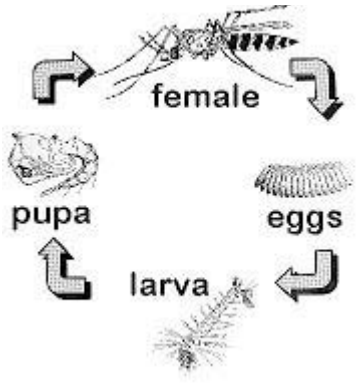
WHAT YOU SHOULD KNOW ABOUT MOSQUITO CONTROL PESTICIDES

California Department of Public Health
Vector-Borne Disease Section

Mosquitoes can be a nuisance and cause allergic reactions in people when they bite. Some mosquitoes in California may transmit serious diseases to humans and animals. For these reasons there are government programs that control mosquitoes.

Life Cycle of a Mosquito



Mosquitoes need water to live. They lay their eggs on standing water or on surfaces that will be submerged in water. The egg hatches into a larva in the water. The larva becomes a pupa, and then finally becomes a flying adult mosquito usually in 1 – 2 weeks. The adult female mosquito then needs to bite an animal or person for blood so that she can develop eggs and repeat the cycle. Mosquito control programs use many ways to control mosquitoes. They try to get rid of standing water in cities and in the country where mosquitoes will lay eggs. They add fish to ponds to eat the larvae and pupae of mosquitoes. Mosquito control programs also use pesticides to kill mosquitoes.

A **pesticide** is a material used to kill a certain pest. There are mosquito pesticides that are placed in water to kill only mosquito larvae and pupae, and others are sprayed in the air to target adult mosquitoes. The specific chemicals in the pesticide products that are poisonous to the mosquito are called **active ingredients**.

Before a mosquito control pesticide can be registered (licensed) for use, studies must be done to determine their effects on other (non-target) animals. These studies determine the smallest amount of pesticide that can harm animals. When pesticides are used correctly, according to the instructions on the pesticide label, people and pets are exposed to much less than the smallest amount that can harm animals.

Scientific studies have found that people who live in places where routine mosquito spraying is done have no more chemical-related health problems than those in areas that are not sprayed.

The pesticides that are put into water to kill mosquito larvae before they become adults are called **larvicides**. People and pets or other animals may come into contact with very small quantities of these products if they enter water that has been recently treated. These products are made to kill mosquitoes and do not harm other (non-target) insects or animals when used properly.

Adulticides are pesticides that kill adult mosquitoes. The active ingredients in adulticides work by stopping the mosquito's nervous system from working properly. Adulticides are applied by spraying the product into the air using a very small amount of the pesticide (usually less than 1 ounce per acre of land). The liquid comes out of the sprayer as a mist of very small drops or a "fog". The fog is spread by air currents. Mosquitoes must come into contact with the fog to be

killed. Mosquito spraying is done in the evening after sunset or in the morning before sunrise when most mosquitoes are flying.

There are easy steps to take to avoid direct contact with mosquito control products, though exposure to these pesticide applications has no effect on most people. During mosquito spraying, people can stay inside and close windows. Extra care should be taken to keep babies and pregnant women away from pesticides because they are more sensitive to pesticide effects than other people. People who are allergic to some chemicals may decide to take the extra step of calling their local mosquito control program to find out when and where spraying will take place.

Larvicides Used in California:

Bacillus thuringiensis israelensis* and *Bacillus sphaericus: Commonly called "Bti" and "Bs" for short, the active ingredients of these larvicides are made from bacteria. These larvicide products are made by mixing these natural bacteria with clay, ground-up corn cob, or a liquid that allows the pesticide to be easily measured and applied.

How they work: When put into water where mosquito larvae are found, the larvae eat the bacteria. The bacteria destroy the stomachs of the larvae and the larvae die.

Effects on people or pets: These products do not hurt people or pets even if eaten because the stomach of a person or pet is much different than the mosquito stomach.

Methoprene: Methoprene is a man-made chemical that is a copy of a hormone normally found inside mosquito larvae.

