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Report of a Meeting of Principal Investigators of WHO Collaborating Centres on Testing and Evaluation of Pesticide Application Equipment



Imperial College of Science and Technology

International Pesticide Application Research Centre

Imperial College at Silwood Park, Sunninghill, Berks., U.K.



12-15 January 1988

*Next collection - instruments to be used  
protocols*

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### Acknowledgement

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Meeting of Principal Investigators of WHO Collaborating Centres on Testing  
and Evaluation of Pesticide Application Equipment

12-15 January 1988, IPARC, Imperial College,  
Sunninghill, Berks, U.K.

Participants :

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  6. Mr. Wirat Samutrapong  
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  7. Mr. R. Bahar (Secretary to Meeting),  
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SL5 7PY,  
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## **Report of the meeting of Principal Investigators of WHO Collaborating Centres in Testing and Evaluation of Pesticide Application Equipment.**

The Principal Investigators of WHO Collaborating Centres on testing and evaluation of pesticide application equipment met at the International Pesticide Application Research Centre, Imperial College at Silwood Park, Ascot from 12-15 January 1988. The meeting was opened by Mr. R. Bahar, Acting Chief, Delivery and Management of Vector Control Unit, Division of Vector Biology and Control. He emphasised that integrated vector control is the accepted strategy for vector control but chemical control remains an essential component of this strategy. The effective, economic and safe use of pesticides for vector control depends on many factors and the Group was requested to review the present programmes of the collaborating centres, the specification and evaluation procedures for equipment and identify the requirements of small communities and individual householders for Primary Health Care. The Agenda is given in Annex I.

### **1. Status of WHO Collaborating Centres.**

The following Institutes are designated as Collaborating Centres:

(The list of WHO Collaborating Centres is given in Annex II and an example of their terms of reference is given in Annex III).

#### **1.1 International Pesticide Application Research Centre, Ascot, United Kingdom.**

Since 1955 this Centre has evaluated pesticide application equipment for WHO as part of its overall programme for the Overseas Development Administration. The Centre is equipped with a series of test rigs, a spray chamber, laser droplet size analyser and image analysing computer. Test procedures are designed to assess the durability and performance of equipment to determine its suitability for field trials. The Centre maintains close liaison with manufacturers in relation to the development of new equipment or modification of existing equipment and conducts research on the application of pesticides. Training courses in the use of pesticide application equipment are provided both in the U.K. and overseas.

#### **1.2 Danish Agricultural Engineering Institute, Bygholm, DENMARK.**

This Institute is equipped to evaluate farm machinery and in relation to pesticide application, has been mainly concerned with tractor-mounted sprayers. Initial work for WHO has been with motorised knapsack mistblowers.

#### **1.3 Entomology Services, Department of Health and Rehabilitative Services, Florida, USA.**

Development and adaptation of equipment to suit specific vector control problems is a primary function of this group, which serves those involved in mosquito control programmes throughout Florida. Training courses are provided and teaching aids, including video presentations, are prepared.

#### 1.4. Division of Medical Entomology, Bangkok, THAILAND

Evaluation of pesticide application is carried out under practical field conditions to evaluate the problems of using equipment and its maintenance. Particular emphasis has been on motorised knapsack mistblowers, aerosol generators and fogging equipment.

#### 1.5 Department of Medical Entomology, Moscow, USSR.

This Group has been appointed a Collaborating Centre to evaluate equipment under field conditions. This Centre, while strengthening its capabilities in testing and evaluation of pesticide application equipment under field conditions was engaged in testing nozzle tips and reviewing the specifications and audio-visual aids on pesticide application equipment for use by WHO Member States.

### 2. Progress in evaluating equipment.

Over 70 different types of pesticide application equipment have been evaluated specifically for vector control.

One new compression sprayer has met the WHO specification, while the design of all other similar equipment or its performance did not meet the criteria specified.

Most compression sprayers have a very small filler hole in which the hand-pump is located. While it is accepted that the small opening prevents operators inserting their hand into the tank, the removal of the pump to allow for refilling causes additional wear on the opening. Debris collected on the pump while it is outside the tank may be introduced into the spray liquid. In consequence the Group felt that the pump should be separated from the filler hole regardless of the size of the opening. Changes in the specification were possible provided there were no additional problems for field use.

New plastic laminates and other materials are being introduced so the search for appropriate pesticide-resistant materials should be continued, to assist with the development of durable, but lighter, equipment.

