

CHEMISTRY

# Insect War May Backfire

The chemicals used for killing insects may harm as well as help. DDT checked a dangerous epidemic of typhus fever in Italy, and may soon be available to civilians.

By JANE STAFFORD

See Front Cover

► THE NEW chemical weapons for our war against insects that destroy crops and spread human disease are turning out to be double-edged weapons. There is danger of disastrous backfire from this kind of chemical warfare just as there is in the gas warfare which military authorities hesitate to use.

The insects—mosquitoes, lice, boll worms, beetles, flies and roaches, like the one shown on the cover of this SCIENCE NEWS LETTER—cannot turn on us with a gas attack of their own death-dealing dusts and sprays, it is true. But our own weapons threaten us in this war. They may at the same time destroy both useful and harmful agricultural insects. They may rid your dog of fleas, but insidiously, and perhaps fatally, damage his liver or paralyze him through nerve damage. They will rid your home of mosquitoes, flies and vermin, but the price may turn out to be high in human health and life.

These double-edged weapons are the new insecticides. Best-known of them is DDT, the anti-lice powder that checked a dangerous epidemic of typhus fever in Italy. Our troops had typhus protection from the vaccine, previously untried under epidemic conditions, which was devised by American scientists just before the war. The Italian people had no such vaccinations and the DDT powder kept them from being ravaged by typhus, long a scourge of war. The DDT dust kept troops and civilians free of lice, and scientists are betting the vaccine was also effective, which history will judge. At any rate, the new insecticide won its battle and helped win a campaign.

## Pre-War Rotenone

Before the war, an insecticide was, to the average layman, something to spray or dust around the house to rid it of flies, mosquitoes or roaches. Most of them, though the layman probably did not know it, were made of rotenone and pyrethrum, substances extracted from tropical roots and poppy-like flowers.

The pre-war layman generally knew, too, that the whitish film he sometimes found on apples was an arsenate spray used to protect orchards from insect pests. He may also have known that paris green was dusted on swamps and pools to cut down mosquito breeding.

Then came the war and the need for more food. Victory gardens turned hundreds of thousands of lay men and women into small-scale farmers and brought them face to face with the insect pests that destroy crops. War also brought the threat of deadly, louse-borne typhus fever and mosquito-borne malaria to millions of American sons, fathers, husbands and sweethearts. And war stopped the imports of rotenone and pyrethrum for fighting mosquitoes and insects that destroy crops.

Most of us had no idea how near we were to losing the war against insects and the disaster that uncontrolled hordes of crawling and flying disease carriers

and crop destroyers might have brought. While we were giving thanks to our chemists for newer and better sulfa drugs and to other scientists for plasma and penicillin to fight germs, another group of scientists were working quietly behind the scenes to give us weapons against our insect foes.

First of these new weapons to be publicly acclaimed was dichloro-diphenyl trichlorethane, nicknamed DDT. It was synthesized in 1874 by a young German chemistry student, Othmar Zeidler, in Strasbourg. He made it almost as a chemical stunt, something as a cook might develop a new recipe for a cake or pudding, and he apparently had no idea that his chemical had any insect-killing powers.

DDT was buried in a German Chemical Society report until a few years ago when Paul Muller, scientist of J. R. Geigy, chemical manufacturing firm in Basle, Switzerland, discovered its properties as an insect killer. Even then, it was a crop pest and not human disease that brought DDT out of obscurity. It saved the Swiss potato crop, threatened in 1939 by Colorado potato beetle, and



**DAILY TREATMENT**—DDT sprayed on 70,000 people each day as shown in this U. S. Army Signal Corps picture quelled a typhus epidemic in Naples.



**FLIES COUNTED**—The effectiveness of household sprays is checked by an actual count of the flies killed.

was soon found to have other agricultural value.

The Geigy firm states that its scientists also discovered DDT's power to kill body lice, which spread typhus fever. When the United States entered the war, the Geigy product was brought to the attention of American military and agricultural authorities.

