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SAFE AND EFFECTIVE MALATHION SPRAYING AGAINST MALARIA IN PAKISTAN:

FINAL REPORT OF ROBERT DAVIS, USAID MALARIA CONSULTANT

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1. Terms of Reference

This writer was retained by USAID on a personal services contract "to review and monitor new field spraying operations procedures for the Pakistan Malaria Control Program." In the words of the contract, "of primary concern to the consultant will be the effective and safe execution of the residual insecticide spraying program." Additional oral instructions from Washington and Islamabad made it clear that the writer was to concentrate on the area of safety measures involved in field operations with malathion.

Achievement of these objectives required field trips to the Punjab, the Northwest Frontier Province, and Sind. Those field trips, whose details are appended, focused on conformity of field operations to safety guidelines laid down in the CDC team report of October 1976, the training instructions laid down by Dr. Jesse Hobbs, CDC, in March 1977 training at Lahore, in the report on cholinesterase reference laboratories written by Dr. Steven Miller, CDC, and in directives to the field from Drs. S. M. Mujtaba and G. H. Mallick, Directorate of Malaria Control (DOMC).

Conversations were also held with all three provincial chiefs, with USAID, WHO and DOMC staff in Islamabad and the field. In Sind, conversations were held with health and medical college officials as well. No field visit was paid to Baluchistan, where malathion spraying begins in September.

This writer's effort has been but a small part of a much larger collaborative effort by DOMC, WHO and USAID to insure that malathion safety precautions are rigidly adhered to. This effort has entailed visits by CDC specialists in toxicology, epidemiology, and cholinesterase determinations, visits to malaria offices and field sites by more than a dozen local USAID and WHO staff, and no fewer than 293 spray squad visits to date by USAID alone.

2. Findings by Province

Since site findings by province have been extensively discussed in earlier reports, they will be briefly summarized here.

2.1 Punjab

Conformity with safety precautions was found to be generally good in nineteen squads visited by this writer in Lyallpur and Sahiwal Zones. Eighteen squads were judged to be doing good work, and one was judged to be doing mediocre work. Occasional deficiencies were noted, such as failure of some spraymen to pull turbans up over the bridge of the nose, failure to cover food-stuffs in one case, with resultant sprinkling due to bounceback, and two cases of supervisors' wearing their own shalwars and kamizes. Six cases of spraymen illness were noted in visits by this writer, none conforming to the CDC definition of malathion intoxication. All recovered.

No deficiencies in equipment or supplies were noted. No Italian malathion was in use.

2.2 Northwest Frontier Province

Conformity with safety precautions for spray was generally good in the 25 subsectors visited by this writer and in the 26 subsectors visited by his co-worker, Mr. Chaudhry Umar Hayat, USAID/Islamabad, with the notable exception of subsector b-5, Swat. This squad was spraying leftover malathion from 1976 in an area not scheduled for malathion. Zone staff promised to have the matter rectified immediately.

There were ten cases of clinical illness among the spray personnel, three among the supervisors and one in a mixer. One fit the CDC clinical definition of malathion intoxication.

No deficiencies in equipment or supplies were noted. No Italian malathion was in use.

Some sources of reducible contamination were noted. These included:

- a) dermal intoxication through the area around the eyes
- b) dermal intoxication through the feet
- c) intoxication through the nose when the sprayman fails to pull the turban up over the bridge of the nose
- d) dripping of suspension down side of bucket during pouring into pump.

Dr. A. K. Afridi, Provincial Malaria Chief, reports poor agreement between clinical picture and the results of tintometric tests in some cases. (See below, 3. 8.)

A good reporting system exists for results of tintometric tests, but there were no written reports for clinical cases.

2.3 Sind

Conformity with safety precautions was generally found to be good in the districts of Nawabshah and Tharparkar, where this writer and Mr. Khwaja S. Ahmad, his co-worker from USAID/Karachi, observed 34 of 53 and 29 of 48 subsectors under malathion spraying, respectively. In Tharparkar, Mr. Khwaja found ten cases of clinical illness among spray personnel, two of which fit the CDC definition of malathion intoxication. Neither had been confirmed by blood test at the time of his visit. There were three cases of illness among spraymen in Nawabshah, none fitting the CDC definition. Two of the three had not been reported to the Malaria Superintendent.

