What You Should Know About Mosquito Control and Pesticides

Mosquitoes can be a nuisance and cause allergic skin reactions in people when they bite. Some mosquitoes in California can also carry viruses that can cause serious disease in humans and animals. For these reasons there are government programs that control mosquitoes to protect the health and well-being of people and animals.

Life Cycle of a Mosquito

Mosquitoes need water to live. They lay their eggs near or on standing 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 to 2 weeks. The adult female mosquito needs to bite an animal or human for blood so that she can produce eggs and complete the life cycle.

Life Cycle of *Culex* Species

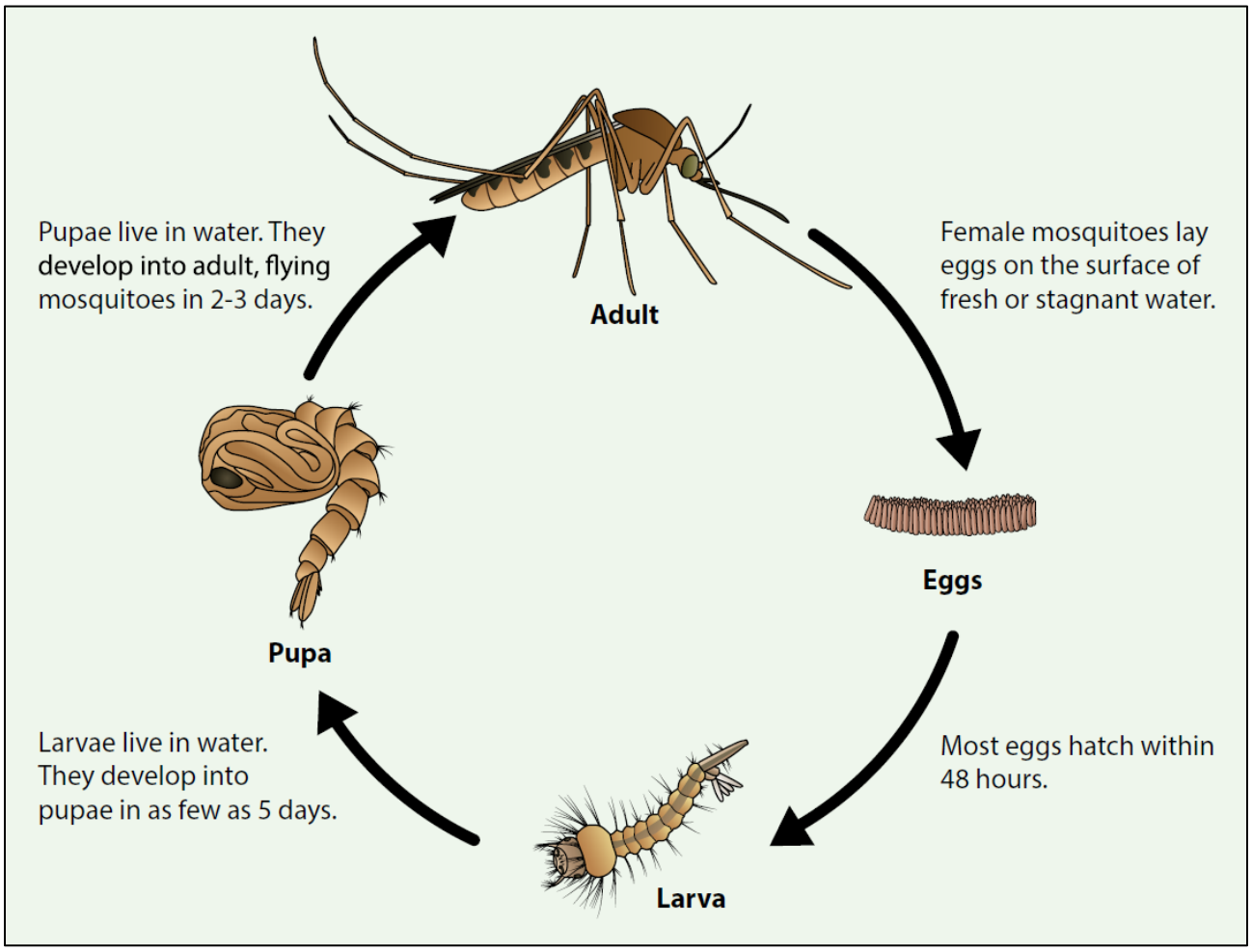

Image Source: CDC

Mosquito control programs use different methods to control mosquitoes, often using a combination of methods at the same time to control mosquitoes more effectively. Examples of control methods that mosquito control programs use include:

- Removing standing water where mosquitoes will lay eggs
- Adding mosquito-eating fish to ponds and other places with standing water to eat mosquito larvae and pupae
- Using pesticides to kill mosquitoes

Pesticides

Pesticides are products used to kill certain pests. Pesticides used to kill mosquito larvae and pupae (called “larvicides”) are applied in water, while pesticides used to kill adult mosquitoes (called “adulticides”) are sprayed in the air. The active ingredients in these pesticide products are poisonous to the mosquito and work in specific ways to kill mosquitoes. Most of these products are designed specifically to kill mosquitoes and pose very little risk to other insects or animals in the environment when applied properly. Mosquito pesticides used in California are regulated by state and federal government agencies, which means they are controlled and managed to make sure they are safe to use around humans, animals, and in the environment.

