

NAVAL INSECT CONTROL OPERATIONS IN RELATION TO SURROUNDING COMMUNITIES

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In pest and disease vector control the Naval establishment comes into particularly close contact with other Government projects in public health. Often the Department of Defense receives requests from communities and organizations in the vicinity of military establishments, asking for assistance in local insect control programs, such as the application of insecticides by military aircraft. However, these requests cannot always be met, because, except under special conditions, it is considered an improper use of Government funds to conduct operations outside the jurisdictional limits of Government property. Such use could involve competition by the military with civilian firms engaged in pest control activities, or the operation would cover areas over which local, state or federal government agencies other than the military have been given responsibility. In many places, of course, there are already effective mosquito abatement districts, and aerial spray is an established part of these district programs. But in many other areas, such districts are not yet established.

In making specific determinations as to whether the Navy should either do or subsidize control outside naval property, several criteria are applied. These are based on the benefit to be received by the Navy, or its responsibility for the condition causing the problem, or the presence or degree of public health emergency. Application of insecticides on property other than that under the jurisdiction of the Navy is, of course, the normal responsibility of the individual, group, governmental or other agency owning, or controlling the property. Except in a dis-

aster or other emergency, prior approval by the Secretary of the Navy is required before funds, supplies, equipment or personnel of the Navy can be used for the benefit of individuals or groups. It can be readily seen that using Navy assets in the absence of such an emergency, for the benefit of individual communities, however worthwhile the work might be, would bring sharp criticism from communities which were not receiving this aid. Therefore, where no emergency exists, the Navy cannot assist in meeting local problems unless it is requested to do so by the United States Public Health Service, the United States Department of Agriculture, or the United States Department of the Interior.

Furthermore, a Naval installation which asks the Secretary of the Navy for approval to assist its surrounding community, even for performing services in an emergency, is required by public law to be responsible also for providing the necessary funds, material and personnel *from its existing allotments*. Obviously, it is necessary that agreements for reimbursement of the actual costs be made, preferably in advance, if the limited operating funds of the installation are not to be depleted.

"When the Naval installation and the civilian community have a joint interest in the problem, Navy participation shall be in proportion to the interest of the Navy," say the regulations, and approval must be asked in the same manner as outlined in the preceding statement. It is only when the *benefit is primarily the Navy's*, rather than the landowner's, that the Navy may routinely do work outside its boundaries. In this case, permission is always asked of the landowner and easements are usually arranged through the local mosquito control agency doing similar work, or through the local public health department.

Sometimes, instead of being the donor

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of manpower, equipment and materials for mosquito control, the military establishment is the beneficiary of already-established community projects. The Government portion of the whole area to be treated may be so small that it is swallowed up, and the entire area most efficiently treated by the community agency. Sometimes, the problem concerns breeding sites which are remote from the military base, yet which are producing populations of mosquitoes that fly in to the military area and cause a problem which the Navy neither creates nor helps to solve, but to which it is subject by its mere proximity.

The military goes about its program just about the same way a mosquito abatement district does. First, we locate the problem, examine the sorts of mosquitoes we have and look for the right kind of breeding places within the boundaries of the installation. Then we set about removing these breeding sites or controlling them, and killing adult mosquitoes which enter from the outside.

Taking the census of our mosquito population is the job of the Medical Department, which, for this purpose, uses light traps supplied by the Civil Engineer or Public Works, as it is called at the Navy shore establishment.

Utilizing information from the light traps, the medical department corpsmen search for breeding places and dip up samples of any standing water in order to discover whether there are any mosquito larvae and, if so, what instar. As is done elsewhere, we consider that first or second instar larvae indicate that we are not *overdosing*, whereas *fourth* instar larvae, obviously indicate that we are not spraying insecticides quite often enough. In this way, the medical survey acts as a guide to the engineer control, so that we neither waste the public moneys nor allow mosquitoes to get away from us.

Our engineer control men are also trained to observe obscure breeding sources, and we keep the entire military force constantly reminded to look for tin cans, pot holes under faucets, holes in

trees, clogged rain gutters, storm drains, forgotten vases, cesspools and fire barrels, ornamental shell casings and other potential troublemakers.

Control starts at the center of a military installation, and the places mentioned above in the inhabited areas are cleaned up first, either by removing them or by applying a residual spray. At this same time, screens and doors are sprayed and sometimes a residual spray is applied to the interior of a building, although this usually is not done unless diseases are endemic in the area, as, for instance, in some places overseas. Ditching and filling are considered essential first steps in eliminating salt marsh and swampy areas in the outer parts of the installation, which usually occur only in air fields and ammunition depots with their large runways and igloo areas.

Ditches, in many cases, are tied into the general drainage system established by the local mosquito abatement or soil conservation district. Sometimes an installation furnishes an impounding area for farmers of surrounding lands whose surplus irrigation waters need to be drained away in order to prevent the high perched water tables which ruin crops as well as breed mosquitoes. Subsurface tiles drain water into permanent ditches leading to the impoundments. At one large naval installation, hydraulic dredge spoil from the channel side is pumped to the low-lying public lands surrounding the other sides of the military base; this is allowed to dry and is then plowed, thus permanently eliminating the swamp, reclaiming tidelands from the bay and preventing mosquito breeding.

Obviously, the most efficient and satisfactory way to meet the problem is to control mosquitoes *before* they can fly, suck blood and lay eggs to ensure the succeeding generation. However, on-the-station control is often not enough.

When all the breeding areas lying under military jurisdiction have been controlled, we turn to barriers against immigrant mosquito adults and for this purpose we use residual applications of dusts and occasionally sprays and fogs. Applications of

wettable powders, used as dusts, penetrate vegetation well, settle over lawns and shrubbery and leave residuals which kill the harboring adults of all species.