No deficiencies in equipment or supplies were noted. No Italian malathion was in use.

Results of tintometric tests done both for monitoring and for confirmation of individual cases were said by Dr. A. A. Ghumro, the Provincial Malaria Chief, to show good agreement between serological and clinical findings.

It should be noted that the findings of good conformity to safety standards by this writer and by Mr. Khwaja are in contrast to the mixed findings of earlier external monitors. Dr. Ghumro and his staff are to be commended for the rapid improvement in field work which they have effected.

3. Findings by Functional Area, with Recommendations

3.1 Transport, Handling and Storage

Restraints of time prevented this writer from devoting more field visits to problems of storage and transport of malathion. This writer's field observations in Muzaffargarh and Malakand Agency have been supplemented by conversations with Mr. Khwaja S. Ahmad, USAID/Karachi, DOMC officials, and a review of DOMC and USAID files on transport and storage of malathion.

Under present conditions, malathion is unloaded at the Port of Karachi and stored in the open for varying lengths of time until it can be loaded onto rail wagons and trucks for shipment upcountry. There is one DOMC officer at the port whose function is to oversee the handling. At its destinations, the malathion is turned over to local malaria personnel, who use local workers to offload it and transfer it to rented storage facilities. From there it is taken to the field in malaria vehicles.

Notwithstanding DOMC efforts to work with Karachi port officials, dispatches from USAID observers have noted deficiencies in port procedures. Urgent attention should be given to seeing that exposure of dockworkers to malathion and other insecticides is minimized. It is inevitable that, given the huge quantities being handled, some malathion boxes will be broken. It is recommended that DOMC continue its present practice of providing port workers with gloves and turbans to reduce the danger of dermal exposure. It is further recommended that the DOMC officer at the port be provided with atropine and trained in its use.

Since dangers of contamination do not end at the port, it is essential that continuing liaison be kept up with rail and trucking authorities. The soon to be appointed transport officer, DOMC, should contact the District Controller of Stores, Pakistan Railway, Karachi Cantonment, to look into implementation of Dr. Mujtaba's letter of 16 May, 1977, outlining procedures for washing at their destinations rail wagons used to transport malathion. Every effort should be made to secure the cooperation of trucking companies to assure that the same measures are taken with their vehicles. In the case of both rail wagons and trucks, malaria sector personnel at the destination should assist in washing out the vehicles.

The DOMC transport officer should make every effort to see that there is no offloading and reloading of malathion at intermediate points between Karachi and the destinations.

Properly packaged malathion should pose no danger in transit to its destination, but it is essential that, on arrival at the collection point, it be handled with due precautions. It is therefore recommended that the malaria personnel who collect the malathion from trains and trucks be given atropine, gloves and turbans and exercise the same precautions as malaria personnel at the Port of Karachi.

DOMC should look into the possibility of sending reboxing materials

to the field. If this proves impracticable, zone and sector personnel should be instructed to keep five or ten empty old boxes at the destinations into which contents of broken boxes can be transferred if necessary. It is also recommended that DOMC issue guidelines to field staff for handling of broken boxes. These should certainly include provision of uniforms and gloves to handlers of broken boxes, even if they are not malaria personnel. Turbans should also be used.

Although this writer found storage facilities to be generally satisfactory, malathion boxes were not always placed high enough to escape water damage in the event of rain. Moreover, an earlier report by Mr. Mushtaq Ahmad Rai, WHO Operations Assistant, found outdoor storage in one subsector of Lahore. Although these may be isolated incidents, it is necessary that all subsectors be brought into conformity with proper storage standards. It is therefore recommended that DOMC issue a directive to field staff to have malathion stored behind locked doors, up on bricks, pallets or platforms high enough to escape water damage. This requirement should be uniformly followed, even in areas where it is anticipated that malathion supplies will be exhausted before the beginning of the rainy season.

