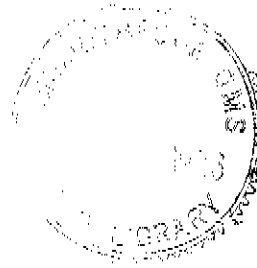




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TOOLS AND TECHNIQUES FOR VECTOR CONTROL AT THE COMMUNITY AND PERSONAL LEVELS

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Vector control at the community and personal levels although an old concept had been somewhat relegated to the back bench in the wake of the availability of chemical pesticides and specialized control programmes during the past few decades. Increasing difficulties with vector resistance, escalation of costs, and general adoption of the principles of Primary Health Care (PHC) have now emphasized once again the role of integrated vector control approach based at the peripheral levels, and in many of these the community and the individual will play an important role. However, much of this, at this stage, is still at research level and it is difficult to find good examples where these concepts have been applied on a large scale or operationally in a disease control programme. For the time being, thus we still depend on chemical pesticides very often used in special programmes.

WHO (1983)¹ identified that the selection of techniques for peripheral use depends on the priorities of the community, manpower and financial resources, specialized knowledge, effectiveness, safety, simplicity of use, cost, visibility and social acceptability. It also requires availability of a core group to promulgate and popularize these methods and trained manpower resources.

One of the important constraints in this area is the lack of socioeconomic understanding on the part of some programme planners. Disease control through vector control is often locked in isolation whereas it should be a part of a clearly planned scheme of things for the overall development of the community in which vector control and/or prevention of exposure to vectors has its rightful place. In fact, as a community advances economically, its desires, demands and tolerance towards vectors change significantly.

Community-oriented approach versus specialized vector control activities

We are generally aware of the specialized (vertical) approaches towards disease (vector) control and there are a few important distinctions one has to keep in mind as regards the tools/techniques required for community-oriented approaches. The vector control methods worth considering for use by the community should meet the following criteria:

- (a) Availability of the tools and equipment should be easy; in contrast, specialized programmes may depend on tools which may not be available locally and/or be high in cost.

¹ World Health Organization (1983) Integrated Vector Control, Seventh report of the WHO Expert Committee on Vector Biology and Control, Technical Report Series, 688

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The expenditure involved to the individual or community should not be beyond the average means. Specialized programmes may depend on the use of expensive equipment which may also not be easily available.

(b) The methods and skills required should be easy to acquire, unlike the specialized programmes which may need special training.

(c) The proposed methods may be of benefit to other local enterprises and in fact, if possible, be income linked so that there is a reasonable probability that the efforts are continued and the interest of the community does not wane after an initial peak of enthusiasm but provides motivation. This may not apply to the other approach.

(d) The proposed vector control method is compatible with local attitudes and beliefs, thus a study prior to actual adoption may be necessary.

(e) The methods and tools are effective and proven and the results are visible.

It is also understood that the proposed methods do not impose any toxicity or health hazards or cause damage to the environment, attributes shared by both the approaches.

Some examples of tools and techniques suitable for peripheral use, either based at community level or personal level

There is strictly not an absolute mutual exclusivism of techniques between the community based or specialized programmes. Some tools may be common to both approaches but the planning/administration/evaluation may vary. Similarly, the methods used at personal level, when used on a large scale, become community-based programmes. In the following section, examples of some techniques and tools suitable for peripheral use are given. Unfortunately, I am not aware of any of these which have been truly adopted as a part of primary health care (PHC). Most of these examples have been drawn from the available information from large-scale research projects or other information available to the ECV unit. At present, we are really not aware of such approaches being used too effectively and in fact some of these are implemented as part of a large vertical programme, and may be used as such for some time to come.

A. Repellents

DEET as a repellent against biting insects has been known for a long time. A 50-100% formulation is applied to the exposed parts of the body, such as legs, arms, face, etc. Other similar preparations based on dimethyl phthalate, ethyl hexanediol are also available. Repellents are generally used in situations where other chemical control measures are not available. Recently soap containing permethrin is being evaluated, but there are still some technical details which should be examined. Repellents can also be applied to personal clothing. Garments treated with DEET have been tried against Simulium damnosum in Cameroon. Light-weight jackets treated with DEET have also been shown to provide protection against biting midges. Within the context of PHC, these approaches can be utilized for some special occupation groups, such as inhabitants who may be unusually exposed, e.g. fishermen, rubber-tappers or those visiting an area with a risk of transmission for short periods, such as tourists.

