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VECTOR CONTROL ACTIVITIES IN THE WESTERN PACIFIC REGION USING THE PRIMARY HEALTH CARE APPROACH

by

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1. Introduction

Within WHO and among health officials of Member States, it is realized that the actual implementation of primary health care is a complex issue which poses several challenges. It is well known that vectorborne diseases are often closely associated with poor environmental sanitation, inferior housing and poverty. It is, therefore, important that communities living under unsatisfactory socioeconomic conditions be approached in the right manner and be informed of the steps they can take to prevent and control vectorborne diseases. It can be assumed that communities have the ability to deal with their problems, and that they desire and have the capacity for change. They must be involved in the process of learning and planning if their effective involvement is to be obtained.

Important concepts of primary health care in relation to vector control are:

(1) using acceptable methods and technology which are accessible to individuals and families in the community and permit their full participation at a cost they can afford;

(2) developing through appropriate education the ability of communities to participate;

(3) involving, in addition to the health sector, all related sectors and aspects of community development.

It may be assumed, at present, that countries are at various stages of implementing primary health care and each may have its own definition of what it involves. Whatever the definition, what is important is that the stragegy, when integrated with vector control, should envisage total coverage of the population and that the community should be involved and should actively participate.

Ideally, community involvement starts with the individual, who learns that he can exercise some control over his own health. This leads to community awareness of health and diagnosis of health or health-related problems. At this stage technical and managerial support can come from outside the community to develop activities that will link up with government programmes.

The kind of activities the community may be involved with to improve its health will depend on the problems identified. Essential health care services can be carried out effectively and economically by the people themselves with the support of the health services, provided they know what to do and agree that it is important to do it.

Approaches will vary according to country and local situations but direct or face to face contacts with members of the community and their leaders are considered essential. With respect to vector control, it is important to emphasize that trained and experienced personnel must give precise technical guidance on what the communities should do, and provide this information in simple and understandable language.

Vector control measures by the community can fall into four general categories as follows: (1) prevention of man/vector contact; (2) destruction of larvae; (3) destruction of adult mosquitos; and (4) source alteration or reduction. In many cases, the most valuable technical factor necessary for developing community measures is a precise knowledge of vector breeding habits.

Some examples of vector control activities carried by community members which are relatively widespread are:

(1) applying hand aerosols for killing mosquitos;

(2) using mosquito nets and screening houses;

(3) burning mosquito coils to kill or repel mosquitos;

(4) cleaning and covering water storage containers;

(5) keeping surroundings clean and improving basic sanitation measures;

(6) siting houses away from major sources of mosquito breeding.

Where there are few resources, the potential for developing a viable community-based vector control programme may appear, at first glance, to be greatly limited. A community living at subsistence level, whose basic needs for food, water and shelter are barely met, cannot usually spare much effort or time for vector control activities. The methods used should be inexpensive in relation to the families total income and not time consuming.

To start the process of community involvement, there has to be an initiative from somewhere. It may come from the community itself or from outside the community, from government or private agencies, or from the health services themselves. The underlying message of WHO in the primary health care approach is that the health services should take the initiative.

2. Country activities

The extent and importance of community participation in controlling disease vectors vary among countries of the Western Pacific Region, and none of them ignore this approach. The most important vectorborne diseases in the Region are malaria, dengue haemorrhagic fever, filariasis and Japanese encephalitis. Apart from individual use of small quantities of commercially formulated pesticides and aerosols bought in shops, there has not been very much progress in the systematic application of insecticides by communities. The need for training, supervision, and funds for insecticides and spray equipment calls for firm commitments, which cannot be easily met by community members themselves without outside collaboration, planning and support. In addition, the choice of cost effective insecticides is rather limited, and only materials with a very good margin of safety to applicators, inhabitants and non-target organisms in the environment should be used.

