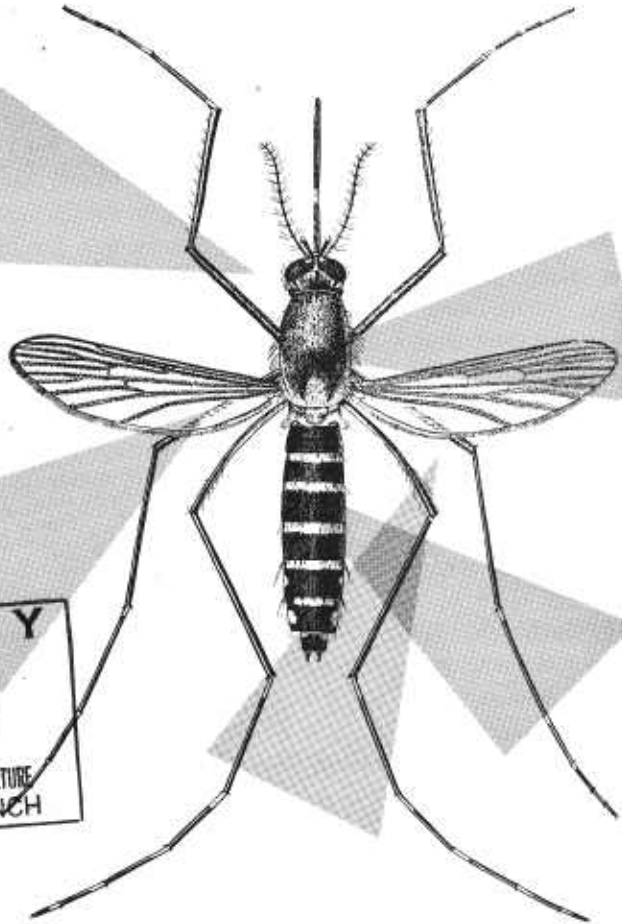


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# Controlling Mosquitoes

**IN YOUR HOME AND  
ON YOUR PREMISES**



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Home and Garden Bulletin No. 84  
U.S. DEPARTMENT OF AGRICULTURE

# CONTROLLING MOSQUITOES

in your home and on your premises



*By John A. Fluno, Entomology Research Division, Agricultural Research Service*

Mosquitoes can be a vexing and sometimes a serious problem. In the home, about the yard, and in public parks, they can interfere with man's chores and spoil his enjoyment of leisure time. Some species of mosquitoes transmit diseases such as malaria to man, encephalitis to man and horses, and heartworm to dogs.

## BREEDING HABITS

In most parts of the United States, mosquitoes breed during spring, summer, and fall. In warm, southern parts, they may breed throughout the year.

Water is necessary for breeding. Female mosquitoes lay their eggs on water or in places that later become flooded. Eggs are elongate, about  $\frac{1}{40}$  inch long in most species, and dark brown or black when ready to hatch. They are laid in batches of about 50 to 200, and several batches may be laid by one female. Bloodsucking females usually require a blood meal before producing eggs.

In warm weather, the eggs of most species hatch in 2 or 3 days. The eggs of some species require a drying period; they may remain dormant for many months, then

hatch within minutes after being flooded by a spring or summer rain, or a tide.

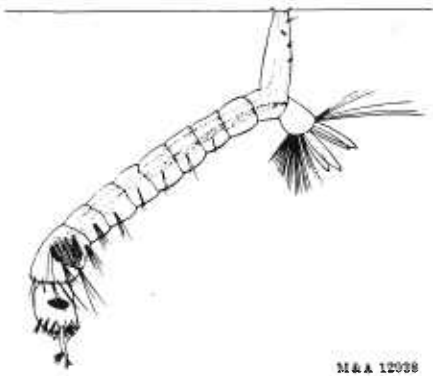
Larvae (wigglers) that hatch from the eggs feed mainly on bits of organic matter in the water. Many species are provided with an elongated tube for obtaining air through the surface film, and most species must come to the surface of the water for air.

Larvae change to pupae in about a week. Pupae are comma-shaped forms, sometimes called tumblers because of their tumbling motion when disturbed in the water.

Pupae usually transform into adults in about 2 days. In another day or two, the female adults are ready to bite; male mosquitoes do not bite.



