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Training of Vector Control Personnel

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Modern vector control campaigns cannot be conducted efficiently and economically unless the organization is staffed with personnel having a high standard of training. Both professional and non-professional personnel are employed at different levels in the organization and the type of training they require depends upon their previous background and the duties they are called upon to discharge. As a rule, only the central administration is staffed by specialists, but the vector control officer at the provincial level is required to be a university graduate and to complete a special three months' course of training. Educational and training requirements for supervisors of local vector control stations and for field inspectors are less exacting, while spray operators may be uneducated men trained by their immediate superiors. The author discusses these requirements against the background of the vector control organization. Suggested curricula for the various training courses are annexed at the end of the article.

The need for special training of vector control personnel has arisen only during the last two decades, following the discovery of modern pesticides. Personnel handling these compounds must be familiar not only with the methods and techniques of application, according to the habits of the vectors concerned, but also with the toxic hazards involved. Modern concepts of vector control, including the possibility of eradicating certain vector-borne diseases such as malaria, have directed attention to the importance of improving the efficiency of control measures. Moreover, the large scale on which the campaigns are conducted and the high cost of their execution demand the greatest possible economy in time and material. These objectives can only be achieved by providing a high standard of training for the personnel involved. The success of the eradication campaigns against *Anopheles gambiae* carried out by Soper & Wilson in Brazil in 1940 and by Madwar & Kerr in Egypt in 1942 was due primarily to good organization and administration and to thorough training of field personnel in the comparatively simple operation of applying Paris green. Training courses are thus indispensable for the efficient planning and execution of vector control programmes. The following observations and recommendations, based mainly on experience in the United Arab Republic, may be helpful to those organizing such courses.

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OBJECTIVES

Training courses should be designed to give professional and non-professional auxiliary personnel an adequate knowledge of some or all of the following:

1. The effective application of the basic principles of vector control according to local environmental conditions.
2. Evaluation of the results of vector control programmes.
3. Avoidance of hazards associated with the use of pesticides.
4. Economy of material by proper planning and organization.
5. The proper handling of transport and equipment.
6. Health education in the local community.

Non-professional but adequately trained auxiliary personnel can be widely utilized not only in the field aspects of vector control but also in the laboratory. The performance by laboratory technicians of simple but important techniques, such as the preparation of permanent mounts for vectors and the maintenance of laboratory cultures, can free the specialist to devote more of his time to work demanding higher qualifications.

The training course should impart a basic knowledge of disease vectors, with special reference to modes of transmission. Depending upon the duties

for which the students are being trained, the course should also include practical field training in the following: collection of specimens; survey methods; identification of specimens; biology and ecology of vectors; raising of cultures; preservation of permanent mounts; and the epidemiology of important vector-borne diseases. Personnel should be thoroughly acquainted with the various pesticides used in vector control and with their hazards, formulations and field application, as well as with the appropriate susceptibility tests. Other subjects in which instruction may be required for certain categories of personnel are: planning and organization of control programmes, including estimation of requirements; evaluation of campaigns, including applied statistics; administration, including job description and distribution of responsibilities; and health education.

LEVELS OF TRAINING AND REQUIRED QUALIFICATIONS

The levels of training required will be dependent upon the structure of the vector control organization which, in many countries, will be developed from the malaria eradication organization and therefore similar to it in structure. Where malaria eradication programmes are nearing completion, it might therefore be advisable to undertake studies of other vector-borne diseases and to make plans for a change-over to vector control, giving priority, of course, to diseases of the greatest local importance. A malaria eradication service usually has the following organization:

1. A central administration responsible for the planning and execution of the programme and the supervision and training of personnel, etc. Both a training centre and a research centre are usually attached to the administration.

2. An intermediate administrative unit, usually at the provincial or zonal level.

3. A peripheral administrative unit, the malaria eradication station, usually at the level of a political district. This is the level at which the auxiliary personnel are mainly employed. They comprise: the chief supervisor, the field supervisor or inspector, the squad leader, and the spray operators.

As the malaria eradication programme nears completion, the heads of the various sections of the central administration, who will be qualified personnel with special training, may be initiated in the control of other important local vectors through visits to vector control projects already in operation in other countries. At the same time the research unit may be expanded in order to enable it to undertake surveys and make advance plans for the change-over to vector control.

The personnel at the intermediate and peripheral levels of the administration will not normally be specialists, but administrative officers executing the orders of the central administration. Before the change-over to vector control they will require fresh training along similar lines to that received for malaria eradication.

At the provincial level, the vector control officer in charge of a section of the programme should be a university graduate in medicine or science with a fair knowledge of public health. He must have completed satisfactorily a special course of 3 months' training (see Annex 1) at a recognized institute of applied vector control.