There are several different pesticides used in California to control mosquitoes. One important reason for using different pesticides is because if the same pesticide is used for a long time, mosquitoes can become less sensitive to that pesticide and may not die when sprayed. By occasionally changing the type of pesticide applied, mosquito control programs can help make sure their mosquito control methods are most effective. Switching pesticides to preserve their effectiveness is often called "pesticide rotation”.

Adulticides

Adulticides typically are applied by spraying the liquid pesticide as a mist or "fog" of very small drops into the air. Mosquitoes that come in contact with the fog are killed, but the droplets are small enough that they will not kill larger insects, such as bees. The amount of pesticide needed to kill adult mosquitoes is very small; typically, less than one ounce (2 tablespoons) of active ingredient is applied per acre (a little smaller than the size of a football field). Mosquito spraying is usually done in the evening after sunset or in the early morning before sunrise when most mosquitoes are flying instead of resting.

Although it is not necessary, people who are concerned about exposure to a pesticide, such as those with chemical sensitivity or breathing conditions such as asthma, can reduce their potential for exposure by staying indoors during the application period.

Common Larvicides Used in California:

1. ***Bacillus thuringiensis israelensis*** and ***Lysinibacillus sphaericus*** **(formerly *Bacillus sphaericus*)**, also commonly called **Bti** and **Bs** for short, are larvicides made from naturally occurring bacteria that are toxic to mosquitoes. For ease of application, these active ingredients are typically mixed with clay, ground-up corn cob, or placed into a liquid carrier before being put into water.

   How they work: When these products are put into water where mosquito larvae are found, the larvae eat the bacteria. The bacteria are toxic to the mosquito larvae and destroy the guts of the larvae causing them to die. These bacteria do not hurt people or pets, even if swallowed, because the digestive systems of people and pets are very different than those of mosquitoes.

2. **Methoprene** is a human-made larvicide that is similar to a hormone normally found inside mosquito larvae that controls their growth and development. Methoprene is mixed with clay into a solid product or is diluted in a liquid carrier before being put into water.

   How it works: When methoprene is put into water, it interrupts the growth of the mosquito and stops larvae from developing into adult mosquitoes. This product has no effect on people or pets at the amounts used for mosquito control.

3. **Surface Films** are products made from oil or alcohols that spread out and form a thin layer over the surface of the water where mosquito larvae or pupae are present.

   How they work: Mosquito larvae and pupae have air tubes that they use to breathe at the surface of the water. Surface films suffocate the mosquito larvae or pupae by preventing their air tubes from getting oxygen at the water's surface. These products are not poisonous to humans, and pets are not harmed by drinking from a pond sprayed with these products.

Common Adulticides Used in California:

1. **Pyrethrins** are chemicals taken from chrysanthemum flowers that are poisonous to insects. The sun destroys pyrethrins very quickly, so when they are used for mosquito control, most of the active ingredients are gone within an hour when exposed to sunlight.

   How they work: Pyrethrins block parts of the mosquito's nervous system, which kills the mosquito. Some people can be sensitive to pyrethrins and may feel a tight or tingly feeling under their skin, soreness around their eyelids, or a scratchy throat if they are exposed.

2. **Pyrethroids** are human-made chemicals similar to pyrethrins. Pyrethoids last longer in sunlight than pyrethrins.

   How they work: Pyrethroids work very similar to pyrethrins to kill adult mosquitoes.

Fish are sensitive to pyrethroids and can die if pyrethroids accidentally get into the water in higher concentrations.

3. **Piperonyl Butoxide** or **PBO** is a chemical that has little effectiveness as a pesticide by itself, but when it is added to products containing pyrethrins or pyrethroids, it makes those chemicals work better.

   How it works: When PBO is mixed with adulticide sprays, it is harder for the mosquito to get rid of the pesticide from their body. When PBO is used, less active ingredient is needed to kill mosquitoes. There is no harm to humans and/or pets when PBO is used in mosquito spraying.

4. **Organophosphates** are human-made chemicals used to kill many kinds of insect pests. In California, only two types of organophosphates are used to kill mosquitoes: malathion and naled.

   How they work: Organophosphates kill mosquitoes by interrupting or blocking the mosquito's nervous system. Organophosphates can be used in areas where pyrethroids are not allowed and can be more effective than pyrethrins and pyrethroids in some conditions. They are also important pesticide rotation options to preserve the effectiveness of pyrethrins and pyrethroids. People who come in contact with large amounts of organophosphates may experience headaches, become dizzy, or feel sick to their stomach. Coming in contact with the small amounts of these chemicals from adulticide spraying does not harm people or pets because the body gets rid of them quickly.

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