



**VECTOR BIOLOGY & CONTROL**

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**Applied Field Research on Malaria  
In Pakistan:**

**A Workshop on Proposal  
and Protocol Preparation**

**by**

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**AR-118-4**

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## **Acknowledgements**

Preparation of this document was sponsored by the Vector Biology and Control Project under Contract No. DPE-5948-C-00-5044-00 to Medical Service Corporation International, Arlington, Virginia, USA, for the Agency for International Development, Office of Health, Bureau for Science and Technology.

## **Table of Contents**

<b>Executive Summary</b>	<b>1</b>
<b>Background</b>	<b>2</b>
<b>Course Outline</b>	<b>2</b>
<b>Operational Resarch</b>	<b>5</b>
<b>Recommendations</b>	<b>7</b>
<b>Appendices</b>	
1. Itinerary	8
2. Persons Contacted	9
3. List of Participants	10

## **Executive Summary**

At the request of USAID/Islamabad and the Government of Pakistan's Malaria Control Programme (MCP), I visited the National Institute of Malaria Research and Training (NIMRT) in Lahore October 21 - 31, 1989 to provide a training workshop on research proposal and protocol preparation, budget development and experimental statistics. Working in groups of one to seven, MCP participants prepared 11 protocols on research germane to their particular geographical area and expertise. Their topics were: vector incrimination (2 proposals), insecticide resistance management (2), personal protection (1), environmental management (2), drug resistance and therapy (2), improved laboratory services (1), and imported malaria (1).

A general framework for protocol preparation was established, but additional training in experimental design and statistical analysis should be offered to MCP personnel seriously engaged in operational research and surveillance assessment. Specific areas of research such as community participation in environmental management may require selected external consultation for final experimental design and implementation. Guidelines for proposal submission, technical review, funding and implementation should be made available to interested MCP personnel.

## Background

In section 4.5.1.4. of the 1987 Report entitled "Terminal Evaluation of the Pakistan Malaria Control Project (391-0472)" it was recommended that "external assistance be sought for the organization and conduct of a course on applied field research to cover preparation of research proposals and protocols." The Vector Biology and Control Project (VBC) requested that I travel to the National Institute for Malaria Research and Training (NIMRT) in Lahore, Pakistan, on October 18 to fulfill this recommendation. VBC provided the following scope of work for my visit:

1. Provide guidelines on the purpose of basic design and implementation of operational research in malaria control programs.
2. Participate and present a course on design, philosophy and implementation of operational research.
3. Assist in developing future operational research priorities for an effective Malaria Control Program in Pakistan.

The course content was not formalized before I traveled to Pakistan because USAID/Islamabad did not provide specific information about the background and qualifications of the participants, the class size or the facilities available. Course content and implementation was organized collaboratively with guidance from Dr. I.A. Shah, Director, NIMRT, and the MCP participants.

My itinerary and a list of persons contacted are presented in Appendices 1 and 2.

## Course Outline

The 20 course participants (Appendix 3) had had varied academic training and research orientation. My initial lecture series on mosquito sampling generated comments and questions that stimulated a series of lectures on applied statistics. After I gave lectures on the philosophy of experimental design and protocol preparation, the students developed protocols to address research problems they considered important to the MCP. The following is a general outline I provided for the protocols:

- i. Title
- ii. Participants and collaborators

- iii. **Background**
  - a. **What has been done by others?**
  - b. **What observations led to proposal development?**
- iv. **Objectives and Rationale**
  - a. **General Objective**
  - b. **Specific aims**
- v. **Materials and Methods**
  - a. **Study area selection**
  - b. **Experimental design**
  - c. **Specific methods for data collection and treatment assessment**
- vi. **Anticipated results - How does the data generated by the methods answer the questions listed in the specific aims?**
- vii. **Budget - What personnel and materials are needed to do the research?**

A detailed schedule of workshop events is presented below:

Date	Activity
<b>October</b>	
21	Registration; Lecture: sampling design.
22	Lecture: Hypothesis testing, elementary statistics, mosquito age-grading, vector incrimination methods, control evaluation and protocol format.
23	Participant protocol preparation.
24	Lecture: Philosophy of research vs quality control, identifying and focusing on research questions, budget considerations.
25	Lecture: Basic statistical tests and how they apply to experimental data.
26	Final assistance with participant protocols and submission of W.K.R.
27	Off
28	Discussed general problems with protocols with group and then met individually with authors of each protocol.
29-30	Presentation of protocols by participants. Dr. Rifaq, USAID/Islamabad, commented on USAID research philosophy and available funds.
31	Prioritized operational research needed in Pakistan.