2.1 China

China for many years has relied upon community participation to markedly upgrade its level of basic sanitation in and around houses, villages, towns and cities. Community involvement in the health services was a political initiative. This has led to a marked reduction in fly, rodent and mosquito populations. Disposal of excreta in underground vats next to houses has been used to generate marsh gas for cooling and lighting purposes. Screened houses and the use of mosquito nets are widely promoted in many rural areas. Additional measures being used to cope with specific vector problems linked to socioeconomic development are:

(1) encouraging the rearing and strategic placement of cattle outside villages in Guangsi and Yunnan Provinces in malarious areas of southern China to facilitate deviation of An. minimus and An. sinensis from man to cattle;

(2) replacing thatch roof mud houses with well-constructed cement houses suitable for screening, combined with the use of mosquito nets to reduce man-vector contact of An. sinensis in rural malarious areas of Shandong and Henan Provinces in eastern China and certain other areas;

(3) clearing of vegetation up to 500 metres from the village perimeter, combined with land reclamation (planting orange trees, for example, to prevent scrub vegetation from growing back) to obtain An. balabacensis - free localities in Hainan Island;

(4) intermittent irrigation practices in rice fields, to conserve water and increase yield, which are carried out in large areas of Henan Province in east China under agricultural auspices, resulting in reduced densities of An. sinensis and Culex vectors of Japanese encephalitis;

(5) the incidence of malaria in the Yellow and Huaihe river villages in 1985 went down to 0.45% partly as a result of a determined effort to encourage farm families to use mosquito nets.

Measures of lesser importance which have been used from time to time are:

(1) HCH fumigation of animal shelters by farmers to kill resting anopheline mosquitos in the early spring;

(2) community collaboration with fisheries personnel in the rearing and release of fish (Tilapia, Ctenopharyngodon, common carp, etc.) in channels in and around rice fields, in which case weeds have been consumed, rice yields have increased due in part to the fish excreta, and the grown fish have been used for human food;

(3) among communities living in the towns of Beiha and Doong Xing in Guangsi Province in southern China near the Viet Nam border, placing of fish (Nilotica introduced from Egypt, Tilapia and Claris fuseus) into water containers to control Ae. aegypti in order to reduce the risks of additional dengue fever outbreaks;

(4) lining and clearing of vegetation along the edges of streams where An. minimus breeds in the vicinity of villages;

(5) as part of a plan to overcome the risk of the community's contracting malaria by sleeping outdoors on hot summer nights in An. sinensis areas, community activities include (a) installing additional windows to improve house ventilation; (b) installing more door curtains, screened windows and using more mosquito nets to reduce man-vector contact; and (c) encouraging the use of pyrethrin coils and skin repellents while gathering outdoors in the evening.

2.2 Republic of Korea

Improvements in standards of living, better housing and basic sanitation facilities, and establishment of model villages for gradual expansion to rural communities have contributed to the control and diminishing importance of vectorborne diseases. As in Japan, farmer pesticide applications have lowered the density of the Japanese encephalitis (JE) vector, Cx. tritaeniorhynchus, in the rural rice growing areas. Recently, however, insecticide resistance has diminished the benefits of farmer spray applications.

Some specific community measures being promoted by health officials include the following:

(1) collaboration with agricultural officials and farmers in selecting and using herbicides at the time of transplanting rice in May and June which are not toxic to larvivorous fish;

(2) collaboration with the agricultural extension and training programme in providing information to farmers on the safe use of pesticides and especially the precautions to be taken when applying them;

(3) the extremely low numbers of JE cases in 1985 were attributed in part to a health education programme instructing farmers to spray pig shelters with residual insecticide;

(4) using a surveillance system based on antibody conversion in sentinel pigs and mosquito light trap captures to warn communities of potential Japanese encephalitis outbreaks. If outbreaks occur, health education activities are stepped up and the media are used to advise communities to give greater attention to personal protection measure and adult mosquito control in and around their houses during the high-risk period.

2.3 Malaysia and Singapore

Both countries have advanced vector control programmes which place strong emphasis on health education and, if necessary, strict law enforcement to obtain participation of the community to prevent the breeding of Aedes mosquitos inside and around houses. Larvicides are rarely used to treat containers in Singapore, and the average Breteau index is now about one.

Singapore adopted the Destruction of Disease Bearing Insects Act (DDBIA) in 1968 which allows for summons and fines to be served on offenders found breeding mosquitos on their premises. Malaysia now has a similar act. The successful programme in Singapore is well known and details of their activities have been reported elsewhere.