The problems associated with record keeping and storage of malathion are addressed at length in a memo of 22 July 1976 by Mr. Chaudhry Umar Hayat, USAID/Islamabad. This memo deserves the attention of the DOMC transport officer when appointed.

3.2 Training of Spray Personnel

Training of spray teams was found to be uniformly good, judged both by direct observation of Mr. Chaudhry Umar Hayat, USAID/Islamabad, and by field observations of spraying.

It is recommended that DOMC continue to give safety training to field staff, and that it reissue before first round of 1978 a revised Urdu version of the 1977 field guide for distribution in the Punjab and for translation into the respective languages in the other provinces. The revised booklet would embody all the instructions in the 1977 version, as well as the additions noted in 3.1, 3.3, 3.4, 3.5, and 3.8. See Appendix 7.5 for a summary of proposed additions to the training curricula and field guide.

3.3 Access to Safety Equipment and Supplies

Every squad visited had soap, atropine and uniforms, except as noted above, 2.2. However, several mixers were mixing with one glove because the other was punctured or had become gummy in the heat. It is therefore recommended that every Assistant Malaria Superintendent be provided with at least one pair of spare gloves. It is further recommended that spraymen be provided, on a trial basis, at least, with close fitting goggles to reduce eye irritation. Both of these recommendations should be implemented before second round, 1977.

Provision of goggles is desirable not only from the standpoint of reducing dermal contact, but also from the viewpoint of improving quality of ceiling spraying.

Mr. Khwaja S. Ahmad, USAID/Karachi, reports that checks of spraymen's collars reveal that some spraymen fail to change their uniforms daily. It is therefore recommended that a) supervisors, AMSs and MSs do "collar checks" during morning inspections to see that spraymen and mixers are wearing fresh clothing and b) that sets of protective clothing be marked "1" and "2," to be worn on odd- and even-numbered days respectively. These measures are essential for reduction of dermal contamination.

3.4 Quality of Mixing

Quality of mixing was generally found to be good. The following comments are worth noting, however, and apply to all three provinces visited:

- a) airdrift of malathion powder to the ground during transfer of powder from scales or measuring cup to mixing bucket
- b) dripping of suspension down side of bucket during pouring into pump
- c) dripping onto bare feet.

Airdrift can be minimized by placing the malathion bucket next to the malathion box, downwind from it if there is a wind. Measuring or weighing should be done over the malathion box, not over the ground.

Most mixers have two buckets, one to receive the malathion, one to receive the water. To prevent dripping down the side of the malathion bucket, mixers should be trained to place the water bucket under the malathion bucket during pouring so as to catch the runoff. Water buckets which will later be dipped into human water sources, such as streams, must be cleaned before dipping.

3.5 Quality of Spraying

The quality of spraying was found to be generally good, both from the standpoint of safety and non-safety measures. A few houses were visited in which foodstuffs had not been covered before spraying, with resultant accumulation of malathion due to bounceback from ceiling spray. It is recommended that, in future, DOMC re-emphasize the need to cover all foodstuffs, both human and animal, before spraying.

One defect uniformly noted was the shortage of extension lances. This makes for poor ceiling spray. It is recommended that every squad be provided with one extension lance. It may be advisable to have the

lance assigned to one sprayman, who would be made responsible for spraying all high ceilings. This should be done at first on a trial basis, with careful monitoring to observe whether the "ceiling men" suffer intoxication as a result of their work.

Non-safety related defects sometimes noted were speedy spraying, excessive overlap, and failure to spray undersides of shelves.

3.6 Quality of Field Supervision

Quality of field supervision was found to be uniformly high. The isolated instances of defective supervision have been noted in earlier reports.