## Operational Research

The investigator and titles of the 11 protocols prepared during the workshop are summarized in Appendix 4. The topics included vector incrimination (2 proposals), insecticide resistance management (2), personal protection (1), environmental management (2), drug resistance and alternative therapy (2), improved laboratory services (1) and imported malaria (1). The proposals addressed topics considered to be of interest to the workshop participants and generally fell under the subjects listed in section 4.5.1.1. of the 1987 terminal evaluation report.

Participants were asked to prioritize the 11 protocols and additional operational research topics germane to MCP objectives. A classification of research topics is outlined below in the order of priority agreed upon by the participants (numbers in parentheses refer to protocols in Appendix 4).

- I. Immediate research to improve or evaluate current control methods.
  - a. Case management and detection.
    1. Enhanced laboratory services for rapid case detection and treatment (11).
    2. Improved surveillance to detect inapparent infections.
    3. Importance of imported cases (4).
  - b. Drug resistance.
    1. Mapping (5,10).
    2. Increasing dose.
    3. Primaquine resistance.
  - c. Role of secondary malaria vectors.
    1. Ability of An. stephensi alone to maintain transmission (3).
    2. Relationship of An. stephensi to malaria control failures by malathion spray.
    3. Incrimination of other vectors (2).
  - d. Vector bionomics.
    1. Seasonality of vectorial capacity and other entomological parameters (2).
    2. Vector competence and transmission efficiency.
    3. Flight range and dispersal.

- e. Evaluation of criteria used to stratify residual spraying.
    1. Epidemiological criteria.
    2. Entomological criteria.
  - f. Effectiveness of selective spray of certain rooms.
  - g. Forecasting malaria to know when and where to spray to prevent transmission.
- II. Short-term alternatives to current control methods.
- a. Efficacy of new drugs on chloroquine-resistant P. falciparum (5,10).
  - b. Management methods to prevent development of resistance to new insecticides and drugs (7, 9).
  - c. Evaluation of new insecticides.
- III. Long-term development of new approaches to mosquito and malaria control.
- a. Adult mosquitoes.
    1. ULV space sprays.
    2. Repellent soaps.
    3. Impregnated bednets (8).
  - b. Larval mosquitoes.
    1. Source reduction (1, 6).
    2. Larval ecology and oviposition site selection.
    3. Larvicides.
      - i. Commercially available compounds - B.t.i., B. sphaericus;
      - ii. New compounds (neem, etc.).
    4. Biological control - fish or other promising agents.
    5. Integrated Pest Management - effects of combining one or more methods and applying them in response to increased vector abundance.
    6. Adult abundance thresholds at which to target larval control.

## Recommendations

The workshop participants were instructed in the general philosophy of protocol and proposal preparation and they generated and evaluated documents addressing specific operational research problems. However, additional training in experimental design and statistical analysis by either an internal or external consultant is recommended to improve research such as source reduction for mosquito and malaria control. A mechanism for individual research protocol processing should be developed and made available to MCP personnel and should include:

- o proposal submission schedule;
- o guidelines for proposal preparation;
- o technical and quality assessment through peer review;
- o funding guidelines and priorities;
- o research implementation and assistance; and
- o methods and schedule for progress and final reporting.

If a number of protocols can be funded and research implemented, an annual meeting or workshop to present and discuss research findings would be beneficial to allow course corrections, stimulate new ideas and ensure timely reporting and data dissemination. Publication of research papers in Pakistan or international journals should be encouraged to provide a permanent, accessible record of research activities.

## **Appendix 1**

### **Itinerary**

- October 18-20 Travel from Bakersfield to Lahore.
- October 21-31 Workshop at NIMRT, Lahore.
- November 1-2 Debrief USAID and Government of Pakistan MCP Director in Islamabad.
- November 2-4 Travel from Islamabad to Lahore to Bakersfield.

## Appendix 2

### Persons contacted

#### Lahore:

Dr. Imtiaz H. Shah, Director, NIMRT  
Dr. Martin Birley, Liverpool School of Tropical Medicine  
Dr. Barry Silverman, VBC  
Dr. Rifaq A. Ismail, Project Officer, USAID/Islamabad  
Mr. Bauber Hussain, Project Assistant, USAID/Islamabad  
Mr. A. H. Chughtai, USAID/Lahore  
Brig. (Retd) Manzoor Ahmed Choudhary, Lahore

#### Islamabad:

Ms. Anne Aarnes, Chief, Office of Health, Population and Nutrition, USAID  
Dr. Rifaq Ismail, Project Officer, USAID  
Dr. Amin Ud-Din, Deputy Director General of Health, Government of Pakistan  
Mr. Ali Ahmed Mujahid, Director, Directorate of Malaria Control