For the smaller political districts, with populations of not more than 200 000, the administrative head may be a qualified sanitary inspector who has had 2-3 years' experience of vector control programmes and who has taken a simplified course of 3 months' duration in a national institute of vector control. The post might also be filled by an efficient chief supervisor of a malaria eradication unit after satisfactory completion of a similar course.

The chief supervisor of a vector control station at the peripheral level should hold a certificate of secondary school education (a total of 12 years' education) and should also have received a special simplified course of 3 months' duration in a national vector control institute, under the supervision of a vector control officer (see Annex 2).

The field supervisors or inspectors should have successfully completed their primary school education (9 years at school) and can be trained locally by the vector control officer with the assistance of the chief supervisors of the station. The course should be of 6 weeks' duration and should concentrate on the special duties they will be required to perform (see Annex 3). However, as lice control is usually carried out in the winter and flea control mainly in the spring, personnel engaged in fly and mosquito control can also be trained in the control of lice and fleas and thus kept fully occupied all the year round. Squad leaders or inspectors who have already been engaged in malaria eradication programmes may need even shorter courses of training.

The spray operators, who may be uneducated but should preferably be literate, are trained locally

by the chief supervisor of the station or by the field inspector to whom they will be responsible.

The microscopist technician should hold a certificate of secondary school education and is required to attend a special training course of at least 3 months' duration in entomology or in parasitology (helminthology and malacology), depending upon the diseases with which he will be concerned (see Annex 4). This course should be given under the direct supervision of the central administration at its own training centre. If the microscopist has already been attached to a malaria eradication programme he will require a much shorter period of training, probably as little as 6 weeks.

CURRICULA OF TRAINING

While it is doubtful if the control of all disease vectors can be undertaken by the same personnel, it appears possible to divide vectors (or parasites) into two main groups: arthropods and rodents on the one hand, and molluscs and helminths on the other. The central administration, however, can be responsible for all aspects of the vector control programme provided that the staff includes, in addition to the epidemiologist, an entomologist and a parasitologist (malacologist). A sanitary engineer, preferably a specialist in irrigation engineering, may also be required.

There is no reason why the head of the vector control unit, whether at the level of the province or the political district, should not supervise control operations directed against both groups of vectors mentioned above, but experience in the United Arab Republic has shown that it is preferable to employ separate teams of auxiliary personnel.

The suggested curriculum given in Annex 1 is suitable for training the head of a vector control station engaged in the control of arthropod vectors; indications are also given, however, of how the curriculum might be modified to suit the needs of the head of a station responsible for the control of mollusc vectors and helminths. Entomology would then be replaced by helminthology and malacology, while in the study of epidemiology, bilharziasis, ancylostomiasis, ascariasis and other helminth infections would replace malaria, yellow fever, filariasis, etc. As the practical application of molluscicides and herbicides is less complex than that of insecticides and rodenticides, some 12 hours might be gained for the study of methods of sanitation and irrigation. Similar adjustments would be made in other parts of the curriculum. If the head of the station is to be made responsible for the control of both groups of vectors, he will require an additional 6 weeks of training.

A simplified version of the same course may also be used for training the chief supervisor. In this case, there should be more concentration on field work, equipment and control operations, at the expense of entomology (or helminthology), epidemiology and general principles of control. This curriculum is summarized in Annex 2, while suggested curricula for field supervisors or inspectors and for laboratory technicians are given in Annexes 3 and 4.

RÉSUMÉ

Des campagnes modernes de lutte contre les vecteurs ne peuvent être conduites de façon à la fois efficace et économique si l'organisation ne possède pas un personnel jouissant d'un haut degré de formation. Le personnel professionnel et le personnel auxiliaire sont tous deux utilisés aux différents échelons de l'organisation et le genre de formation dont ils ont besoin dépend à la fois de leur bagage antérieur et des devoirs qu'ils devront assumer. En règle générale, seule l'administration centrale possède une équipe de spécialistes; cependant le responsable provincial de la lutte contre les vecteurs doit être diplômé de l'université et avoir suivi un cours spécial de formation de trois mois. Les titres exigés pour les surveillants et les inspecteurs sur le terrain sont moins importants et les hommes chargés des pulvérisations peuvent être des ouvriers non qualifiés, simplement entraînés par leurs chefs directs. L'auteur présente des suggestions pour les titres et connaissances qu'on est en droit d'exiger aux différents échelons de l'organisation.