Maintenance of high supervisory standards requires that Assistant Malaria Superintendents (AMSs), on whom the brunt of supervision falls, be provided with sufficient transport allowances to carry out their duties. Transport allowances now in force are regarded by all malaria staff consulted as inadequate to the needs of their respective zones. The provincial health authorities place themselves in an anomalous position when they give the malaria field staff a job to do but deny them the resources to do it. No malaria staff consulted have named a figure for AMS monthly transport allowance lower than Rs. 120 as the minimum required for continued good supervision. Provincial health authorities should see to it that, with due regard for local differences in size and topography, adequate transport allowances; in no case less than Rs. 120 for AMSs, be provided, so that malaria field personnel can carry out the work entrusted to them.

3.7 Quality of Field Safety Measures

With the notable exception of one squad in Swat and one squad in Hyderabad, safety measures were closely adhered to. Both these squads have since been visited by local sector and zonal officers to rectify errors made.

The need for goggles has been noted above, 3.3. It is further recommended that all squad members be required to wear shoes as a safety measure. The sandals in common use are not a satisfactory substitute because their open tops expose squad members to contamination.

3.8 Cholinesterase Determinations

Limited observations of results from Punjab and the Frontier shows some discrepancy between results of tintometric monitoring and clinical picture. Most notably, two spraymen in the Frontier with tintometric readings of 25 per cent denied history of clinical symptoms. No data was available to this writer about consistency among tintometric, Michel and clinical results for the same spray personnel.

It is recommended that DOMC redouble its current efforts to monitor compatibility among Michel, tintometric and clinical results, and that Mr. M. S. Shah, DOMC/Lahore, be dispatched to zones which have equipment in order to observe that Michel and tintometric tests are being properly carried out and are consistent with clinical findings. If Mettler scales are found defective, the services of Mr. Syed Iftikhar Zaidi, Azam Instruments Ltd., Karachi, should be requested. Mr. Zaidi has rendered DOMC useful assistance in this respect before.

It is further recommended that, contingent on availability of funds, the next external review team include one member competent to evaluate the work of Michel and tintometric determinations.

Note is taken of Dr. Mujtaba's directive of 8 June 1977, which calls for monthly monitoring of a ten per cent or more sample of spraymen. This directive has not been carried out and cannot be carried out with the inadequate number of tintometric kits now in the field. It is therefore recommended that the international agencies, singly or together, donate to DOMC a number of tintometric kits sufficient to assure that every zone under malathion spray has one kit.

In the same directive, Dr. Mujtaba indicated that Michel tests were to be done only for confirmation of tintometric results. The five kits now in use are adequate for that purpose, and no new purchase of Michel kits is necessary.

This writer has not found any hard and fast criterion in use at the field level for taking squad members off the job. He recommends adoption of the following stringent standard: any member of a spray squad presenting one or more of the five CDC clinical symptoms -- blurred vision, giddiness, nausea, vomiting, abdominal cramps -- should be ordered to bathe and rest, and should be given atropine. The supervisor should make out two copies of the appended case report (7.2, below) and send them, with the affected squad member, to the District Safety Officer for a tintometric test. Any person with a tintometric reading below 62.5 per cent should be taken off work and kept off work until his reading returns to above 62.5 per cent.

This recommended standard is based on a conservative reading of reference (1), cited in 7.4, below, which states, "an individual who has been chronically exposed to organophosphate pesticides should be withdrawn from further exposure when his ChE activity values drop to 25-50% of normal and should not be allowed to return until these values rise to at least 75% of normal." This writer has reviewed the tintometric results from last year's tests of spray personnel exposed to Italian malathion, and believes that even the stringent standard recommended here would not lead to excessive layoffs or impairment of productivity. It should be noted in this context that the early USAID reports of this year showed only about one per cent of spray personnel to be suffering from clinical illness. Under the recommended standard,

even many of these men would be kept working if they had satisfactory tintometric readings.

3.9 External Monitoring of Field Operations

It is recommended that the present external monitoring continue, using the appended revision of the field observation form, 7.3, below. In light of their knowledge of the local languages, Pakistani personnel of USAID and WHO may be the most satisfactory persons for this job.