When 1% temephos sand granules are used in Peninsular Malaysia, residents and property owners must do the applications themselves to keep their premises Ae. aegypti free and not expect municipal or regional sanitarians or local vector control staff to do this for them. A strategic health education campaign, consisting of poster displays, house-to-house talks and distribution of circulars by Aedes inspectors, newspaper articles and television shows have provided precise details on how individuals can prevent breeding by simple environmental measures or by the use of temephos. A small packet of 1% sand granules suitable for a year's requirements can be purchased in selected stores at a cost of about 75 US cents, equivalent in price to one person viewing one or two movies a year.

In Sarawak State of Malaysia, staff attached to the vector control unit are able to cover the relatively small population (200,000) of Kuching by repeated applications (4 times a year) of 1% temephos granules. After five years of such applications, steps are being taken to obtain a permanent solution to the problem in Kuching and other towns in the State. Low-income populations residing in crowded coastal localities are being encouraged to replace 200-litre water drums with large mosquito-proof water tanks that are designed to collect

rainwater. After briefing the community on the benefits of the tanks, they usually agree to pay a small nominal sum for the tank materials, which results in better community acceptance and care of the tanks.

In Sabah State of Malaysia, health education campaigns have been used to promote community prevention of malaria and dengue fever. Health education specialists have prepared posters, on the advice of technical personnel, which have emphasized basic sanitation for Aedes control and the use of mosquito nets to prevent bites of night-biting malaria vectors. The first to benefit from the correct use of mosquito nets in the highly malarious village interlands would be children and infants, the group most vulnerable to malaria infection. Maternal and child health care activities in some localities are being combined with informing mothers on the potential risks and symptoms of dengue haemorrhagic fever and the methods of preventing vector breeding.

Health officials in Malaysia and Singapore have collaborated with other government departments and industry in preventing the proliferation of breeding sites during the construction of factories, roads and development projects in outlying areas. A simple example here is the use of bulldozer to level land that has been cleared. In the field of personal protection, a recent report from Malaysia indicated that more than US$10 million are spent annually on mosquito coils.

The Ministry of the Environment in Singapore places a high priority on a viable health education programme and has a special department and staff to work full time in promoting community-based health activities. Considerable importance is given to vector control and community measures to prevent the breeding and exclusion from the home and shop of flies, mosquitos and rodents. Pamphlets are prepared for distribution to show-owners, homes, industry, schools, etc. Health education specialists on vector control are also involved in producing television shows and giving talks and demonstrations in schools.

2.4 South Pacific

The three main vectorborne diseases in the countries and areas of the South Pacific are dengue fever, subperiodic bancroftian filariasis, and epidemic polyarthritis, more commonly known as Ross River virus infection. In addition to Ae. aegypti and in certain places, Ae. albopictus, a number of other Stegomyia of the Ae. scutellaris complex are also involved in the transmission of one or more of these three diseases, especially Ae. polynesiensis.

The Ae. scutellaris species have similar breeding habits to Ae. aegypti and Ae. albopictus and they breed in artificial or natural breeding sites in and around houses. Thus the community vector control measures used for dengue vectors are for the most part applicable to the subperiodic filariasis and epidemic polyarthritis vectors, with the exception that a few of the latter vectors are more difficult to control by simple environmental measures and include Cx. annulirostris, Ae. vigilax and Ae. vexans.

The improvements which are now being made in village sanitation and in up-grading the level of basic sanitation, which include the construction of water-seal latrines and provisions for piped water supply, are at the same time reducing the number of vector breeding sites. These basic sanitation measures normally involve the active cooperation and participation of the community, including their payment for some of the sanitation facilities installed. This programme is a long-term process, with a view to attaining certain targets by the end of this decade, and involves government collaboration with international and other agencies.

