

DDT in the Home

by L. S. HENDERSON

EVER SINCE man began to live under a shelter, insects have followed him into that shelter. Whether he has lived in a cave, a grass hut, a tent, a log cabin, a frame house, or a palatial mansion, insect pests have been present. They may be only annoying, or they may be injurious. Insects in man's home may bite him, spread disease, contaminate or destroy his food, damage his clothing, ruin his household furnishings and possessions, or even attack the structure of the dwelling.

From the time man was first troubled by these pests in his home, he has spent a great deal of time and effort in attempting to develop new and better ways of getting rid of them. Early methods were often crude and ineffective. Modern advances in biology have revealed information that helps us to know when and where we can best apply control measures. Physics and engineering developments have helped us devise new equipment and new ways of applying insecticides. The chemists have found or made up new compounds that are more effective for controlling insects.

One such compound is DDT. Its discovery has opened the way to new and better methods for controlling insects in the household. Chemists are developing other similar or closely related compounds, and already some have been found that may prove even more useful than DDT.

The older sprays available for the control of household insects had to be used so the insects were hit directly with the spray. Such sprays were useful in obtaining an immediate reduction in the number of insects present, but the effect of the spray lasted for a few minutes and then more insects would begin to come in again. Often it was impossible to hit all the insects and many of them escaped or were unharmed in protected places. Repeated applications of spray had to be made in

an attempt to control such pests as roaches, bedbugs, carpet beetles, silverfish, fleas, brown dog ticks, flies, and mosquitoes.

Investigators found that DDT sprays had an unusual property not possessed by the common household sprays. They found that when DDT insecticides were sprayed on surfaces, insects crawling over the remaining residual deposit of DDT were killed. This residue continued to be effective for several months, and sometimes for a year or more. In practical tests in homes where repeated applications of an ordinary household spray would have been required to eliminate insect infestations, a single DDT residual treatment did the job. Insects in protected places not hit by the spray have to crawl over a DDT deposit when they come out into a treated room in search of food and water, and are killed. Not only is the existing infestation eliminated but for some time after that any insects that happen to find their way into the treated area are killed before they can establish a new infestation.

Insects are not killed immediately upon contact with a DDT residue. As they crawl over it, however, the DDT is absorbed into the body through the feet and body wall. Exceedingly small amounts in the insect body begin to affect the nervous system. The first symptom is a restlessness or excitement which may cause the insect to crawl or fly away. Later the insect is seized with tremors and convulsions, loses its ability to make coordinated movements of flight or crawling, and eventually rolls over on its back. Kicking and twitching of the legs continues for some time, but gradually the insect grows weaker, and death follows.

Death may occur a few minutes or several hours after contact with DDT, depending upon the resistance of the insect and the condition of the deposit. Death may not occur for several days in the case of some of the more resistant insects that touch only small amounts of residue.

DDT has no fumigating effect and insects will not be killed simply by being in the same room where DDT has been used. They do not have to eat the material to be killed, but they must actually come in contact with it, although continuous contact is not necessary. During the first brief contact with a DDT residue a fatal amount of DDT is absorbed by the insect, and it will die, even if it moves off to an untreated area. During the period of excitement some insects may fly or crawl for a considerable distance before they become inactive. In some cases very few dead insects may be found immediately in a treated area. This does not mean that the DDT is not effective. You should look for its results in the absence of live insects, not in the presence of dead ones.

Although the DDT residue is slower in killing insects than are some other insecticides and although it is not effective against all kinds of insects, it does have advantages that other insecticides do not have. One is its long-lasting effect. Another is that DDT is effective against more different kinds of insects than most other insecticides, and its use provides

the most effective and simplest method of control yet discovered for some household insects. As is true of the best of insecticides, however, DDT must be used properly in order to give satisfactory results.

Another advantage is its adaptability to use under different conditions and by different methods. It can be formulated into a number of different kinds of sprays and dusts, although it is not a good insecticide in its original form. Preparation of most DDT formulations requires special equipment or technical knowledge and skill and cannot be done satisfactorily in the home.

There are several DDT sprays that may be used in the home for the application of a DDT residual deposit. The most suitable one is a 5-percent solution of DDT in deodorized kerosene. An emulsion containing 5 percent of DDT can be prepared from commercially available concentrates. If the concentrate contains 25 percent of DDT, mix one part of concentrate with four parts of water to form a 5-percent spray. Wettable powders are also available for the preparation of DDT suspensions. These powders have been specially prepared so they can be mixed with water, and usually contain 50 percent of DDT. Follow the directions on the container label for preparing the spray mixture.

Many of the household fly sprays now on the market have from $\frac{1}{2}$ to 3 percent of DDT added to the toxic ingredients already present in the spray. Such sprays will give a quick kill of crawling insects that can be hit directly with the spray. Their best use is as a space spray, where the air is filled with a fine floating mist of spray, to obtain quick, temporary relief by killing the flying insects in your home. You should not use preparations containing more than 3 percent of DDT as space sprays. Although there may be some slight residual effect from these weak DDT solutions, you should not depend on them for applying an effective DDT residual deposit.

