

CHEMISTRY

Insecticide Repels and Kills

NMRI 448, most effective insect repellent and killer, developed by Navy research for jungle fighting, is being manufactured for civilian use.

► A TWO-EDGED weapon against "bugs" that does more than even DDT has emerged from scientific research.

It repels insects and it kills insects.

Like DDT, the new chemical, called 448, goes on killing any insects that come in contact with it for a long time. It is effective up to 30 hours, after it has been sprayed on walls, clothing and skin.

Going farther than DDT, this new anti-bug weapon also repels insects, keeping them at bay for 10 to 14 days.

If you spray your house or barn, you not only kill all the flies, mosquitoes and other bugs in it, but you can be sure no more will come in for 10 days to two weeks. It is non-poisonous, so it can be sprayed on cattle before they go out to

pasture, and on people going to picnics or sitting on the lawn.

NMRI 448 was developed by Lt. Comdr. Michael Pijoan and associates at the Naval Medical Research Institute, Bethesda, Md. The initials are for the name of the institute. It is made up of two long-named chemicals, 2-phenylcyclohexanol and 2-cyclohexyl cyclohexanol.

The repellent feature, of course, was the prime object of the research at the Naval Medical Institute. Even before the first Marine landed on Guadalcanal, the Navy knew it had to fight bugs, especially malaria mosquitoes, as well as Japs. And fighting bugs in the tropics, as many a returned veteran will tell you, is something different from swatting the flies or mosquitoes that occasionally get into your screened house or lifting a few ants out of the sugar at a picnic.

A repellent for use in jungles has to be powerful, safe and easy to use. Something a man can quickly douse himself with which won't hurt him if he should swallow a little of it and something that won't irritate his skin. It also has to be something that will not dissolve in water, so that it will not be washed off by sweat and tropic rains.

To make sure of this point, 448 and other repellents were tested under tropical conditions in the laboratory. A temperature of 90 degrees Fahrenheit dry bulb, 80 degrees wet bulb, was maintained in a cage full of mosquitoes.

Scientists and their assistants smeared a repellent on one of their arms and then sat with it inside the cage, holding a clock on the mosquitoes to time the first bite. To make sure the repellent would work under conditions of dripping sweat as well as "pool sweat," the kind that stays on the skin instead of dripping off, the scientists engaged in vigorous exercise for some of the tests.

Dimethyl phthallate, most commonly used insect repellent during the war, had a repelling time of only 80 to 90 minutes. NMRI 448 averaged 289 minutes in early laboratory trials. Follow-up trials in the jungle showed it had an even longer repelling time.

Mosquitoes that spread malaria were the chief target at which 448 was aimed. But it has turned out to be effective against disease-bearing mosquitoes as well as such other bugs as chiggers, fleas, flies and cockroaches.

Insect repellents have been known and used for many years. Some of you may remember burning Chinese punk sticks at evening garden parties. Oil of citronella, which some people found as repellent as the mosquitoes did, is another old-timer.

The two most effective repellents today are the Navy's 448 and Rutgers 612, which chemically is 2-ethylhexanedial 1,3. Indalone, introduced within the past few years, is highly effective against flies.

The insect-killing power of 448 has only recently been discovered, since it was made in the search for a better repellent. It is this unique double feature, killing and repelling, of 448 that promises to raise it above DDT and other newer insect killers.

The list of new insect killers is long and confusing. They include the highly toxic benzene hexachloride, also known as 666; sabadillo, azobenzene, a highly effective unidentified compound with the empirical formula $C_{10}H_6Cl_8$; DFDT which is a chemical cousin of DDT, TDE which is another relative of DDT, and hexaethyl tetraphosphate.

The war stimulated the search for new chemical weapons against bugs for a number of reasons. Troops had to be protected against malaria, typhus fever and other diseases spread by insects. More food was needed, so crops, poultry and cattle had to be protected as never before. Finally, some of the older anti-bug chemicals, such as rotenone, were in short supply.

Peace finds the world still desperately needing food, and people in many regions living under such overcrowded, unsanitary conditions that disease is an ever-present specter. Many public health officials believe that one-half the infectious, or germ-caused, disease problems occurring in the world are directly attributable to insect vectors. The financial cost of insect destruction is staggering. The poultry industry alone loses \$85,000,000 in a year to insects.

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Official U. S. Navy photograph

11-HOUR REPELLENT — Lieut. (jg) Jachowski (left) watches Lieut. Comdr. Michael Pijoan (MC), USNR, as he completes the synthesis of the new insecticide which repels disease-bearing insects for as long as 11 hours as well as kills them. Two years of laboratory experiments with some 2,000 trial preparations were made at the Naval Medical Research Institute, Bethesda, Md.