M&A 6623-A  
**Mosquito eggs; greatly enlarged.**



Larva (wiggler) breathing through air tube at water surface; greatly enlarged.

## CONTROL

If mosquitoes are a problem where you live, the first thing to do is to find and eliminate their breeding places. Additional control may be obtained by killing larvae and adults with insecticide.

### Eliminate Breeding Places

Mosquito eggs cannot hatch unless they are in water. Look for standing water on your premises; eliminate it if possible and practical. Follow these steps:

- Remove unneeded, temporary water containers.
- Flatten or dispose of tin cans.
- Place discarded bicycle and automobile tires in places where water cannot get into them.
- Fill in tree holes with concrete.
- See that cisterns, cesspools, septic tanks, fire barrels, rain barrels, and tubs in which water is stored are tightly covered.
- Empty and thoroughly wash birdbaths at least once a week.
- Clean out rain gutters.

- Examine flat roofs after rains; be sure no water remains on them.
- Drain or fill in stagnant pools and swampy places. If pools cannot be drained or filled in, remove debris and floating vegetation.
- Examine philodendron and other plants in water in the house. Plants potted in soil will not breed mosquitoes, but saucers under the plants may accumulate enough water for breeding.
- Examine fish bowls and aquariums for larvae; not all kinds of fish destroy mosquito larvae.

### Kill the Larvae

If there is standing water on your premises, and it cannot be eliminated, examine it at least once a week to find out whether larvae are present. Dip out some water with a pan or cup; a white utensil is preferable because the larvae can be seen easily against a white background. If you find larvae, apply an insecticide spray.

*Formulations.*—If the water you wish to treat *is not used as drinking water for humans or animals, or for birdbaths or aquariums*, you may apply a spray containing 1 percent of DDT or 0.5 percent of lindane, or 2 percent of malathion, or you may apply kerosene or fuel oil full strength.

The active materials in these sprays are usually contained in preparations sold for control of ants, roaches, and mosquitoes. If you cannot purchase a ready-made preparation containing the recommended percentage of insecticide,

use an emulsifiable concentrate (EC) to make a spray, as follows:

1. Mix  $3\frac{1}{2}$  teaspoons of either 25-percent DDT EC or 55-percent malathion EC with enough water, kerosene, or fuel oil to make 1 pint of spray. Or—

2. Mix  $2\frac{1}{4}$  teaspoons of 20-percent lindane EC with enough water, kerosene, or fuel oil to make 1 pint of spray.

*Application.*—If you use any recommended insecticide except full-strength kerosene or fuel oil, apply about 1 ounce of spray to each 100 square feet of water surface. If you use kerosene or fuel oil, apply it full strength at the rate of 2 to 4 ounces to each 100 square feet. *Do not apply kerosene or fuel oil on water containing emergent vegetation;* they usually are not very effective on such areas, and they may kill the vegetation.

For small areas, use a compressed-air sprayer or a knapsack, garden, or hand sprayer. Adjust the nozzle for a fine-mist spray. Repeat applications at weekly intervals if needed.



M&A 6342

**Mosquito larvae and pupae developing in water in a glass container.**

## Kill the Adults

Elimination of standing water and control of larvae are of primary importance in ridding your premises of mosquitoes, but these measures may not solve your problem. Many mosquitoes are strong fliers, and may reach your premises from distant breeding places. Then, control measures must be directed against the adult mosquitoes. Such control measures give only temporary relief—from about half an hour to a week or more, depending on the method used and the abundance of mosquitoes.

### Outdoors

The accompanying table tells how to prepare sprays that will control adult mosquitoes outdoors.

*Residual sprays.*—Few mosquitoes will live to enter your house if you apply an emulsion or oil solution of 5-percent DDT or 1-percent lindane to places where mosquitoes rest or hide near the house.

These sprays are potent a week or more after they are applied to surfaces. When so applied, they are known as residual or surface sprays. As long as the insecticides remain on the surfaces, they kill mosquitoes that come in contact with them.

Apply residual sprays to the foundations and underparts of buildings, around buildings, between logs, on tree trunks, and to the undersurfaces of leaves. Apply to the point where runoff occurs. Use a compressed-air sprayer, or a knapsack, garden, or hand sprayer to treat small areas. Adjust the nozzle for a coarse spray.

