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Mosquitoes and What You Can Do About Them

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Mosquitoes have been important throughout human history because of the disease organisms they transmit. Mosquito-transmitted viruses cause dengue and yellow fever, and other organisms cause malaria and filariasis. We are relatively lucky in Idaho because, except for western equine encephalomyelitis, an inflammation of the brain that primarily affects horses, none of these diseases occurs here.

In our region, mosquitoes are important primarily for the nuisance and discomfort of their bites. Some areas of Idaho can have very high populations of mosquitoes at times, and susceptible people suffer greatly. Outbreaks can be so severe that local governments or private landowners apply control measures.

Mosquitoes also have a beneficial side. They are fed upon by birds and fish, so they serve as an important link in the food chain that supports higher animals.

Mosquito life cycle

Many species of mosquito occur in Idaho, and all of them share the same basic life cycle (see next page). However, they differ in the ways they overwinter. Some species overwinter in the egg stage, remaining under the snow all winter then hatching when warmer spring temperatures create temporary pools of snowmelt. Other species overwinter as adults within protected places such as buildings and other structures.

In either case, before laying eggs the adult female mosquito flies about searching for blood. Only the female feeds on blood. She requires the

protein in blood to mature a batch of eggs. Male mosquitoes feed on nectar from flowers, never on blood.

After the female ingests blood, about 2 or 3 days pass before she lays eggs in or around water. The immatures must live in water to survive. This explains why mosquitoes are usually more abundant during very wet weather.

The female deposits her eggs as floating rafts on the water surface after coming out of hibernation in spring. The eggs hatch in 2 or 3 days or, in the case of overwintering eggs, when spring snowmelt floods them. The eggs produce wormlike larvae or "wigglers" that strain microorganisms from the water for food and must come to the water's surface to breathe. The wigglers usually molt three times in 4 to 10 days then change to comma-shaped pupae or "tumbler" that do not feed.

The immatures are readily eaten by fish, and for that reason, mosquito immatures are seldom found in large bodies of water containing fish or other predators. Mosquito larvae usually occupy temporary accumulations of water such as spring ponds, tree holes, manufactured containers, or even tire ruts in roadways that fill with water after heavy rains.

The adults emerge from the pupal skins after about 2 days. An adult female begins to search for a blood meal soon after she emerges and will continue to feed on blood after laying each batch of eggs. She searches for the odors we produce such as carbon dioxide and several others that come from our skin. She also uses visual cues such as color and shape and our warm skin temperature to find us.

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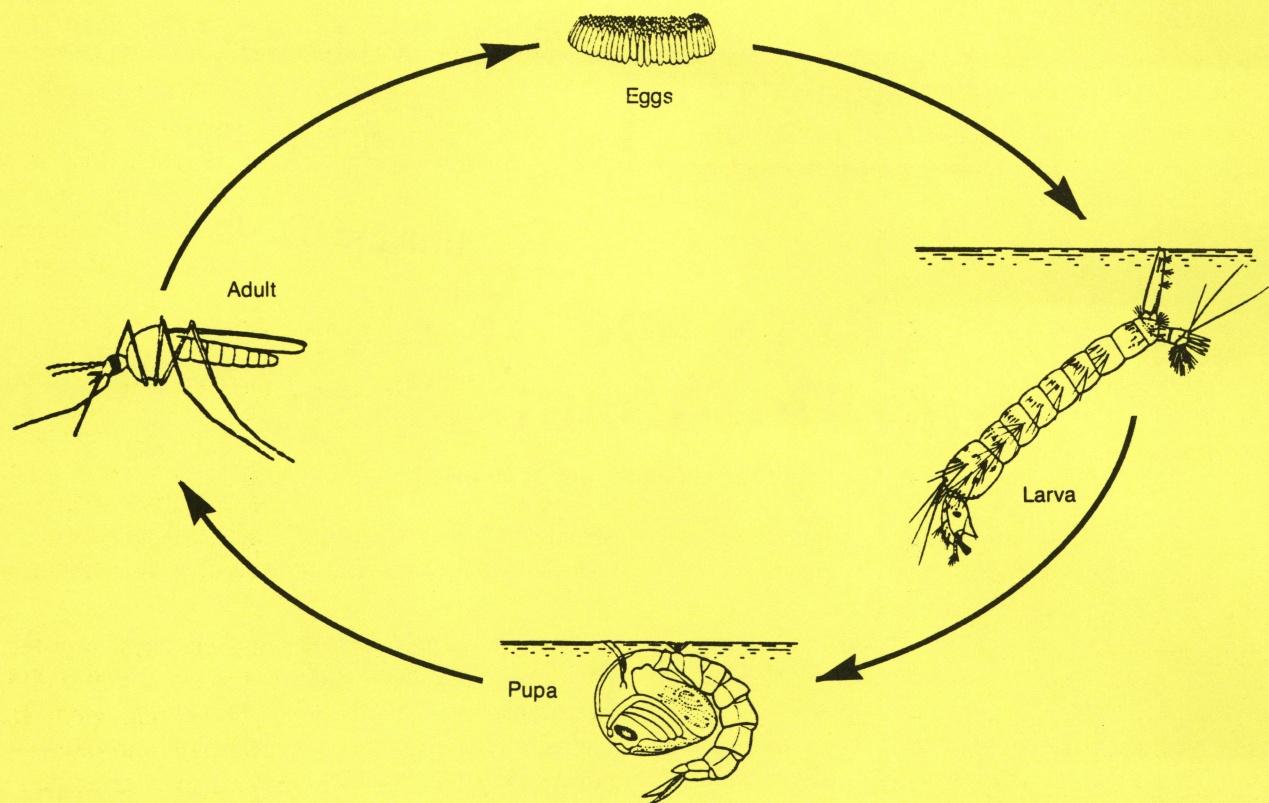


