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ANTI-LARVAL OPERATIONS AS THE ATTACK MEASURES (IN URBAN AREAS, ARID AREAS OR OTHER SPECIAL CIRCUMSTANCES)

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Usually, anti-larval operations have been applied as a supplement to the traditional programme elements of residual house spraying case finding and drug administration, but there are also some situations where anti-larval operations have been used as the principal attack measure. Its use in urban areas, arid areas or other special circumstances depend on technical, operational and economic considerations.

Technical considerations:

- Related to the natural habits of the vector, such as exophily. In Cambodia and in the Sugut area of Sabah where A.balabencis is the main vector, interruption of transmission has not been achieved because the mosquitoes can enter freely the sprayed farm huts (which usually have no, or only partial walls) to bite man at night although with less number, and escape without picking up a lethal dose of the insecticide. Other exophilic species such as A.maculatus, A. minimus, A.fluvirostris, do not remain even in unsprayed houses in the day time. These behavioural characteristics render the vector refractory to the regular spraying programme.

- Related to the type and structures of the houses, which make spraying impractical or unfeasible, such as the use of houses without walls or excessively fenestrated.

- Related to human habits which lead to outdoor transmission.

Operational reason for using anti-larval measures due to their convenience or to simplify attack operations.

Economic reasons and operational convenience are often inter-related and difficult to differentiate. Instances are few when operational convenience does not produce economy.

Anti-larval operation in urban areas, arid areas

The rapid expansion of urban areas, the development of peripheral slum areas by rural exodus to towns, the concentration of population in urban areas, render the use of residual spraying impracticable and costly. In this situation, the use of anti-larval measures outstand as the only attack measures in MEP & Malaria Control. The preferential methods of anti-larval measures may vary widely according to type and extent of breeding places.

Where the breeding places are wells, underground cisterns or limited surfaces, the use of diesel oil (solar oil) as larviciding is very economic, effective and safe. Such was the case of Ballora quarter in the periphery of Aleppo city and Anadan village (arid area). Solar oil was used at 5 cc per sq. meter in wells and cisterns at weekly intervals. The breeding of A.claviger, which was the cause of new foci, was easily controlled and eliminated without any residual spraying.

The example of Jordan 1951 is worth to be mentioned. A.superpictus and A.sergenti were considered to be the main vectors of the Jordan Valley. Extensive breeding existed along the banks of the Jordan River and its tributaries. In many cases both species are seen breeding together in the same place. Shallow water running slowly over pebbly or rocky beds strewn with tiny vegetation and exposed to the sun offers the best breeding conditions for this species. A. sergenti also breeds along the greasy edges of streamlets and springs. In one instance sergenti was found breeding in an exposed well 5 meters across, the water in which was about 30 meters deep, containing some floating dead weeds.

Both species were recorded in every village of the Jordan Valley. Surveys of DDT sprayed premises for adults showed that these species had disappeared from inside such premises, but larval collection showed considerable breeding continued in nearby breeding places, and adults of A.sergenti and A.superpictus were discovered in large numbers in caves, fissures and cracks: 354 sergenti and 383 superpictus were captured from 16 caves and holes, to avoid contact with DDT sprayed premises, thus a high rate of malaria transmission was maintained in the Jordan Valley in spite of the DDT residual spraying.

What was the remedial measure? Of course, the only solution was the anti-larval measure: larviciding and source reduction, as larviciding paris green, solar oil 5 cc per sq. meter, and 5% DDT solution, as source reduction drainage wherever feasible. Many countries have used anti-larval measures to protect towns.

In Kabul (Afghanistan) anti-larval measures were used against anopheles. In India permanent engineering works have improved the sanitation and narrowed the scope of anti-larval work. In indonesia permanent sanitation sometimes with larvicidal measures was effective. In Netherlands New Guinea, the anti-larval measures applied to protect towns, were drainage and oiling, the results have been successful in Sorong.

Anti-larval operations in special circumstances (Problem areas)

Definition:

"A problem area is a geographical area within which an adequate epidemiological evaluation shows that the transmission of malaria parasites despite total, complete, regular and sufficient coverage with residual insecticides, and where careful studies have revealed that administrative or operational factors are not responsible for the persistence of transmission, and where additional measures are required in order to prevent the occurrence of new cases" Xth Report, Expert Committee on Malaria. An understanding of the nature of problem areas requires consideration of the bionomics of two major factors: the human host and the insect vector. A third factor, the parasite, may be involved under exceptional circumstances.

A. Bionomics of the human host as a cause of persistent malaria transmission.

B. Bionomics of the insect vector which may contribute to persistent malaria transmission.

   1. Unsuspected or insufficiently investigated aspects of mosquito behaviour, such as exophily, exophagy or excito-repellency;

   2. Existence of previously unsuspected vectors whose bionomics render them refractory to the regular spraying programme.

C. Bionomics of the parasite.

Failure to interrupt transmission of malaria in a problem area is usually due to a combination of inter-related causes, usually associated with the insect vector, among which may be mentioned the following:

A. Abnormally low contact of the mosquito with adequately treated surfaces due to:

   1. Natural habits of the vector, particularly exophily

2. Reaction of the anopheline to the insecticide, particularly excito-repellency.

3. Human habits leading to outdoor transmission.

B. Inadequate insecticidal efficiency of surface due to:

1. Abnormally frequent reconstruction or resurfacing of houses;

2. excessive intervals between cycles in relation to local epidemiology of malaria;

3. transmission by a vector not recognized at the planning stage;

4. specific physiological resistance of the vector to the insecticide.

Measures to be applied in problem areas

A. Imagicidal measures: improvement of insecticide, or change of insecticide, use of combination of insecticides.

B. Chemotherapeutic measures such as radical treatment of cases confirmed, mass drug administration etc.

C. Anti-larval measures:

a) Use of known larvicides or granular cyano-phospherousones, especially applicable when breeding places of the vector are restricted in relation to number of houses as in towns where large surfaces of water exist, aerial spraying of larvicides may be used.

b) Aerial spraying of herbicides as in dealing with the sub-genous Kertezia breeding places.

c) Methods of biological control or environmental sanitation.

Conclusions:

1. Anti-larval operations should be considered as the only remedial measure to be used against the refractory vectors.

2. In Pre-eradication survey:

a) Complete bionomical study of anopheles is necessary to undertake in PES, to decide whether residual spray is effective or technically not effective owing to the habits of either the vector or man.

b) Study of water supply system and methods of its storage.

c) Drainage and sewarage system.

d) Future trends and plans for expansion of urban areas, and future plans for drainage, sewarage and safe disposal of liquid wastes.

e) Mutual co-ordination and better collaboration between the municipal authorities, engineers, public health authorities and the technical direction of the Malaria Eradication Programme.

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