO which supports one staff member of the three professional staff at the Unit and the Government of Indonesia which provides counterpart professional staff, spraymen, laboratory facilities, store houses, etc. The primary objective of the grant was to search for an environmentally acceptable insecticide for the control of DDT-resistant An. aconitus, the main vector of malaria in most of the islands of Java and Bali. This was done by carrying out field trials on insecticides emanating from the WHO scheme for the screening and testing of new insecticides. This program has a high priority for the Government of Indonesia as malaria represents the No. 1 problem among the communicable diseases listed in the Indonesia Country Health Program.

The priority for developing alternative insecticides remains high regionally and world-wide. Residual spraying is still the most cost effective method of malaria control as long as the mosquito vector is susceptible to the insecticide used even with the most expensive alternative insecticides available.

At the present time this project is the only one in the world with the necessary expertise and experience required for conduct of Stage IV and Stage V field trials of alternative insecticides.

An indication of the need to maintain this expertise is to be found in recent WHO reports on vector resistance. A tabulation of these reports shows that so far, 24 species of Anopheline mosquitos in 48 countries have been confirmed as being resistant to DDT, 43 species in 72 countries are resistant to dieldrin HCH, 6 species in 10 countries to organophosphate insecticides and 2 species in 5 countries to carbamates. Vector resistance to insecticides has been reported in 12 of the Asian countries in 16 vector species.

#### Recommendations:

1) Village scale trials of new insecticides, insecticide formulation and applicant equipment should be continued.

These trials should be carried out in areas where the Anopheles vectors of malaria are already resistant to DDT and other chlorinated hydrocarbons. Though earlier work of the sub-unit has already demonstrated the efficacy of fenitrothion against An. aconitus the possible development of resistance to this compound cannot be excluded as organophosphate insecticide resistance has already developed in other malaria vectors. Though the number of new compounds becoming available is much reduced, it is important to retain the capacity for testing these under field conditions. The results of these trials will be of importance not only to the Government of Indonesia but to many other countries in the South-East Asia and Western Pacific Region, where vector resistance is also a problem.

Studies should be carried out both on newer compounds and those which have already successfully undergone field trials to determine how they might be applied more selectively, effectively and, consequently, more economically.

Experience at the sub-unit has already shown that at minimal cost the villagers can be readily trained to apply and even participate in the evaluation of residual insecticides under appropriate supervision. Extending this concept to larger areas could result in major savings in labor costs.

2) Additional research should be devoted to the evaluation and development of the ultralow volume concept of adult anopheline control and should include:

- a. A determination of any residual effects following application
- b. Evaluation of vehicle mounted ULV equipment

3) Research should be conducted on the development of comprehensive and integrated methods of malaria vector control.

Even in those geographical areas in which insecticides resistance has developed in malaria vector populations, the rising cost of insecticides has made it imperative to reduce, as much as possible, the quantities being used. This might be done by their more selective use. Another approach, however, is to integrate into vector control programs other feasible methods of control which would reduce the amount of residual spray required. Studies should be carried out to determine the

possible application of environmental management and, particularly, source reduction methods which could be applied by the communities themselves. These might involve either changes of irrigation practices or, where feasible, permanent elimination of breeding sites in the vicinity of villages. Changes in salinity might control mosquito breeding in coastal lagoons.

When available, biological control agents should also be tested to determine their possible place in an integrated malaria vector control program.

In some larval habitats such as that of lagoons, the use of larvicides might prove more economical than that of adulticides and this should be examined.

4) The sub-unit should expand their studies on the ecology of malaria vectors on Java and Bali, particularly those breeding in irrigation water and brackish water e.g. rice fields and lagoons.

Fundamental to the development of more selective control methods whether by insecticides or alternative approaches is the need for a better understanding of the ecology of the vector species both of the aquatic and adult stages. Such studies should focus on species breeding in irrigation water, particularly in rice fields and those breeding in brackish water, especially coastal lagoons and fish ponds. Both of these types of habitats while common in Indonesia are also of great regional importance throughout Southeast Asia. Studies should include location of larval populations and variations in their seasonal densities, adult movement and resting habits both indoors and out, both in houses and in animal shelters as well as natural resting places.

5) As a basis for development of Comprehensive Vector Control studies should be conducted on the vectorial capacity of Anopheline species on the outer islands.

In many areas of the vast outer islands of Indonesia the relative importance of the various potential vectors of malaria is uncertain. Since such information is basic to any future control programs, studies should be organized and carried out in collaboration with both research and control groups of the Indonesian Government to determine the species of Anopheles responsible for malaria transmission on the outer islands. Such studies should include checking sporozoite rates and blood meal feeding preferences.

6) Also as a basis for development of comprehensive vector control, studies should be conducted on the ecology of Anopheles vectors of the outer islands.

Once the identity of the Anopheles species responsible for malaria transmission has been determined, studies on their ecology should be started to obtain information on their larval habitats, their characteristics, adult movement, host preference, favored resting place, and biting habits. This information is needed in order to plan selective and economic programmes for the control of these vector species.

## 7) Transfer of Technology

A special effort should be made to involve Indonesian staff at all levels, both scientists and technicians. The transfer of the technology involved in the implementation and assisting of the Government of Indonesia, and other Governments of the Region to develop scientific manpower to pursue the research independently, must be regarded as one of the most important objectives in the future conduct of this research project.

8) The recommended activities should be carefully coordinated with other ongoing or planned research and the operational needs of the GOI-CDC, particularly the malaria control program. Therefore, it is recommended that a special coordinating committee be established to review and approve the various elements of research proposed in the planned expansion of the insecticide testing sub-unit at Semarang. The members of such a committee should include representatives of all organizations or agencies concerned with or conducting malaria research in Indonesia such as CDC, Litbang Kes, the WHO Malaria Advisory Team, the WHO VBCRU, the USAID Mission's office of health, NAMRU and the Universities.

It is suggested that functions of the coordinating committee may include:

1. Ensuring that planning of malaria research is done with full knowledge of all pertinent information available within the country.
2. Ensuring that malaria research planned is designed to solve the priority operational problems of the National Malaria Control Program.
3. Planning of research to avoid unnecessary duplication of effort.
4. Planning for the development of systematic coordination, cooperation and collaboration as appropriate among the various entities concerned with malaria research.
5. Arranging for routine exchange of reports and other pertinent information among all committee members.

It is further suggested that regular, perhaps quarterly meetings would be desirable for planning, for reviewing of progress and research results and to expedite prompt utilization of research results for actual field application.

This recommendation is consistent with the conclusions reached at the WHO Workshop on South-East Asia Regional Programme for Applied Research in Malaria Control which stated, "Co-ordination of research activities is essential at the Regional and National levels. In this regard at national level the existing mechanism should be utilized if adequate. Where necessary, the establishment of a co-ordinating body/council should be considered."

9) It is recommended that the project should be continued for a three year period with a gradual expansion, and re-structuring to enable the project to continue the insecticide studies as well as phase into the additional studies recommended above on a priority basis as determined by the Government of Indonesia.