Some simple community activities, which are being promoted and are necessary at this time to reduce vector breeding potential and lower risk for transmission, are:

(1) collection, removal, disposal, burying or burning of all unusable tin cans, jars, bottles, tires, coconut shells and husks, claim shells and other items that can collect and hold water;

(2) regular emptying of water in flower vases inside houses, schools, offices and public buildings at least once a week;

(3) covering of large volume ($\geq$ 500 litres) water storage tank inlets and overflow outlets with wire-mesh;

(4) keeping small water drums (200 litres or less) covered and also turning them upside down once a week when the water level is low, or using a fixed cover permeable to rainwater (burlap or rice bag, etc.) with a simple tap installed at the bottom;

(5) keeping all tires, metal boxes, wash-hand basins, boat hulls, old car and truck parts, and other items on industrial and commercial premises in sheltered areas protected from rainwater;

(6) puncturing water-logged tree holes with a knife and also tires used by children for swings and other recreational purposes at schools, parks, and beaches;

(7) clearing weeds and tall grass from premises to reduce outdoor vector resting sites while at the same time revealing container breeding sites not easily seen by casual observation.

In Fiji, health education circulars, legislation with provisions for fines, newspaper articles have been used to promote community activities in vector control.

In Samoa, a country-wide health education programme to promote community participation in vector control started in 1981. A plan was developed to visit all the villages (about 300) in the country, and the vector control staff eventually met with village leaders in over 100 villages, including members of the woman's committees. Circulars were distributed, slides and films shown in the villages, and vector control demonstrations performed. Other activities included a national workshop on filariasis control, talks in schools, articles in local newspapers, projecting a vector control slogan on cinema screens before the main feature film, and preparation of a manual for school teachers and health personnel, illustrating how individuals can control mosquitos in and around their houses.

In French Polynesia, considerable importance is attached to health education and active participation of the community, especially schoolchildren, in vector control. During one dengue outbreak, radio broadcasts were used to summon several thousand schoolchildren to a central laboratory to collect one black ovitrap each into which had been placed a small quantity of temephos. This stimulated considerable interest in the community and led to immediate distribution of these traps to thousands of houses to supplement other control measures.

3. Problems and approaches

This paper will not go into the complexities of the problems and approaches involved in achieving motivation and participation. Approaches will vary according to country and local situations. It is important to emphasize, however, that trained and experienced vector control personnel must give precise technical guidance on what the communities should do, and provide this information in simple and understandable language. They will need to be more involved in health education activities and in collaborating with community health workers and leaders, primary health care workers, school teachers and others. Appropriate guidance also has to be given to health inspectors and junior sanitarians who often have day to day contact with the community.

With regard to health education methods in countries of the Western Pacific Region, knowledge shared among national participants at several vector control workshops has emphasized the importance of face to face contacts with members of the community and their leaders. Apart from legislative approaches, some suggestions for solving problems of community acceptance are listed below:

(1) make educational materials as simple and attractive as possible like comics;

(2) use slides and posters to supplement talks;

(3) try to educate in groups instead of going from house-to-house only;

(4) give a short talk on community vector control at a time routine community activities are taking place (dance, bazaar, etc.);

(5) identify persons in the community to promote health education, do not try to do everything yourself;

(6) meet at a time convenient to the community and not at a time convenient to you;

(7) give talks at schools and encourage the school officials to include simple elements of vector control in the school curriculum;

(8) encourage schoolchildren and art teachers to make health education posters and carry out vector biology projects;

(9) show films in the villages, and film shorts in public cinemas and on television;

(10) place posters in health centres, make circulars for house-to-house surveys, and use newspapers for special articles;

(11) prepare simple manuals for the use of school teachers, community leaders and related health personnel, who can include vector control education among their multi-disciplinary duties.

4. A priority activity - impregnated mosquito nets for malaria vector control

Increased attention has been given to personal protection measures and the treatment of mosquito nets with permethrin, a residual pyrethroid insecticide. Projects have been implemented against malaria vectors in China, Laos, Papua New Guinea, Malaysia and the Solomon Islands, and additional projects are at the advanced planning stages in Viet Nam and Vanuatu. Results indicate that treated nets are a simple, quick, safe, cheap and effective technique to reduce transmission potential and the numbers of mosquito biting people for about six months. Although this method has not been used on large scale comparable to DDT indoor residual spraying, a consideration of epidemiological, logistical and cost factors indicate that treated nets could be preferred to DDT spraying in some situations.

