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Research Needs and Priorities: Chemical Control

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The most critical needs in chemical control investigations on *Aedes aegypti* are: (*a*) knowledge of the habits of the species under field conditions; and (*b*) field evaluation of chemical measures.

On the surface, it would seem that the significance of this species in disease transmission would have motivated scientists to compile a complete dossier on its behaviour and habits. Unfortunately, scientific zeal for the suitability of this insect as a laboratory tool has far overshadowed the meagre efforts expended on field investigations. To develop effective tools or methods, one must have information on the conditions under which these techniques are to operate or be applied. Chemical measures are extremely sensitive in this respect, since compounds that are quite toxic to an insect may prove ineffective because of the ecology of the species. With *A. aegypti*, little or no information is available on these important subjects: (*a*) egg viability under different natural conditions, (*b*) types of breeding-sites and relative significance of each in a control area, (*c*) time-period that adults remain in the vicinity of their breeding-habitat, and (*d*) resting habits and survival of adults under natural conditions.

These types of data must emerge from field research on the insect in its environment. Frequently, too large a gap exists between laboratory studies and operational programmes. The latter assume that sufficient knowledge is available to apply the recommended methods effectively; the former are based on evaluation with unpolluted media, uniform conditions, standard exposure-times and specific insect stages. If research is to set priorities on its efforts, it should know what the problems are at the field level; e.g., which are the important breeding-sites, such as tires, cans, drums, ceramic urns, and tree-holes. In a given area, which of these sites are the primary source of the infestations? Do the mosquitos rest near the breeding-sites? Will an adulticide, larvicide or ovicide serve most effectively?

Field studies present many frustrating difficulties, including the time required in which to determine the true value of a control measure. Nevertheless, in the final appraisal, the only valid assessment of a pesticide is its performance under field conditions. Workers are prone to accept toxicity data (LD_{95}, LD_{50}, etc.) as proof of the usefulness of a compound. Such data merely show that contact between the toxicant and the insect will be lethal; they bear little resemblance to what one may expect in the field. Furthermore, the results obtained may differ from one geographic area to another. One then comes to the inevitable conclusions that (*a*) a compound should be field-tested before its incorporation in a control programme, and (*b*) compounds of value in one geographic area should undergo pilot trials in other areas before acceptance there.

In studies of pesticides for use against *A. aegypti*, these items warrant consideration: (*a*) development of an ovicide, (*b*) evaluation of pesticides under actual and simulated field conditions, (*c*) evaluation of pesticides for use as space (ground or air) treatments, (*d*) assessment of pesticides at maximum dosages compatible with safety to man and animals and under the techniques employed on *A. aegypti* eradication programmes and (*e*) development of components of chemical control tools (i.e., formulation, means of application, etc.).

The previously mentioned subjects are preludes to discussion of what is probably the most neglected problem of chemical control studies; i.e., the paucity of data on the effective use of various chemical measures, together and/or in conjunction with non-chemical techniques in attaining control or eradication. Operational management at times appears obsessed with the concept that the use of more than one chemical control technique in a project should be avoided, a concept that appears quite untenable when one considers the arsenal of chemical weapons now available. Research is not faultless, since it frequent-

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ly seems content to develop effective individual measures without giving further consideration to the means by which such measures can be brought together to produce maximum control of the insect involved.

The judicious blending of control tools required to produce successful end results concerns these elements:

(*a*) *Chemical measures*. This involves consideration of the chemicals used, the method of application, the cycle of treatment, etc.

(*b*) *Source reduction*. This involves the elimination of breeding-sites by destruction or mosquito-proofing of containers.

(*c*) *Education and legislation*. The former explains the role of the individual in an eradication campaign and secures his co-operation; the latter provides for compliance when voluntary co-operation is inadequate.

(*d*) *Operational supervision*. The key to a successful programme is the intelligence with which the campaign is organized and executed. Execution must be sufficiently flexible to meet the problems that arise.

(*e*) *Other measures*. This category includes those techniques that are experimental at present and not advanced to the stage of operational use (genetic control, biological control).

If we are to obtain the maximum benefits from the tools developed by industry and applied research, we must recognize the distinct and pressing need for investigations on the integrated use of the various control measures.