Recently engineering plastics have been used to injection mould spray nozzles. In assessing the erosion of these nozzle tips and those made from brass, stainless steel or ceramics, it was felt that the expense of abrasive material could be reduced if the test liquid was recycled and changed only four times at five hour intervals during a standard 20 hour test.

Some equipment such as motorised knapsack mistblowers had specified a long "running in" period at a reduced speed, but as droplet spectra and projection of spray depended on air output at the nozzle, performance tests needed to be conducted at the maximum engine speed. In some cases the fuel mixture may require adjustment during the initial operation of the equipment.

To assist with evaluation and improvement of equipment, the Collaborating Centres agreed that they should maintain close liaison with manufacturers of equipment and chemical companies. This will assist manufacturers in their understanding of the requirement for safe application of pesticides, and encourage them to modify equipment where

necessary. In particular manufacturers need to simplify some equipment so that it is cheaper and easier to operate and repair. One example was the use of a compressor already fitted to a vehicle engine to provide air to a vortical nozzle, thus eliminating the cost of a separate engine. However, Collaborating Centres should not issue any certification of equipment.

Equipment manufacturers need to be encouraged to provide detailed, illustrated instruction books on the use and maintenance of their equipment in a style that can be easily understood by operators and translated, where possible, into the vernacular language.

The invention of the electrodynamic nozzle to apply ultra-low volume electrostatically charged sprays on wall surfaces has been evaluated with 'field trials' in conjunction with the Tropical Pesticides Research Institute, Arusha, Tanzania. The new technology shows considerable promise but further development of the equipment and field trials are needed.

When evaluating equipment, the Group considered that more consideration needs to be given to safety features including an assessment of the risk of operator contamination due to leakage and spillage of pesticides during field use. Other factors include the potential for cutting the operator's skin, effect of vibration, potential of fire risk and noise levels.

Unfortunately testing of some equipment over a sufficiently long period to assess its durability is expensive, so it was suggested that after initial assessment, a limited number of machines should be operated on a field-scale during which detailed data on their performance would be collected. Such data needs to be collated so that it is readily available to those who have to select equipment supplied for tenders. More information is also needed on the problems which occur with different equipment when used in the field during vector control programmes, so there should be a survey of the type of equipment, number of machines and problems encountered in different countries. Unfortunately information on pesticide application is spread though many journals, Trade magazines and other publications which are not always readily available to those responsible for vector control. A computer data-base has been started (see WHO/VBC/86.924) and this needs to be maintained and improved using better computer software with standardisation on MSDos (IBM compatible) computers.

In the long-term efforts, should be made to establish an 'Expert System' which can be used to advise on the selection of application equipment and pesticide application rates for specific problems. Furthermore, the Group considered that this information, as well as news of activities of the Collaborating Centres, needs to be distributed more regularly and recommended that a newsletter should be circulated to all the Centres.

Initially the newsletter should be produced every six months and should include short articles and reports on equipment, illustrated with drawings that may not be accepted in scientific journals, but are nevertheless relevant to the users of vector control equipment. Funds will be needed to collect the information, to publish the newsletter and for its distribution.

### 3. Training

Safe and efficient use of equipment however, depends to a large extent on training. The WHO Collaborating Centre have prepared a number of slide presentations on compression sprayers, fogging equipment and other pesticide application equipment. These slides can be used in training courses to illustrate the different types of equipment, how they should

be used and maintained (see WHO/VBC/86.924). Unfortunately the individual pictures cannot convey the correct movement of tools used in maintaining equipment nor the details of operating the equipment so the Group advised that video recordings should also be made. Apart from their use at courses, the tapes can be replayed by individuals as video recorders are now widely available, although unfortunately several different recording systems are used. A major problem with production of video tapes will be the time and cost of editing tapes so that a clear instructional programme is produced.

In training programmes, it will be important to identify responsible individuals who will be able to train others and check on their ability to operate equipment safely, effectively and efficiently. Some countries have legislation that stipulates the level of competence required by those who apply pesticides, but in any case the certification of trained spray operators should be encouraged.

Some training programmes or fact-finding missions on vector control equipment may be possible in developing countries at relatively little expense if WHO could provide financial support to Collaborating Centre staff to enable a visit, financed from other sources, to be extended for a short period.