How it works: Methoprene is mixed with clay or is used as a liquid solution for easy measurement and application into water. Methoprene stops the larvae from growing into adult mosquitoes.

Effects on people or pets: This product has no effect on people or pets at the amounts used for mosquito control.

Mineral oil or alcohol-based surface products: These oils and surface films are put on the surface of water bodies to kill mosquito larvae and pupae. These larvicides spread out and form a very thin, nearly invisible layer over the surface of the water and prevent the mosquito larvae or pupae from breathing at the water's surface.

How they work: Mosquito larvae and pupae must come up to the surface of the water to breathe. These products suffocate the mosquito larva or pupa by preventing them from penetrating the water's surface and obtaining oxygen.

These products can cause a mild skin rash if they are sprayed directly on a person. Once these products are applied to water, a person or animal would not be bothered even if they went swimming. The products are not poisonous and pets are not harmed by drinking from water bodies treated with these products.

Adulticides Used in California:

Pyrethrins are chemicals from chrysanthemum flowers that are poisonous to mosquitoes and other insects. The sun destroys pyrethrins very fast so when they are used for mosquito control, most of the chemicals that are sprayed during the night are gone within an hour after sunrise.

How they work: Pyrethrins disrupt the nervous system of the mosquito which leads to uncontrollable movements, paralysis, and death.

Effects on people or pets: Most people are not affected by these chemicals when they are used in mosquito spraying. People who are allergic to pyrethrins may feel a tight or tingly feeling under their skin, soreness around their eyelids, or a scratchy throat. When used correctly, pyrethrins will not kill fish.

Pyrethroids are man-made chemicals that are related to pyrethrins. Pyrethoids last longer in sunlight than pyrethrins (up to a couple of days).

How they work: Like pyrethrins, pyrethroids disrupt the normal function of a mosquito's nervous system leading to uncontrollable movements, paralysis, and death.

Effects on people or pets: Most people are not affected by pyrethroids used in mosquito spraying. People who have allergies to these chemicals may feel a tight or tingly feeling under their skin, soreness around their eyelids, or a scratchy throat. Pyrethroids can kill fish if they accidentally get into water where fish live. The pesticide label provides application instructions and application rates (dosages) to prevent this or other non-target effects.

Piperonyl Butoxide (**PBO)** is a chemical that is added to pesticides containing pyrethrins or pyrethroids to make them work better.

How it works: PBO makes it harder for the mosquito to get rid of the pyrethrins or pyrethroids from their body. When PBO is used, less active ingredient is needed to kill mosquitoes.

Effects on people or pets: The small amount of PBO a person or pet could come into contact with during mosquito spraying would not present a risk.

Organophosphates are sometimes used to control mosquitoes in California. There are two organophosphate chemicals currently used to kill adult mosquitoes. Both of these chemicals have been used for mosquito control for more than 40 years.

How they work: These pesticides kill mosquitoes by blocking the normal function of the mosquito's nervous system. Poisoned mosquitoes cannot control their movements and they eventually become paralyzed and die.

Why they are used: Organophosphates are sometimes used by mosquito control programs as an alternative to pyrethrins or pyrethroids to help maintain the ability of these chemicals to kill mosquitoes. If the same pesticide is used for a long time in the same area, the mosquitoes can become resistant to that pesticide and will not die when they are sprayed. Mosquito control

programs can make sure more commonly used pesticides will stay effective by occasionally using a different chemical to kill adult mosquitoes. This process is often called "pesticide rotation".

In California, organophosphates are used for rotation, or sometimes used over crops where pyrethroids may not be allowed. Organophosphates can be more effective than pyrethrins in some conditions.

Malathion and Naled are the two organophosphates currently used in California.

Effects on people or pets: Organophosphates can be potentially harmful to people who work with them and do not follow the pesticide label instructions. People who come into contact with large amounts of these chemicals can have headaches, become dizzy, feel sick to their stomach, or even die. Coming into contact with small amounts of these chemicals from spraying mosquitoes poses little risk to people or pets because the body gets rid of them quickly. No chronic health effects have been seen in people where these chemicals are routinely used for mosquito spraying.

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