### ***How to prepare sprays to control adult mosquitoes outdoors***

Insecticide	Formulation <sup>1</sup>			How to prepare <sup>2</sup>
	Residual spray	Space spray	Fogs	
DDT -----	5 percent, EC ---	5 percent, EC ---	5 percent, EC ---	Mix 6 fluid ounces of 25-percent DDT EC with enough water, kerosene, or fuel oil to make 1 quart of spray. <sup>3</sup>
	5 percent, WP ---	-----	-----	Mix 3 ounces of 50-percent DDT WP with enough water to make 1 quart of spray.
Lindane -----	1 percent, EC ---	-----	-----	Mix 1½ fluid ounces of 20-percent lindane EC with enough water, kerosene, or fuel oil to make 1 quart of spray.
	1 percent, WP ---	-----	-----	Mix 1¼ ounces of 25-percent lindane WP with enough water to make 1 quart of spray.
Malathion -----	-----	0.5 percent, EC ---	0.5 percent, EC ---	Mix ¾ fluid ounce of 20-percent lindane EC with enough water, kerosene, or fuel oil to make 1 quart of spray. <sup>3</sup>
	-----	-----	3 percent, EC ---	Mix 1¼ fluid ounces of 55-percent malathion EC with enough kerosene or fuel oil to make 1 quart of spray.
	-----	2 percent, EC ---	2 percent, EC ---	Mix 1½ fluid ounces of 55-percent malathion EC with enough water, kerosene, or fuel oil to make one quart of spray. <sup>3</sup>

<sup>1</sup> EC=emulsifiable concentrate; WP=wettable powder.

<sup>2</sup> When mixing a wettable powder with water, first make a paste by mixing the powder with a little of the liquid; when lumps disappear, continue to stir and add rest of the liquid. Strain before spraying.

<sup>3</sup> For use as fogs, mix with kerosene or fuel oil; do not mix with water.

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## FISHPONDS AND ORNAMENTAL POOLS

Mosquitoes sometimes breed in fishponds and ornamental pools.

*If you do not have fish in your pond or pool, you may apply a "House and Garden Spray" or an "Indoor-Outdoor Household Spray" to kill mosquito larvae. These sprays come in pushbutton containers. Use only a spray that is clearly labeled for treating plants. Apply as little of the spray as possible. It is best to try about 5 seconds of spraying for a pool 5 to 6 feet in diameter. Spray over the surface of the water; then wait 24 hours. If larvae are still living after 24 hours, spray again. Pupae will not be killed by the spray; so*

watch the pool for mosquito breeding, and spray when the mosquitoes are in the larval stage.

*If you have fish in your pond or pool, do not apply insecticides to it. Mosquito breeding can be almost eliminated by keeping the pool clean. Do not let vegetation, particularly the kind that floats, grow into large mats. If the surface of the water is relatively free of floating plants, the fish will be able to capture and eat most of the mosquito larvae. Only an expert can apply insecticides in amounts that will kill the mosquitoes without harming the fish.*

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Do not spray an emulsion or oil solution on vegetation; it may burn the leaves. Instead, apply one of the suspension sprays made from wettable powders (see table). Do not spray flowering plants; bees may be killed.

*Space sprays.*—There are times when you want quick relief from outdoor mosquito attacks, especially during picnics, lawn parties, or other outdoor gatherings. You can control mosquitoes during these occasions by using (1) a 0.5-percent lindane or 2-percent malathion emulsion or oil solution, or (2) pyrethrum or allethrin (obtainable ready for use from insecticide dealers), or (3) a DDT-pyrethrum aerosol bomb.

A spray containing 5 percent of DDT may also be used (see table for mixing directions), but during

periods when mosquitoes migrate near dusk, pyrethrum or allethrin is more effective. Various formulations of liquid insecticides containing pyrethrum or allethrin may be obtained from many hardware, department, and food stores.

These sprays used for temporary control are known as space or contact sprays. They should be applied with a hand or power sprayer or with an aerosol bomb, aimed so the spray will drift through bushes, grass, and other vegetation. Treatments should be repeated every few hours, or as often as necessary.

*Fogs.*—Insecticide fogs and mists are very effective in temporarily controlling adult mosquitoes in outdoor areas, and give quick relief when needed.