The tale that the first DDT available in the United States was smuggled out of Switzerland appears to be more romantic than true. A quantity of the potent insect killer was sent openly from Basle to the firm's offices in New York as a regular business transaction. It came in the form of the agricultural insecticide, under the trade name of Gesarol. The New York offices did not then know its chemical structure.

#### Synthesized by U.S.D.A.

The active ingredient was extracted and later synthesized by U. S. Department of Agriculture scientists who tested it in experiment stations all over the country. At the same time, military authorities in great secrecy investigated its anti-lice property.

Today DDT is being produced in large quantities by a number of firms in the United States. Production has expanded to the point where all military needs are expected soon to be met and there is hope that limited civilian distribution for essential needs may be possible later this year.

DDT is used as a body-dusting powder and as an emulsion to impregnate clothing in fighting lice and typhus fever. It is active not only against lice and agricultural pests but also destroys mosquito larvae, fleas, flies, moths, roaches, bedbugs and silverfish.

#### Health Hazard

"The toxicity of DDT combined with its cumulative action and absorbability from the skin places a definite health hazard on its use," according to Dr. M. I. Smith, Dr. E. F. Stohlgman and Dr. R. D. Lillie, of the U. S. Public Health Service. (*Public Health Reports*, July 28)

The symptoms DDT produces in laboratory animals strongly resemble in some respects the action of phenol, or carbolic acid. It is more than three times as poisonous as phenol to rats and possibly twice as poisonous to rabbits, the scientists found.

The effects of DDT in laboratory animals are cumulative. Small single doses given repeatedly lead to chronic poisoning. Most obvious of the symptoms are the effects on the central nervous system. These show up as overexcitability, generalized fine and coarse tremors and spasticity progressing to a flaccid type of partial paralysis of the extremities. Death from a fatal dose may often be delayed for several days.

Less obvious is the damage to the liver which, for the very reason that it

does not appear so readily, may be more serious.

Although DDT is quite poisonous when absorbed by the body, it is not very readily absorbed when applied to the skin, although it is absorbed to some extent through skin. In the powder form in which it is used for delousing, it probably is not as easily absorbed as in a solution, Dr. Smith said. It may also be absorbed through the skin to some extent from clothing impregnated with the chemical.

Apparently no DDT poisoning has developed from its use in war theaters as an anti-lice and therefore anti-typhus fever weapon, nor has any trouble apparently been seen so far among those working with the chemical in its manufacture.

#### No Warning

But some of the very properties that make DDT so useful as an insecticide will multiply the potential trouble. It has no warning odor or taste and when used as a liquid spray, is invisible on the sprayed surface. Yet it clings for weeks and months to clothing, to walls in dairy barns and homes, and to hides of cattle or pet animals. During this period it keeps its insect-destroying power, which is fine. If, however, it can injure food plants or animals higher in the biologic scale than insects, this will not be so good.

Tests are under way in at least two government laboratories to learn what danger DDT may hold and, if possible, how to control it so as to take the widest advantage of this strikingly effective insecticide.

Before it is widely used as an agri-

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## Do You Know?

The British Association for the Advancement of *Science* is 113 years old.

Colombia is now producing enough *cement* for its own needs.

Canada has a 22% increased *wheat* acreage this year, nearly 4,000,000 acres.

*Potash-containing dust* from the recent eruption of Vesuvius may be sent to England for use as fertilizer.

In hot, dry countries, people sometimes carry *cucumbers* to eat and quench their thirst, as they are approximately 96% water.

*Steel bottles* are used to hold oxygen for high-flying air crews; the oxygen is compressed at 122 times atmospheric pressure.

*Big weeds* in a garden as tall as the crop plants should be cut off and not pulled, as pulling injures the roots of the crops.

*Lead* is being used in many civilian applications at the present time because it is one of the most available metals for non-war purposes.

*Phosphorus*, now used in large quantities to make smoke screens in battle areas, is an essential constituent of all tissues of the body.

Hybrid hevea *rubber plants*, resistant to South American leaf blight, have now been developed in Brazil by crossing Oriental strains with the best and most resistant Brazilian plants.