4. Future Requirements for Areas not yet fully Operationalized

4.1 Continuing Medical Education

Considerable efforts have already been made to educate the medical profession to clinical aspects of malathion poisoning. The increasing use of organophosphates in agriculture makes it likely that organophosphate intoxication will increase in the future. All practicing clinicians must be reached with information on this increasingly important subject. It is therefore recommended that DOMC explore ways and means of educating the medical profession on clinical aspects of organophosphate intoxication. This may include half-day seminars in large institutions, articles in the literature, or any other effective way of disseminating the relevant information. Such efforts should include approaches to medical colleges to see that they include this subject, perhaps through guest lectures, and are provided, where necessary, with the relevant literature. A constructive contribution to this effort could be made by mimeographing and distributing to the medical profession an English language clinician's guide to organophosphate poisoning. In light of the very heavy workloads of DOMC physicians, the compiling of such a guide would best be done by USAID or WHO medical staff, using as a core the information in "Toxic Hazards of Malathion," which has been distributed in Sind by the provincial Malaria Headquarters. Such a guide should also be distributed to malaria supervisors, with instructions that they are to accompany any intoxication patients requiring physician's care to the medical facility, inform the physicians of the patient's exposure to malathion, and place in their hands a copy of the clinician's guide. Supervisors must be made to understand that such emergency situations are no place for deference to physicians.

4.2 Reporting of Clinical Illness and Serological Results

There is an excellent reporting system for results of tintometric monitoring in those zones where ten per cent samples of spray squads are regularly taken. However, it is recommended that a column be added to the form for recording any clinical symptoms noted in the men tested. Summary results of tintometric monitoring should be submitted to DOMC/Islamabad.

There is no written reporting system at present for informing zone and provincial offices of suspected intoxication cases. It is recommended that the appended uniform case report (7.2, below) be placed in the hands of malaria supervisors, and that they be instructed to send two copies to the zonal office with the suspected intoxication patient whenever they see one or more of the five symptoms of intoxication. For uniformity of interpretation, the symptoms should be listed on the form in the provincial languages as well as English, as on the appended example.

4.3 Disposal of Italian Malathion

DOMC and the international agencies have not yet formulated a common approach to the disposal of the Italian malathion. Ideas now under consideration by various parties include local reformulation for agricultural use, return to the manufacturers, donation to Cyanamid, and burial. Since USAID does not yet have an official position, the following comments are offered in lieu of a recommendation.

All of the methods of disposal now under consideration would entail considerable expenditure of money and manhours. This expenditure would be quite futile if the primary objective of disposal were not achieved, namely, the assurance that there will be no further cases of death or serious intoxication from malathion. The idea has been raised by DOMC that the Italian malathion might be reformulated locally for agricultural application. In considering this idea, one must bear in mind that agricultural spraying is not and cannot be done under close supervision by the health authorities. The only protection against serious intoxication under conditions of poor field supervision is to use a product of very low toxicity. In this connection, it is relevant to note that malaria spray squads have encountered intoxication this year despite good safety standards while spraying a product with oral LD₅₀ of 1000 to 2000 mg/kg in white rats. The oral LD₅₀ of any product reformulated for agricultural use would certainly have to be higher than this, and the testing would have to be done by a WHO-approved laboratory.

Whatever method is finally agreed upon, it should be implemented under the most rigorous safety precautions, with DOMC and foreign malaria personnel present, and under the supervision of a professional industrial hygienist with experience of the disposal method chosen. There must also be a knowledgeable clinician present equipped to treat any cases of intoxication which may occur during disposal or reprocessing.