WHO has been the first international organisation to develop detailed specifications for pesticide application equipment, but other agencies, such as FAO, increasingly need durable equipment that is safe to operate. The Group supported the need for WHO to participate in an international and bi-lateral meeting of Agencies and manufacturers to review pesticide issues and consider specifications of equipment and chemicals and other factors that will increase safety when applying pesticides.

#### 4. Equipment for small communities to use for vector control.

WHO has previously been concerned primarily with the use of spray teams who have been responsible for area-wide vector control. However as a single control measure may not effectively control vectors under all circumstances, different methods need to be integrated at various levels of the health care system. Equipment is therefore needed for vector control by community health workers, and the general population made aware of how these measures can be implemented with appropriate training programmes.

Items of equipment suitable for use in community health programmes include impregnated bed-nets and screens, mosquito coils and other dispensers of pyrethrin insecticides, aerosol pressure packs (not using fluorocarbon propellants) and other refillable aerosol containers and nebulisers and slit guns. Some refillable aerosol containers can be repressurised using an air pump and consideration needs to be given to a small, robust compression sprayer. There is also potential for development of the electrodynamic nozzle for production of aerosol sprays.

#### 5. Specifications for vector control equipment.

The Group discussed the interim specifications due to be published in the 3rd Edition of "Equipment for Vector Control", and agreed that each Collaborating Centre should examine them in detail and circulate comments prior to the next 'Expert' Committee on Engineering Aspects of Vector Control due to be held in Geneva, 31 October-8 November 1988.

Particular aspects discussed included the acceptability of motorised equipment which the manufacturer had rated at a lower engine power to decrease wear; the need to maintain an aerosol with VMD of less than 25 % on vehicle mounted aerosol generators up to an output of 500ml/min. and the problem of sampling droplets with odourless kerosene. It was suggested that for measuring droplets it should be a non-volatile mineral oil such as risella oil provided the viscosity and volatility were specified.

#### 6. Proposed Agenda of Meeting of Expert Committee on Engineering Aspects of Vector Control

The Group approved the proposed agenda with minor amendments.

#### 7. Recommendations

- 7.1 To help with the distribution of information, one of the Collaborating Centres could be designated to collect information on a six-month basis from other centres and write a newsletter for distribution.
- 7.2 Collaborating Centres should make contact with manufacturers and explain to them the objectives, aims and procedures involved with testing and evaluation of equipment.
- 7.3 Safety consideration should always be part of the equipment evaluation programmes. Items such as handling pesticides, noise, fire, vibration, potential for cutting skin and pesticide leakage during spraying should be noted in all reviews.
- 7.4 The Pesticide application database IPARC should be further strengthened. To assist with the collecting and handling of data and information, all the Collaborating Centres should contribute by providing abstracts and other information. Should personal computers be considered for purchase? IPM compatible units should be given priority. This will facilitate the exchange of information.
- 7.5 As a long range goal, a system must be developed to advise vector control managers on the selection of application equipment and chemical application rates for specific problems.
- 7.6 In order to standardise the PAE specification, a meeting of the representative of international and bilateral agencies involved and related manufacturers must be organised to discuss and review this subject.
- 7.7 Training is a fundamental component of each Collaborating Centre Programme which must be further encouraged. One of the principal contributions of each Centre to assist with training is to provide additional training materials. The use of video recorders to produce training tapes should be promoted through the funding for such activities.

## ANNEX I

Meeting of Principal Investigators of WHO Collaborating Centres on Testing and Evaluation of Pesticide Application Equipment -Imperial College, Ascot.

### Agenda

#### Agenda Item

1. Opening of meeting
2. Adoption of the Agenda and selection of officers
3. Progress reports from Collaborating Centres including:-
  - 3.1 New equipment tested or in process of being tested
  - 3.2 New developments in the field of pesticide application equipment.
  - 3.3 Specification produced or revised
  - 3.4 Teaching material produced
  - 3.5 Training work carried out
  - 3.6 Relation with industries
  - 3.7 Papers published
  - 3.8 Dissemination of information
4. Data base of pesticide application equipment
5. Procedures and methods of WHO PAE testing and evaluation
  - 5.1 Bench test
  - 5.2 Field test
  - 5.3 Co-ordination of testing and evaluation of PAE with other international agencies
6. Review of existing WHO interim specification developed for different types of PAE and identifying the needs for developing specification for newly introduced PAE
7. Suggested agenda items for the forthcoming WHO Expert Committee on engineering aspects of vector control
  - 7.1 Other business
8. Recommendations and approval of the report
9. Closure of the meeting.