4.1 Comparative costs of DDT spraying and treated mosquito nets

Figures indicated that 1 kg. of 75% DDT costs US$2.10. This amount of DDT is often required to spray one house such as those in Laos. Transport of DDT within the country, training of spraymen and payment of per diem or salary to sprayman are added costs. An adequate good compression sprayer to apply the DDT costs at least US$43. It is conservative estimated that one cycle of DDT spraying costs US$3.50 per house and two cycles a year US$7.00.

One double-sized nylon mosquito net (11m^2) costs about US$3.00, based on the price in the Philippines. A typical house would require at least two nets, making an initial cost of US$6.00. The permethrin insecticide needed to treat the two nets twice a year at 0.5g/m^2 would come to about US$2.50, assuming the cost of 1 litre of 20% EC to be US$20.00.

As a rough estimate, the first year costs of DDT spraying would be about 15% less than the use of treated nets. However, during the next four years, the same nets could be re-treated, which would mainly involve the cost of insecticide. In such cases, the use of

treated nets would cost about 50% less than DDT spraying. The total estimated costs of DDT spraying per house for a five-year period would be US$35 (US$7 x 5) versus US$18.50 for treated nets (US$8.50 for first year; US$2.50 a year for next 4 years). The labour costs for net treatments would be lower than DDT spraying because the nets could be treated by community workers requiring little training.

Treated nets should not be considered as a replacement for DDT spraying but used to complement DDT spraying. For example, nets could be used in places where community resistance to DDT spraying is high and in highly endemic areas where the housing is poor. They could also be used when there are transport and logistical difficulties in reaching isolated rural areas. Treated nets could also be used to maintain insecticide pressure on vector populations in localities where DDT spraying has been withdrawn because the malaria incidence dropped below 5%.

The mosquito nets for some projects in the Western Pacific Region have been purchased in the Philippines from a small rural village in Batangas Province, where 15 women with sewing machines have experience in assembling good quality nylon mosquito nets. In the countries where mosquito nets are being used, the ability to sleep more comfortably is one of the biggest factors in achieving community acceptance of this technique.

4.2 Advantages of owning a mosquito net

Factors making mosquito nets suitable for community vector control activities can be highlighted by pointing out the following advantages of owning a treated mosquito net:

Why use a mosquito net?

a) Simple and effective means of personal protection.

b) For sleeping comfort.

c) Reduces bites of infective and non-infective mosquitos.

d) Complements a malaria control programme to help reduce disease transmission.

e) Can be used by anyone without special assistance.

Why treat a mosquito net?

a) Extends the useful life of the net even when torn.

b) Becomes a toxic resting site during the day when the net is unoccupied.

c) Kills mosquitos attempting to bite sleeping person or after having bitten.

d) Reduces number of infective and non-infective mosquitos biting in homes for 6 months or more.

e) Complements a malaria control programme by using an inexpensive method individuals in the community can implement and maintain.

Suggestions for health care workers

a) Create a need for mosquito nets by giving talks on:

- Reducing exposure of children to malaria or other vectorborne diseases.
- Ease of use because of the passive protection provided.
- Variety of pest insects other than mosquitos that are killed by a treated net, i.e. cockroaches, fleas, lice, biting flies, ants, houseflies, mites and bedbugs.
- Sleeping comfort obtained.
- Prestige of owning a mosquito net.

b) Impregnate old nets already in use; make materials available for people who wish treatment.

c) Determine ways to make new nets available to the people who do not have them. Distribute them but do it while the idea is fresh and the need is current.

d) Encourage proper use, instruct, periodically return and reinforce by maintaining communication with the people.

e) Determine what effect the long-term use of treated mosquito nets has on vectorborne disease in your locality.

5. Insecticides purchased for home use

As to the funds spent by individuals and families for control of pests and vectors in homes, this apparently amounts to many millions of US dollars a year in countries such as Malaysia and the Philippines. It also represents an expensive form of community participation in vector control, the amounts of which probably exceed many national vector control budgets. It is therefore important that more information be obtained on the cost effectiveness of mosquito coils and other commercial pest control devices of known active ingredients so that meaningful information can be disseminated to the general public.

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