4.4 Disposal of Empty Cartons

The unfortunate misconception persists among DOMC field staff that burning of empty cartons produce phosgene gas. USAID/Washington discussed the matter earlier this year with Dr. Jesse Hobbs, CDC, with American Cyanamid, and with Dr. Virgil Freed, Oregon State University. Their conclusions, set down in a USAID/Washington cable dated 9 April 1977, are worth quoting:

"Malathion empty containers should be burned in small quantities well away from village. Burning should be complete and rapid if not allowed to smolder. People and livestock should be kept away from smoke. FYI -- according to Dr. Freed concern over phosgene gas arises when polyvinyl chloride is burned -- malathion is packed in polyethylene -- end FYI. If malathion boxes are buried possibility exists that shallow water table could be contaminated eventually contaminating wells."

DOMC should not enter into any new contractual arrangements for sale of

malathion cartons. Where such contracts have already been signed, malaria authorities should see to it that contractors are apprised of their responsibility for any consequences of failure to honor their terms. Cartons should be delivered to contractors wiped free of malathion, inside and out.

4.5 Compensation to Spray Personnel Taken Off Work

Implementation of the recommendations contained in 3.8 will certainly lead to spray personnel being taken off work from time to time. The present practice is not to compensate personnel for lost time. This may lead to concealment of symptoms on the part of personnel for economic reasons, with consequent underreporting of incipient cases and potentially unfortunate repercussions on DOMC.

On the other hand, full pay to spray personnel could lead to malingering. As a compromise solution, it is recommended that any spray personnel taken off work on grounds of suspected intoxication be placed on half pay for the duration of treatment.

5. Overall Conclusions

This writer finds DOMC in overall good compliance with safety standards pertaining to field use of malathion. Contingent on continued compliance with those standards and timely implementation of the recommendations contained in this and earlier reports, he recommends that USAID not discontinue assistance to DOMC on grounds of safety.

It is worth noting that the present report is the fourth report with original recommendations for DOMC to be written in the last twelve months. The other three are the original CDC report, the report of the external assessment team (EAT), and the report of Dr. Steven Miller, CDC chemist. It is no reflection on DOMC or the international agencies to point out that, absorbed as they are in reporting to their respective constituencies, they may have devoted less time than desirable to following up on individual points raised in various reports. These very expensive special reports can be cost-effective only if their provisions are carefully followed up. In respect to the CDC report, the Miller report, and the present report, it is recommended that AID/Islamabad detail Mr. Chaudhry Umar Hayat to follow up with DOMC on individual recommendations. The contents of these reports are largely administrative and logistical, and therefore well within the ambit of Mr. Chaudhry's competence. He can turn, as necessary, to AID and WHO technical people for guidance on technical matters, to Mr. H. B. Keller on loan questions, and to Mr. Khwaja S. Ahmad on matters relating to the Port of Karachi.

Follow-up on the EAT report must be the ongoing task of someone with a firm grasp of malaria from the technical side, probably from USAID, in order to fulfill the terms of the loan agreement.

6. Acknowledgements

This writer wishes to thank all of the USAID, DOMC and WHO staff who have assisted him in his work here. On the Washington side, special thanks must go to Mr. Lawrence Cowper, Technical Assistance Bureau, USAID. In Islamabad, timely advice and assistance were forthcoming from Mr. Walter Shurkin, USAID, and from Drs. Julian de Zulueta, WHO, James Martin, USAID, S. M. Mujtaba, DOMC, and G. Hashim Mallick, DOMC. Field tours were made in the amiable company of Messrs. Masud Siddiqui and Chaudhry Umar Hayat, both USAID/Islamabad, and Mr. Khwaja S. Ahmad, USAID/Karachi. Every courtesy was extended in the field by the three provincial malaria chiefs and their staffs, as well as by zonal and sectoral personnel in the field. To all of them go this writer's heartfelt thanks.