Annex 1

SUGGESTED CURRICULUM OF SENIOR COURSE FOR HEAD OF VECTOR CONTROL STATION[1]

Total duration: 3 months=78 working days
Lectures: 2 hours per day; practical work: 4 hours per day; total 6 hours per day (field days: 8 hours)

1. ENTOMOLOGY (OR HELMINTHOLOGY AND MALACOLOGY)

Lectures: 40 hours; practical work: 80 hours; total: 120 hours (20 days)

	hours
Arthropod classification and general morphology	12
Culicidae	18
Other Nematocera and Brachycera	18
Cyclorrhapha	18
Other orders of insects	18
Ticks and mites	12
Rodents	12
Test and discussion	12
	120

2. EPIDEMIOLOGY, PARASITOLOGY AND STATISTICS

Lectures: 45 hours; practical work: 45 hours; total: 90 hours (15 days)

	hours	
Principles of epidemiology	6	
Malaria	10	} (or bilharziasis)
Yellow fever	8	
Filariasis	10	
Typhus	10	} (or ancylostomiasis and ascariasis)
Plague	6	
Trypanosomiasis	8	
Leishmaniasis	8	(or other helminth infections)
Applied statistics	18	
Test and discussion	6	
	90	

3. SUBJECTS RELATED TO VECTOR CONTROL (pesticides and equipment)

Lectures: 36 hours; practical work: 18 hours; total: 54 hours (9 days)

	hours	
Insecticides, rodenticides and resistance	24	(or molluscicides and herbicides (12 hours) + sanitation and irrigation (12 hours))
Equipment	30	
	54	

[1]The curriculum as set out in detail applies to the control of arthropod vectors. However, indications are given in brackets of the subjects that might be substituted to modify the course for the control of mollusc vectors and helminths.

4. METHODS OF VECTOR CONTROL

A. *Principles of control*

Lectures only: 66 hours (11 days)

	hours	
Personal hygiene and environmental sanitation	6	
Mosquito control and principles of malaria eradication	42	(or bilharziasis control)
Fly control	6	(or ancylostomiasis control)
Louse control	3	
Flea and rodent control	6	(or control of other helminths)
Control of bedbugs, roaches, etc.	3	
	66	

B. *Control operations*

17 field days (lectures: 12 hours; field work: 124 hours; total: 136 hours)

	hours		
	lectures	*field work*	
Pre- and post-operational surveys			
Mosquitos and malaria	—	24	(or bilharziasis)
Fleas, rodents, lice, etc.	—	40	
Fly surveys	—	16	(or other helminths)
Planning of vector control	2	14	
Geographical reconnaissance	2	14	
Organization, costing, evaluation of campaigns	8	16	
	12	124	

5. ADMINISTRATION AND HEALTH EDUCATION

Lectures: 20 hours; field work: 4 hours; total: 24 hours (4 days)

6. EXAMINATION

2 days

SUMMARY OF COURSE

Subject	No. of hours				Working days
	Lectures	Practical work	Field work	Total	
Entomology or helminthology & malacology	40	80	—	120	20
Epidemiology & statistics	45	45	—	90	15
Pesticides & equipment	36	18	—	54	9
Control methods (17 field days)	78	—	124	202	28 [a]
Administration & health education	20	—	4	24	4
Final examination	4	8	—	12	2
Totals	223	151	128	502	78

[a] Including 17 field days.

Annex 2

SUGGESTED CURRICULUM OF JUNIOR COURSE I FOR CHIEF FIELD SUPERVISORS

Subject	No. of hours				Working days
	Lectures	Practical work	Field work	Total	
Entomology or helminthology	30	60	—	90	15
Epidemiology & statistics	20	34	—	54	9
Pesticides & equipment	18	36	—	54	9
Control methods	84	—	210	294	39 [a]
Administration & health education	20	—	4	24	4
Final examination	4	2	8	14	2 [b]
Totals	176	132	222	530	78

[a] This comprises: 12 field days for survey work; 18 field days for control operations; 9 lecture days for principles of control.
[b] This includes one field day examination.

Annex 3

SUGGESTED CURRICULUM OF TRAINING COURSE FOR FIELD SUPERVISOR OR INSPECTOR

Subject	No. of hours				Working days
	Lectures	Practical work	Field work	Total	
Entomology or helminthology	20	40	—	60	10
Epidemiology	12	6	—	18	3
Pesticides & equipment	20	16	—	36	6
Control methods	25	—	175	200	25
Administration & health education	8	—	4	12	2
Final examination	2	2	10	14	2 [a]
Totals	87	64	189	340	48

[a] Including 1 field day.

Annex 4

SUGGESTED CURRICULUM OF JUNIOR COURSE II FOR LABORATORY TECHNICIANS (MICROSCOPISTS)

Subject	No. of hours				Working days
	Lectures	Practical work	Laboratory work	Total	
Entomology or helminthology	30	60	—	90	15
Epidemiology & statistics	12	18	—	30	5
Pesticides & equipment	18	12	—	30	5
Laboratory techniques	47	—	235	282	47
Administration & health education	20	4	—	24	4
Final examination	4	—	8	12	2
Totals	131	94	243	468	78