ANNEX II

List of addresses of WHO Collaborating Centres for testing, evaluation and development of Pesticide Application Equipment.

1. International Pesticide Application Research Centre (IPARC)

Imperial College at Silwood Park,  
Sunninghill, Ascot,  
Berkshire SL5 8PY  
United Kingdom

Principal investigator: Dr. G.A. Matthews

2. West Pasco County Mosquito District

Office of Entomology Services,  
Department of Health and Rehabilitative Services (HRS)  
1217 Pearl Street,  
Jacksonville, Florida 32202  
United States of America.

Principal investigators : Dr. Jobin Mullerman, Jr. and Mr. J.W. Robinson

3. Statens Jordbrugtekniske Forsog

Byholm  
D.K. 8700 Horsens  
Denmark

Principal investigator : Dr. K.G. Klausen

4. Department of Medical Entomology#

Martsinovsky Institute of Medical Parasitology and Tropical Medicine,  
M. Pirogovskaya 20  
Moscow 119435  
Union of Soviet Socialist Republics.

Principal investigator : Dr. M.M. Artemiev

5. Division of Medical Entomology,#

Department of Medical Sciences,  
Bangkok 10100  
THAILAND

Principal investigator : Dr. Boonluan Phanthumacinda

# For field trial only

## ANNEX III

### A Sample of Terms of Reference for a Collaborating Centre

1. To carry out bench and field tests on insecticide application equipment specifically for vector control, as requested by WHO, for confirmation of conformity with the relevant existing WHO specifications, or for assessment of their suitability for use in vector control programmes.
2. To provide WHO, as requested, by correspondence or other means of communication, technical information and advice on:
  - a) the design, construction and performance of various types of vector control equipment of interest to both parties, as well as laboratory and field testing results as available;
  - b) vector control equipment testing protocols and procedures as available;
  - c) vector control equipment specifications and other related subjects of interest to both parties as available and agreed upon.
3. To provide consultancy assistance to WHO as and when required and mutually agreed upon in each case in the various specialised areas of vector control methodology, materials and equipment of interest to both parties.
4. To provide instruction or information to WHO fellows on vector control equipment, testing methodology and procedures utilised at the Institute as available and mutually agreed upon in each case.
5. To publish and disseminate information on vector control equipment specifications, equipment testing procedures, test results and other related subjects of interest to both parties in so far as it is not restricted.
6. To participate in conferences or training activities organised by WHO as mutually agreed upon by each party.

## ANNEX IV

### List of Working Papers

<u>Agenda Item No.</u>	<u>Title and Author</u>	<u>Reference No.</u>
3	Progress Report, IPARC , Sunninghill G.A. Matthews	VBC/MPI/WCCPAE.01
3	Progress Report, Danish Agricultural Engineering Institute, Bygholm, Denmark K. Petsson	VBC/MPI/WCC/PAE.02
3	Progress Report, Entomology Services Department of Health and Rehabilitative Services, Jacksonville, Florida, USA F.W. Opp and J. Robinson	VBC/MPI/WCC/PAE.03
3	Progress Report, Division of Medical Entomology, Department of Medical Science, Ministry of Health, Bangkok, Thailand Wirat Samutrapong	VBC/MPI/WCC/PAE.04
3	Progress Report, Department of Medical Entomology, Marinsinsky Institute, Moscow, USSR M.M. Artemiev	VBC/MPI/WCC/PAE.05
4	Data base on pesticide application equipment G.A. Matthews	VBC/MPI/WCC/PAE.06
5	Procedure and methods WHO PAE testing and evaluation R. Bahar	VBC/MPI/WCC/PAE.07
6	WHO interim specifications developed for different types of PAE	



**Thursday, 14 January**

**Day 3. 09.30 - 11.00 Meeting (Agenda Item 6), Review of specifications**  
11.00 - 11.30 Coffee  
11.30 - 12.30 Meeting (Agenda Item 7)  
LUNCH  
14.00 - 15.30 Meeting (Agenda Item 8), Recommendations  
15.30 - 16.00 Tea  
16.00 - 17.00 Preparation of report  
19.45 - DINNER

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**Friday, 15 January**

**Day 4. 09.30 - Completion of report**  
Meeting to finalise Items 7 and 8  
Opportunity to see other groups at Imperial College  
19.45 - DINNER

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