7. Appendices7.1 Record of Consultant's Daily Activities

<u>Date</u>	<u>Activity</u>	<u>Place</u>
12 June	Travel	Karachi-Islamabad-Lahore
13 June	Visited Malaria HQ	Lahore
14-17 June	Field Visits	Lyallpur, subsectors d-10, d-17, d-1, d-2, d-6, d-8, d-9, d-11, d-12, d-13, d-14, d-16, d-5, d-7
18 June	Travel	Lahore-Islamabad
19 June	Day Off	Islamabad
20 June	Office Work	USAID/Islamabad
21 June	Travel	Islamabad-Multan
22 June	Field Visit	Muzaffargarh Zone Office and Storage Facilities
23-24 June	Field Visits	Sahiwal, subsectors d-4, a-6, d-3, d-2, a-4
25-26 June	Days Off	Lahore
27 June	Travel	Lahore-Islamabad
28 June-1 July	Office Work	USAID/Islamabad
2 July	Travel	Islamabad-Peshawar
3 July	Day Off	Peshawar
4 July	Visit to Malaria HQ, Travel	Peshawar, Peshawar-Swat
5-7 July	Field Visits	Swat; subsectors c-2, c-10, c-8, c-1, a-1, a-2, a-9,

		a-3, d-2, d-1, d-3
8 July	Day off	Swat
9 July	Field Visits	Malakand Agency, d-7, d-8
10 July	Day off	Peshawar
11 July	Travel	Peshawar-D.I. Khan
12 July	Field Visits	D. I. Khan, f-6, f-5, f-4
13 July	Field Visits	Bannu, a-4, a-6, a-7, b-5, b-7
14 July	Field Visits	Kohat, a-3, a-1, d-10, d-9
15 July	Travel	Peshawar-Islamabad
16 July	Day off	Islamabad
17-18 July	Office work	USAID/Islamabad
19 July	Travel	Islamabad-Karachi
20 July	Visit to Sind malaria HQ, travel, visits	Hyderabad, Hyderabad-Nawabshah, Nawabshah, m-2
21 July	Field visit	Nawabshah, k-7, k-8, k-9, k-5, k-3
22 July	Day off	Hyderabad
23-27 July	Field Visits	Nawabshah, m-4, m-3, m-7, m-8, m-5, l-6, l-7, l-1, l-2, l-3, l-4, j-5, j-1, j-3, j-4, j-6, j-8, i-8, l-6, i-4, h-7, h-8, h-5, h-4, g-2, g-6, g-5, g-3
28 July	Visit to Sind malaria HQ, travel	Hyderabad, Hyderabad-Karachi

29 July	Office Work	USAID/Karachi
30 July-	Office Work	USAID/Islamabad
12 August		

7.2

Uniform Case Report on Suspected Malathion Intoxication: Malathion lot # _____
and Date: _____

Name of Patient: _____ Age: _____

Position: () Sprayman () Mixer () Supervisor () Community Member

Time and Date of Onset: _____ Locality of Onset: _____

Symptoms: Blurred vision Yes () No ()

Giddiness Yes () No ()

Nausea Yes () No ()

Vomiting Yes () No ()

Abdominal cramps Yes () No ()

Other Symptoms: _____

Duration and course of illness; measures taken; outcome: _____

Date and Results of Tintometric and/or Michel Tests: _____

Has the patient fully recovered? Yes () No ()

Name of Reporter: _____

Date of Report: _____

Zone: _____ Subsector: _____

Case histories

Name: _____ Position: () Sprayman () Mixer () Supervisor

Date of onset: _____ () Community Member

Symptoms:	B lurred vision	Yes ()	No ()
	G iddiness	Yes ()	No ()
	Nausea	Yes ()	No ()
	Vomiting	Yes ()	No ()
	Abdominal cramps	Yes ()	No ()

Duration and course of illness: _____

Mea sures taken: _____

Cholinesterase date(s) and results: _____

Name: _____ Position: () Sprayman () Mixer () Supervisor

Date of onset: _____ () Community Member

Symptoms:	B lurred vision	Yes ()	No ()
	G iddiness	Yes ()	No ()
	Nausea	Yes ()	No ()
	Vomiting	Yes ()	No ()
	Abdominal cramps	Yes ()	No ()

Duration and course of illness: _____

Mea sures taken: _____

Cholinesterase date(s) and results: _____

Name: _____ Position: () Sprayman () Mixer () Supervisor

Date of onset: _____ () Community Member

Symptoms:	B lurred yision	Yes ()	No ()
	G iddiness	Yes ()	No ()
	Nausea	Yes ()	No ()
	Vomiting	Yes ()	No ()
	Abdominal cramps	Yes ()	No ()