An all-cotton *gauze bandage*, recently developed, fits and clings better than ordinary gauze because of its stretchability, semi-elasticity, and roughened surface that decreases slipperiness.

*Wild turkey* distribution seems to indicate a definite correlation between turkey population and certain types of soil containing sufficient calcium and phosphorus occurring in "granite" soil.

*Algae* or green slime can be controlled in a garden pool by potassium permanganate; a teaspoonful of a saturated solution of this chemical for each gallon of water in the pool will not injure lilies or fish.

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cultural spray, however, scientists would like to know whether the liver or other organs may be seriously damaged by eating it on vegetables and fruits. The amount on each apple or tomato would be small, but in the course of a few years, quite a lot might accumulate in the body from such sources. Suitable precautions may need to be worked out for those who handle it in manufacture or in large-scale use on mosquito-breeding places and the like.

### Lethane Family

DDT, however, is only one of the new weapons chemists have given us against insect foes. Many Victory gardeners and farmers are already familiar with the Lethane family of insecticides, developed by scientists of the Rohm and Haas Company in Philadelphia. Soon they will be learning to use a new member of this anti-insect chemical group, Dithane.

Dithane is diethylene-sodium-bisdithiocarbamate. It is fatal to both chewing and sucking insects and also to another kind of crop pest, the fungi. This triple-barrelled action is combined with another unique feature. When dithane is sprayed on the ground, plants can absorb it through their roots and become immune to insect and fungi destruction. Leaves of plants will also take up dithane when sprayed in a liquid form.

What this means in terms of more food for the hungry war and postwar world is seen from field tests in which potato yields were from 25 to 100 bushels more per acre than when conventional fungus destroyers were used.

The Lethane family of insecticides are thiocyanates, as deadly to insects as the name suggests, but said to be harmless to humans and other warmblooded animals, on the basis of tests made for Rohm and Haas. At first the Lethanes were used in combination with rotenone for agricultural uses, stepping up the killing power of the rotenone to a high degree so that this war-scarce substance could be stretched to protect more and more crops. One of the newest Lethanes, however, is powerful enough to be used without rotenone, and, in fact, is more powerful against some crop-destroying pests than rotenone.

Lethane 384 Special proved itself valuable in controlling head lice in children in England's crowded schools and nurseries, and in freeing air raid shelters from these and other vermin.

It performed a real war service, ac-

ording to reports from the British Ministry of Health, among women fire watchers guarding London and other English cities. Coming from all walks of life, some of these women were more fastidious about preserving the permanent waves in their hair than about the cleanliness of hair and scalp. Daily delousing of the pillows, mattresses and blankets on which they rested during their watches was impossible under war conditions. So head lice became a real problem and the British authorities are grateful to Lethane for solving it.

### U. S. Authorities Skeptical

But their enthusiasm is not shared by some authorities in this country. A few experiences, not yet published, make them wonder how the British escaped serious skin and scalp injury. These same authorities also take a cautious attitude toward the Lethanes because they are cyanide-containing compounds and even the layman knows about poisonous cyanides such as hydrogen cyanide. On the other side of the picture, thousands of gallons of Lethane sprays have been used in the past several years without any reports of injury except to the insects.

The history of DDT and the other new insecticides is still in the making and will probably repeat the history of the sulfa drugs and similar weapons we use against our enemies of the insect and microscopic world. Enthusiastic reports of benefits are likely to be followed by reports of harm and, eventually, by knowledge of safe methods of use.

*Science News Letter, August 5, 1944*

### MILITARY SCIENCE

## Wool Jacket Issued to U. S. Soldiers in Europe

➤ AMERICAN soldiers fighting in Europe will be issued a new wool field jacket, made of olive drab serge.

Designed primarily for combat use, it will take the place of the enlisted men's olive drab coat which has not proved practical in actual fighting. The old coat does not leave the arms free for action and is uncomfortable.

The wool jacket has a convertible collar which may be turned up tight around the neck. It has two inside breast pockets and two outside breast pockets, adjustable shirt-type sleeves, and adjustable waist.

The War Department has ordered 4,000,000 jackets to be delivered soon.

*Science News Letter, August 5, 1944*