Oftentimes the military installation is concerned about mosquitoes which are breeding around the base in agricultural areas. These mosquitoes will menace the well-being of the persons at the military station, a small city, but yet they are not of sufficient importance to the sparsely populated farm areas around us to justify the tax outlay for an urban level on control. By means of a payment contract, the Government attempts to square the debt for this extra control work done by the mosquito abatement district. This helps to carry our share of the local taxes, but it does not, of course, pay for the fact that there is a good abatement district to start with.

We feel that the military play a very considerable role in the establishment and continued welfare of the mosquito abatement districts of the country, however, for several reasons. By our example, we do have some impact on the community, in which our military and civilian employees are residents and taxpayers, influencing the community to desire better sanitation and insect control. By our indoctrination, we educate our personnel to expect high standards in these matters and when they leave the military they carry these expectations and the willingness to work to establish them, into the communities to which they move. And it should be noted here, that many civilian mosquito abatement entomologists and managers and research people are reserve officers in the military forces and bring into the military a continuing flow of practical experience and attitude which helps to nourish and invigorate the military programs.

Finally, the military spends millions of dollars each year on insect research through subsidies, grants, and contracts with foundations and universities as well as other governmental agencies. For example, a major portion of the funds required to operate the USDA laboratory on Insects Affecting Man, at Gainesville,

Florida, comes from the Department of Defense. Likewise, studies on the detection of insecticide residues and insect resistance to insecticides at the Beltsville laboratory are funded in part by DOD Grants.

We like to think that the malaria control program conducted by the military immediately after the war in the Philippines, in which program we were greatly aided by AMCA members Dr. Francisco Dy, the late Dr. Antonio Ejercito, Mr. Cornelio Urbino and others, had some slight influence on the establishment of the later successful malaria eradication program under the direction of AID, WHO and the Department of Health of the Republic of the Philippines. This program, which included dusting adult harborages and spraying the interiors of buildings, procedures that previous ideas on the habits of *Anopheles minimus* had seemed to argue against, has been reported in *Mosquito News*. We feel that such programs as the one that Lt. Colonel Milton Flemings conducted in Japan were of value also in the subsequent establishment of local control. Similarly with the program that Mr. Joseph Poole has long had established in the Ryukyus. In these cases, the control was done for our military benefit but because of the dedication of the personnel involved and the built-in "prestige" or public awareness of our activities, local control programs gained impetus, we feel, far in advance of the normal course of events.

The Armed Forces at the present time have 88 entomologists on active duty. These are divided among the services as follows—the Army has 52, 22 are in the Navy, and the Air Force has 14. For the most part, these entomologists represent a highly trained and coordinated professional pool instantly available whenever and wherever needed. In addition, these 88 active duty personnel are backed up by a large reserve contingent who, in a short period of time, could be recalled to active duty with only a minimum of indoctrination and training required. We also have available a large group of highly trained

technicians and sub-professional personnel. Considerable emphasis by all three services has been placed on vector control training programs and, as we have mentioned the annual two weeks of active duty "for training" keeps the Reserves in up-to-the minute touch with our military program—and we with theirs.

SUMMARY. We have attempted to describe the interactions between the military control and the civilian mosquito abatement which we feel are mutually valuable. Where the military need for control is not matched by a need on the part of the surrounding community, we augment such control either with our own forces or by contract with civilian agencies. Where there are strong programs on both sides of the fence, we lend support to the civilian efforts by the indoctrination and training of our personnel who live, or will live, in

communities and provide a growing body of support to mosquito abatement. By grants to research, the military aid in the discovery of materials, techniques and equipment which will improve the efficacy of efforts by all agencies. And by participation in civilian conferences and the temporary resorption into our ranks of civilian mosquito workers who are Reservists, we help to speed up the flow rate at which information on practical control techniques passes around. We feel that at least some of the generally increasing interest among the populace in genuine mosquito control is due to the example of the military programs which are on view around the world. We also feel that the military and the civil programs are too closely interwoven to be successfully separated and we hope it continues to be that way.

PRESENT STATUS OF INSECTICIDES FOR MOSQUITO CONTROL IN FLORIDA

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In Florida, insecticides are used extensively for the control of *Aedes taeniorhynchus*, *Aedes sollicitans*, *Culex quinquefasciatus*, *Culex nigripalpus*, and *Psorophora confinnis*; and to a lesser extent against *Aedes aegypti*, *Mansonia* spp., fresh-water *Aedes* and *Anopheles* spp.

With the intensive research on arboviruses now being conducted in the state, it is not possible to say what other species might be added to the list for serious attention by control districts in the near future. New information already has justified second thoughts about some of the fresh-water *Aedes* and at least one anopheline. Reliable information on the present status of insecticides against certain of these species is fairly complete; for others it is, at best, sketchy or incomplete.

CHLORINATED HYDROCARBONS. *Aedes taeniorhynchus* and *Ae. sollicitans* present a single problem from the standpoint of control, with *taeniorhynchus* being by far the dominant salt-marsh species over most of the state.

It was against these species that the armed forces during World War II, and the mosquito control districts in the immediate post-war period, demonstrated that mosquitoes could be controlled over large areas with DDT applied by aircraft as a larvicide—adulticide. However, by 1949 DDT resistance was demonstrated in several counties (Deonier and Gilbert 1950; Bertholf 1950; Cain 1950; King 1950). There followed a short period during which other chlorinated hydrocarbons were used with varying degrees of success (Keller and McDuffie 1951; Keller and Chapman 1953).

However, by 1955 a number of Florida

¹ Contribution No. 139 Entomological Research Center,