Duration of course of illness: _____

Mea sures taken: _____

Cholinesterase date(s) and results: _____

7.4 References

- 1 Criteria for a Recommended Standard. . . . Occupational Exposure to Malathion (Washington?: DHEW, 1976), p. 143. See also mimeographed "Instructions Regarding the Safe Use of OMS-43 in a Stage IV/VII Trial" (Geneva: WHO, n. d.), p. 4: "Pronounced (about 50%) depression. . . The worker should be withdrawn from spraying (and any other exposure to insecticide) until cholinesterase activity returns to normal. This may sometimes take more than two weeks."

7.5 Recommended Additions to Field Guide and Training Courses

Contingent on DOMC acceptance of the recommendations embodied in 3, above; the following additions should be made in the DOMC field guide and in training courses for field staff:

- a) for spray squads: All members of the spray squad must pull the turban up over the bridge of the nose during mixing and spraying. All members of the squad must wear shoes. Open sandals which expose the skin to malathion are not acceptable. All spraymen and supervisors must wear goggles during spraying. When a squad member has blurred vision, giddiness, nausea, or abdominal cramps, the supervisor must give atropine, bath, and rest, fill out a case report form in duplicate, and send the affected man to the zonal office with the report forms for a tintometric test. Squad personnel taken off work for malathion intoxication will be put on half pay while they are off work. If a squad member or householder needs the care of a physician, the supervisor should follow all the above procedures and, in addition, personally accompany the patient to the medical facility, inform the attending physician that the patient has been exposed to malathion, give details of exposure and history, and provide the physician with a copy of the English language clinician's guide to organophosphate intoxication.

The supervisor must always have on his person the English language clinician's guide and this vernacular field guide.

Every mixer must have one bucket for malathion and one for water. At the mixing station, spray pumps, malathion box and malathion bucket should be placed several meters away from the source of water. The water bucket should be filled at the source and carried from there to the malathion bucket. Malathion measuring, whether with balance or with measuring cup, should be done over the box, not over the ground. When measuring cups are used, they must be of standard size, not the personal property of the mixer. The malathion bucket should be placed next to the malathion box, downwind from it if there is a wind. When the suspension is poured from the malathion bucket into the pump, the water bucket should be placed under the malathion bucket to catch the runoff, if any. Water buckets which are subsequently dipped into human water sources, such as streams, must be cleaned before dipping.

Children and adults must be out of rooms during spraying. Human and animal foodstuffs must be covered. If they cannot be covered, then the area where they are lying must not be sprayed, walls or ceiling.

Each squad should have one sprayman equipped with extension lance for high ceilings.

All pieces of protective clothing are to be marked 1 or 2, with pieces so marked to be worn on odd and even numbered days respectively. The supervisors, inspectors and AMSs should do collar

checks in the morning to see that unwashed clothing is not being used.

Supervisors should dispose of empty cartons by taking them to a remote area, away from the population, and burning them, liners and all, two or three at a time.

- b) for District Safety Officers, AMSs, and zonal incharges: Local malaria personnel should prepare for the arrival of malathion by truck or rail by keeping stores of atropine, syringes and protective clothing at the unloading site. Protective clothing must be used for handling of broken boxes. If reboxing materials for boxes received in broken condition are not locally available, then five or ten empty boxes from the previous year's stock should be kept on hand for reboxing of any material received in damaged containers. All malathion must be stored behind locked doors on bricks, pallets or platforms above the water line.

District Safety Officers should take a tintometric reading from any field personnel who have one or more of the commonly observed symptoms of malathion intoxication -- blurred vision, giddiness, nausea, vomiting and abdominal cramps -- and remove from work any such person with a cholinesterase reading below 62.5 per cent. No such person should be returned to work until his reading has risen above 62.5 per cent.