### Appendix 3

#### Workshop on Technical Assistance in Operational Research Planning and Protocol Writing

#### List of Participants

Place of Posting	Name and Designation
Directorate-General Health Services, Punjab, Lahore	Dr. Furrukh Tirmizi Director Health Services, (CDC)
Directorate-General Health Services, Punjab, Lahore	Dr. Mehmood Afzal, Asst. Director (Malaria)
Directorate-General Health Services, Punjab, Lahore	Mr. Mukhtar Ahmad Shah Parasitologist
Directorate-General Health Services, Punjab, Lahore	Mr. Sana Ahmad Khan Mahmud C.D.C. Officer
Directorate of Health Services N.W.F.P., Peshawar	Dr. Mohammad Iqbal Asst. Director (Malaria)
Directorate of Health Services N.W.F.P., Peshawar	Mr. Shaukat Parvez Asst. Entomologist
Directorate of Health Services N.W.F.P., Peshawar	Mr. Murtaza Khan Malaria Superintendent
Malaria Control Programme Baluchistan, Quetta	Dr. Mahmood Sultan Parach Epidemiologist
Malaria Control Programme Sindh, Hyderabad	Mr. Sumar Sadruddin Epidemiologist
A.D.H.O. Office Kotli	Mr. Sher Ali Awan C.D.C. Officer
A.D.H.O. Office Muzaffarabad (A.K.)	Raja Abdul Qayoum Khan C.D.C. Officer
National Institute of Malaria Research and Training, Lahore	Mr. Abdul Aziz Senior Scientific Officer

<b>Place of Posting</b>	<b>Name and Designation</b>
National Institute of Malaria Research and Training, Lahore	Mrs. Ghazala Nadeem Scientific Research Officer
National Institute of Malaria Research and Training, Lahore	Dr. Muhammad Pervaiz Mahmood Trainee Physician
National Institute of Malaria Research and Training, Lahore	Rai Mushtaq Ahmad Asst. Scientific Officer
National Institute of Malaria Research and Training, Lahore	Mr. S. D. Pervez Asst. Scientific Officer
Malaria Control Programme Baluchistan, Quetta	Mr. Ali Ahmed Entomologist
Malaria Control Programme Baluchistan, Quetta	Mr. Muhammad Sadiq Malaria Superintendent
Office of the Dy. Director Health Services, Muzaffarabad	Mr. Abdul Hameed Khan Senior Microscopist

## Appendix 4

### Protocols Written

1. Abdul Aziz. A field trial of Bacillus sphaericus and environmental management for malaria control in Pakistan.
2. Abdul Aziz and Sher Mohammad Solangi. Identification of blood meals and vector incrimination by sporozoite assay using enzyme-linked immunosorbent assay.
3. Mohammad Iqbal, S. Pervez, Mustafa Khan and Sumar Sadruddin. Establishing/confirming of Anopheles stephensi as a vector in NWFP and Sind provinces.
4. Mohammad Paracha, Ali Ahmed and A. Sadiq. Studying the sudden cause of malaria due to influx of Afghan refugees in Quetta.
5. S. Sadruddin, A. Majid Khan, Bashir Moghal, and Raza Mohammad. Studies on P. falciparum resistance to chloroquine in Sind.
6. Sher Mohammad Solangi, Hafiz M. Mahmood Akhtar, Sher Ali Swan, Fazal Kareem, M. Sadiq, Abdul Hameed Khan and Raja Abdul Qayyum Khan. Control of mosquito density by reducing breeding places through environmental management.
7. S.D. Pervez and M.A. Rai. Resistance management of malaria vectors in Pakistan by rotating insecticides.
8. Ghazala Nadeem, Abdul Aziz and S.D. Pervez. Efficacy of permethrin-treated bednets in the prevention of malaria.
9. Farrukh Hussain Tirmizi, Mohammad Afzal, Javed Iqbal Malik, Sana Ahmed Khan, Mahmud and Mukhtar Ahmed Shad. Monitoring resistance of vectors by susceptibility testing.
10. Farrukh Hussain Tirmizi, Afzal and Mukhtar Ahmed Shah. Response of Plasmodium falciparum to antimalarial drugs in Punjab by use of in vivo test.
11. F. H. Tirmizi, M. Afzal, M.A. Shah, S.A.K. Mahmood and S.A. Sheikh. Expansion of laboratory services for the detection of malaria positivity at the Basic Health Unit level.