B. Use of insecticide-treated or simple bed-nets

A bed-net or a mosquito-net is used in many parts of tropical Africa, America and Asia as a personal protection device from mosquitos. Before the advent of residual insecticides for malaria control, this was a very popular method used in the tropics. With the advent of many malaria control programmes based on the use of residual insecticides, there has been a feeling of security and in many suburban and urban areas progressive use of airconditioning

has made their use less popular. Recently, within the overall context of PHC and community participation in vector control, considerable work is being carried out. Schreck and Self (1985)¹ have described a simple method of treating bed-nets with permethrin by the inhabitants themselves under nominal supervision. At a dosage of 0.2 to 0.5 g technical ingredient per square metre, the effectiveness may last up to three years and the cost of treatment per net may be around 30-50 cents. A large study involving several villages and both entomological and epidemiological statement is now underway in The Gambia.

Darriet et al. (1984)² demonstrated that when permethrin was utilized to treat the bed-nets at relatively low rates of 0.08 g/m² reduction in the entry rate, increase in exit rate and reduction in engorgement reduce the man/vector contact considerably for several months.

Other synthetic pyrethroids, such as deltamethrin, have also been employed and in a study in Mali by Diallo (unpublished thesis, 1982) this insecticide was used at 8 mg/m² with promising results.

An interesting feature of this approach is that protection continues to be provided, even if the bed-nets are damaged.

C. Mosquito coils, hand aerosols and fumigation mats

Mosquito coils are extensively used in the Western Pacific, South-East Asia, Central and South America and Africa. Mosquito coils usually contain pyrethrum powder as the active ingredient and the smouldering smoke keeps the mosquitos away from biting. The entomological effects have not been thoroughly studied but, since 1984-85, a field test with mosquito coils at community level is being carried out in Tanzania. Despite this fact, use of mosquito coils is well established and, in Japan alone, over one million mosquito coils were sold at a cost of 20 billion yen (\$87 000 000 approx.).

Hand aerosols, usually available in 300 ml cans, are extensively used worldwide and there are several hundreds of brands. Most of these contain one or more pyrethroids usually synergized with piperonyl-butoxide. For aircraft disinsection, the insecticide, usually d-phenothrin is applied by hand.

Fumigation mats, which operate from an electrical supply, are gradually replacing mosquito coils in the urban areas. Synthetic pyrethroids like bioallethrin or (S)-bioallethrin are usually the active ingredients. Precise information on their effectiveness is not available, but 1300 million mats were sold in Japan alone in 1982 at a cost of about \$ 100 000 000.

D. Community involvement in an income-linked approach for the control of malaria vectors through integrated approach

Integrated vector control with socioeconomic development by economic exploitation of algae for paper manufacture and conversion of lagoon areas to prawn culture has been utilized for source reduction and modification near Pondicherry, India. Use of indigenous larviporous fish, *Gambusia affinis*, further helped in reducing and eliminating breeding sources. Although, so far, confined to village scale, this technique, if applicable under the prevailing ecological situation locally, has a good chance of success, but sound study and planning is required (Rajagopalan & Panicker, 1984).³

¹ Schreck, C. E. & Self, L. S. (1985) Treating mosquito nets for better protection from bites and mosquito-borne disease (Document WHO/VBC/85.914).

² Darriet, F. et al. (1984) Evaluation of the efficacy of permethrin - impregnated intact and perforated mosquito nets against vectors of malaria (Document WHO/VBC/84.899/WHO/MAL/84.1008).

³ Rajagopalan, P. K. & Panicker, K. N. (1984) Feasibility of community involvement in integrated vector control in villages (Document WHO/VBC/84.903).

E. Malaria control through integrated control

Integrated control of malaria vectors through source reduction, minor engineering works, biological control, environmental improvement, such as social forestry, has been shown to be successful against An. culicifacies in Kheda district of Gujarat in India. Health education has played an important role in this and community participation has been observed to be at a high degree. Fisheries for control of mosquitos and food are entirely managed by the community. The income from the forests also goes to the village governing council, thus these provide an incentive to assure continued participation by villagers (Sharma & Sharma, 1986).¹

F. Integrated vector management for urban filariasis control

Urban filariasis transmitted by Culex quinquefasciatus is a man-made disease largely because the vector breeds in the polluted water in the urban, suburban or rural environment due to unplanned growth. Application of some source-reduction methods through inter-sectoral collaboration, community participation, utilizing a combination of biological, environmental and chemical methods, has proved successful (Rajagopalan & Das, 1985).² These approaches can be adapted for community use, but presently are part of a vertically administered programme.