Fog solutions should contain 5 percent of DDT, or 2 to 3 percent

of malathion, or 0.5 percent of lindane. Protection may be short when mosquitoes are migrating; thus fogging will have to be repeated.

A wide assortment of fog units and mist machines are available at moderate prices.

A fogging attachment for gasoline-driven lawnmowers may be purchased from some dealers in automotive supplies and home furnishings. This device is attached to the exhaust pipe of the engine, and produces a dense fog of insecticide. The unit should be operated so the fog drifts with the wind to pass through the area to be protected.

### **Indoors**

If you find mosquitoes inside your house, you can kill them with any good household spray that is sold for control of flying insects indoors.

An aerosol bomb containing DDT, malathion, or methoxychlor is highly effective and easy to use. When the aerosol is released for a few seconds, it kills the mosquitoes in an average-sized room. Best results are obtained if doors and windows are kept closed during spraying and for 5 or 10 minutes after spraying. Only products labeled for flying-insect control should be used in this manner. Some residual-spray products labeled for control of crawling insects are also packaged in aerosol bombs; use of such products may be hazardous if they are sprayed into the air, even though windows or doors are open.

Sometimes it is necessary to apply a residual spray to mosquito

resting places in the home. For this use, apply a 5-percent DDT spray (emulsion or oil solution; see table) to dark and secluded spots—under chairs, tables, beds, and bookcases, in closets, behind pictures, and between articles of furniture. The insecticide should remain effective for several weeks to several months.

## **REPELLENTS**

Repellents for application to humans include deet (diethyltoluamide), ethyl hexanediol, dimethyl phthalate, and dimethyl carbate. These repellents are sold alone and in various combinations. They may be sprayed on the outer clothing or spread on exposed parts of the body. Care must be taken to keep them away from the eyes, nostrils, and lips. Some of these repellents may be injurious to plastics (such as plastic watch crystals), nail polish, and certain painted or varnished surfaces.

Repellents protect humans from mosquito bites for 1 to 5 hours; the time depends on the amount of sweating and rubbing of the skin, and the abundance of mosquitoes. It is important to cover evenly the area of skin that is to be protected; mosquitoes will quickly find and bite untreated spots. For this reason, many persons prefer the pressurized spray cans of repellent; they tend to give a more uniform coverage but are slightly more expensive.

When picnicking, hunting, fishing, hiking, or camping, most people find that repellents are the best protection from mosquito bites.

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## ORGANIZED MOSQUITO CONTROL

Some States have a law permitting organization of mosquito-control districts. Jurisdiction of the districts may be exercised by the State department of agriculture or State department of health. Usually the law permits organization of a mosquito-control district (often countywide) where (1) the majority of residents indicate by petition or vote that they desire it, and (2) the need is shown by an ade-

quate survey of the local mosquito problem.

If you live or work in an organized mosquito-control district, support your local organization. Organized control can accomplish much more than individual efforts alone. If you are not certain whether such a district can be formed in your area, consult your State department of agriculture or State department of health.

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## PRECAUTIONS

Insecticides used improperly can be injurious to man and animals. Use them only when needed and handle them with care. Do not use insecticides in concentrations greater than recommended. Follow the directions and heed all precautions on the labels.

Keep insecticides in closed, well-labeled containers in a dry place. Store them where they will not contaminate food or feed, and where children and pets cannot reach them. Do not use insecticides near foods, dishes, or cooking utensils.

Avoid repeated or prolonged contact of insecticides with the skin. Avoid inhalation of insecticide dusts or mists.

Avoid spilling insecticides on the skin and keep it out of the eyes, nose, and mouth. If you spill any on your skin or

clothing, remove contaminated clothing immediately and wash the skin thoroughly with soap and water. Launder clothing before wearing it again.

When handling insecticides, wear clean, dry clothing.

Wash your hands and face before eating, drinking, or smoking and immediately after completing insecticide application.

To protect fish and wildlife, do not contaminate lakes, streams, or ponds with insecticide. Use insecticides with care in these locations. Do not clean spraying equipment or dump excess spray material near such water.

Empty containers are particularly hazardous. Wrap them in several layers of newspapers and place them in the trash can.



**This edition replaces all previous editions of this publication. Because of changed insecticide recommendations, earlier copies should be destroyed.**

Washington, D.C.

Revised December 1968

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