The gas-propelled aerosols now available commercially are a war development and are another form of space spray. Most of them contain DDT and pyrethrins and they are excellent for obtaining a quick kill of flying insects in a closed room. When used at many times the normal rate of application they may be helpful in the control of crawling insects. At these high concentrations they may be irritating, and they have no lasting effect. For permanent results repeated applications are required.

DDT can be ground and diluted with inert carriers such as talc or clay, and in this form it is a good insecticidal preparation for applying a residual deposit, especially against some of the crawling insects. Some DDT dusts for agricultural purposes contain only 1 to 3 percent of DDT, but for use as a household insecticide a dust should contain 10 percent of DDT.

In order to obtain the greatest benefit from the use of DDT, you should take advantage of its long-lasting effect and apply it to surfaces

as a residual treatment. The important thing to remember is that you should treat surfaces where the insects to be controlled will come in contact with the DDT deposit. It is evident that the treatment will have to be applied in different places for the control of different household pests, because of their varying habits. A rather complete coverage of all surfaces can be made for general insect control. It is not often necessary to make such a general application to control any one insect problem. The usual procedure will be to treat only selected areas to control certain insects.

A 5-percent solution of DDT in refined kerosene is most suitable for the control of flying insects such as flies, mosquitoes, and wasps. It is important to treat screens on windows and doors. In localities where insects are not abundant this may be sufficient. Even where insects are abundant it is not necessary to spray the entire interior. For the control of flies, spray such favored resting places as hanging light fixtures and drop cords; projections or uneven places on walls and ceiling; and edges of beams, arches, and door and window frames. Pay particular attention to treating the kitchen and dining room, where flies may be attracted by food odors. It will be helpful to spray outside the house on the porch, around doors, and around garbage cans. If this is done, many flies will be killed before they get a chance to enter the house. For controlling mosquitoes spray in dark corners or secluded spots, and under beds or other furniture where they may hide during the day.

A paint brush may be used for applying the DDT solution to screens. Any good sprayer that produces a moderately coarse spray can be used to apply the solution in other places. Most ordinary household sprayers will do. Put on just enough spray to moisten surfaces thoroughly. One quart of solution will cover 250 to 500 square feet, depending upon how absorbent the surface is.

For the control of crawling insects such as roaches, silverfish, clothes moths, carpet beetles, ants, bedbugs, fleas, and brown dog ticks, the solution may have to be sprayed on floors, lower parts of walls, around baseboards or moldings, around door and window frames, in corners, in cracks or crevices, on beds, behind or underneath objects, or within cabinets, cupboards, drawer spaces, closets, or storage spaces. Remember the habits of the insect to be controlled so a DDT residue will be left in places where they develop, feed, seek shelter, or will crawl over the deposit in the course of their normal activities.

The 10-percent DDT dust is useful against many crawling insects. It should be applied with a small hand duster of the bellows, bulb, or plunger type, using the nozzle to blow the powder into cracks or crevices, and behind or underneath objects where it would be difficult to reach with a spray. The spray should be applied in exposed places where the appearance of the white powder would be objectionable, and

to vertical or underneath surfaces where a powder would not adhere. Although most infestations can be controlled with either the liquid or powder, the combined use of the two, each in the places to which it is most suited, will often give more rapid or more satisfactory control.

Precautions

Although DDT is a poison, it is not so dangerous as sodium fluoride or arsenicals, which are commonly used. It is perfectly safe to use if a few simple precautions are observed.

Do not contaminate food or utensils when using DDT. Do not store DDT containers where they might be mistaken for food packages, or where children can reach them. Food in packages can be stored safely in sprayed places after the spray has dried.

Do not spray an oil solution near open fires. Avoid excessive or prolonged contact of the skin with an oil solution of DDT. Wash with soap and water when you are through spraying. Do not breathe large amounts of spray mist.

Caged birds and goldfish should be removed from rooms being treated with DDT insecticides. Any oil spray is likely to injure house plants.

THE AUTHOR

L. S. Henderson is an assistant chief of the Division of Insects Affecting Man and Animals in the Bureau of Entomology and Plant Quarantine. A graduate of the University of Kansas, Dr. Henderson joined the Department in 1938. After 4 years in Alabama, where he tested insecticides against the white-fringed beetle, he transferred to the Agricultural Research Center at Beltsville. He did the preliminary work on a method of testing and evaluating liquid roach insecticides and was in charge of the household insect project before he was brought into the divisional office in Washington in his present capacity.

FOR FURTHER READING

Laboratory of the Bureau of Entomology and Plant Quarantine, Orlando, Fla.: *DDT and Other Insecticides and Repellents Developed for the Armed Forces*, U. S. D. A. Miscellaneous Publication 606, 1946.

ALSO, IN THIS BOOK

The Chemistry of DDT, by H. L. Haller and Ruth L. Busbey, page 616.
Pests That Attack Man, by E. F. Knipling, page 632.
Air War Against Insects, by H. H. Stage and Frank Irons, page 835.
Blowers for Insecticides, by W. L. Popham, page 839.
Pests in Stored Products, by R. T. Cotton, page 874.