G. Control of the vectors of dengue and DHF through community participation

The distribution and the breeding habitats of Ae. aegypti, the principal vector of dengue/DHF in urban areas, are such that environmental control through source reduction, destruction of immature stages, scrubbing and cleaning of containers to dislodge eggs, filling of tree holes, changing water in the receptacles and flowerpots every week, use of fish in large tanks, use of tight-fitting covers for jars and even the use of temephos as a larvicide could and should be done by the community members. All the principles of good housekeeping will help in this matter and legislation, as used in Singapore, can greatly improve performance (Chan Kai Lok, 1985).³ Such legislation has to be enforced vigorously to assure success.

H. Tsetse control utilizing simple or insecticide-impregnated traps for riverine species

Amongst the techniques for vector control at community level, there is probably none as promising as the use of simple or insecticide impregnated traps. These traps were originally designed for sampling tsetse fly populations. These have been successfully used in Ivory Coast and Congo. In Congo, traps are provided by the health services, but their maintenance is carried out by the villagers. The acceptance of these traps is very high because the inhabitants can see for themselves the results. The technique of impregnation of the trap material by synthetic pyrethroids further improves the efficacy.

I. Control of cyclops intermediate hosts of Guinea worm through community participation

Guinea worm disease presents the weak links in the cycle of transmission. One is the infection of water bodies by people who step into water, thereby releasing the immature stages, and the second is drinking water with the cyclops carrying the infective stages.

¹ Sharma, V. P. & Sharma, R. C. (1986) Review of the integrated control of malaria in Kheda district, Gujarat, India (In press).

² Rajagopalan, P. K. & Das, P. K. (1985) Integrated vector management for urban filariasis control in Pondicherry, ICMR Bulletin, 15, No. 11, November, 1985.

³ Chan Kai Lok (1985) Singapore dengue haemorrhagic fever control programme: A case study, SEAMIC, 1985.

Community efforts can be thus concentrated in avoiding contamination of water by health education and changing the design of the wells from stepwells to draw-wells. Further use of appropriate filters for drinking water to exclude the cyclops. Both these techniques are now being tried in India (Bo Elding, 1986).¹

In Indonesia, Suroso and Bang (1986)² have reported reductions in the levels of larval infestation by using "education and guidance" of community members by health centres in adopting some of the above measures. They used a community approach utilizing school students, volunteers and other community members and carried out intensified health campaigns.

Boonluan et al. (1986)³ have also reported field trials utilizing community approach towards controlling Aedes aegypti. Students from various schools and teachers were utilized in their field trials. Local health authorities and members of the community were also trained and their assistance obtained. Although reduction in the larval infestation indices and numbers of cases of DHF were noticed, they found that beyond a certain point reduction in larval indices was not noticed and this level was far higher than the minimum sought.

Constraints

At present, we do not have a great deal of information on the community-based vector control measures, but the following can be considered as some of the constraints:

1. Lack of proper understanding of the eco-epidemiological and socioeconomic situation leading to selection of methods which are not cost effective or acceptable. The priorities of the community have to be carefully considered.
2. Difficulty due to lack of legislation and implementation of such legislation, even though it may exist.
3. Lack of trained manpower who would form a core group for the maintenance of efforts needed.
4. Lack of proper evaluation methods.
5. Lack of motivation of the community members over a very long period of time. Vector control is arduous and the average person in a village or town cannot be expected to cooperate over a long period of time, thus some incentive is essential.
6. Administrative difficulties at high levels within the ministries of health to adapt from ongoing vertical programmes to the PHC activities.
7. While considering 6 above one has to appreciate that some of the community-oriented programmes are not so efficacious that the results are visible outright.
8. Lack of dynamic leadership. Very often such measures have a bigger chance of success when dynamic leadership is available. In its absence, the methods do not seem to work.

¹ Bo Elding (1986) Guinea worm eradication through community participation: An integrated approach (In press).

² Suroso, T. & Bang, Y. H. (1986) Control of dengue haemorrhagic fever and the community involvement in Indonesia (In press).

³ Boonluan, Phanthumachinda et al. (1986) Approaches for community participation in Aedes aegypti control, Phanus Nikhom District, Chonburi Province, Indonesia (In press).