Fig. 1. Mosquito life cycle.

Prevention and control

Mosquito adults seldom fly more than a few miles from their breeding sites and therefore can usually be found near water. The best way to prevent mosquitoes from breeding is to find and eliminate temporary accumulations of water where eggs hatch. The environment needs to be altered so the immature mosquitoes cannot complete their life cycles. Controlling adults is much more difficult so larval control is usually the method of choice.

Eliminate breeding sites on the farm

- Remove standing water by keeping irrigation and drainage ditches clean and sloped. Empty barrels and other containers that fill with rainfall.
- Except in designated wetlands, remove standing water by draining the area or by filling it with earth.
- Drain or fill seepage ponds or puddles.
- Drain excess irrigation water away from the premises or collect it in a storage sump to reuse.

Eliminate breeding sites at home

- Check your property and destroy or dispose of containers that could hold water such as tin cans, tires, planter overflows, and depressions in plastic mulch.
- Check your rain gutters to make sure they drain.
- Change water in birdbaths at least twice a week.
- Fill or drain puddles or ditches near the home and remove vegetation along ditches to allow water to flow freely.
- If you have control of ornamental ponds or pools, introduce goldfish or other fish that feed upon immature mosquitoes.

What you can do to prevent bites

- Don't wear perfume, scented deodorants, or other fragrances that add to your smell.
- Wear light-colored clothing.
- Pace yourself. The more strenuous your activity, the more mosquito-attracting carbon dioxide you give off.

- If possible, avoid going outdoors when mosquitoes are most active. Mosquitoes usually bite in the hours before the sun goes down and again before it comes up. They avoid the hottest part of the day.
- Wear repellents to mask your smell.
- Go into areas where single generation mosquitoes, "snow mosquitoes," are plentiful only after they have completed their life cycle.

Natural enemies

Mosquitoes are an important part of the diets of many fish. However, introducing mosquito-eating fish to ponds or other water bodies may be restricted. Contact the Idaho Department of Fish and Game for details. Pupfish and mosquito fish for mosquito control are used most commonly in warm water. Goldfish may do a better job in colder waters. Aquatic insects such as back swimmers, water beetles, and water skippers can be very effective at mosquito control. Other invertebrates such as water hydras, flatworms, and nematodes have been effective in some cases. Several fungi are known to eliminate mosquitoes in some situations but are not dependable. Bats and insect-eating birds also help control mosquitoes. Encourage them with improved nesting sites.

Repellents

Repellents are available as liquids, aerosols, lotions, and creams. When properly applied to the neck, face, arms, ankles, and other exposed skin, a small amount of repellent will protect you 2 to 4 hours depending upon personal factors and your degree of activity.

Despite their name, repellents do not really repel. They mask your odor so the female mosquito does not recognize you. Anything you do to weaken the mask, such as wetting your skin, washing, or doing physical activity that increases your odor, will shorten the life of the repellent. Other than oil of citronella, all repellents contain DEET plus other chemicals that extend its effectiveness. A preparation containing 35 percent DEET will give you maximum protection. Those containing higher concentrations are for treating clothing only.

Take these special precautions when using repellents containing DEET:

- Do not apply repellents over cuts, wounds, or irritated skin.
- Do not apply repellents to your eyes or mouth or to the hands of young children. Do not spray directly on face.

- Do not spray repellents in enclosed areas.
- Use just enough repellent to cover exposed skin and/or clothing. Do not use it under clothing. Avoid overexposure. Frequent reapplication and saturation is unnecessary.
- After returning indoors, wash treated skin with soap and water. Wash treated clothing.
- These repellents may cause skin reactions in rare cases. If you suspect that you or your child is reacting to this product, wash treated skin and call your local poison control center. If you go to a doctor, take the repellent with you.

Chemical control

Some areas of Idaho have mosquito abatement districts financed by taxation. If you live in one of these areas, you can call the district and have its personnel treat your property. However, in most areas of Idaho you have to control severe outbreaks on your own.

Mosquitoes spend most of their lives in water. If you break this part of their life cycle you will kill the larval and pupal stages, preventing adults from hatching and laying eggs. Although mosquitoes spend only a short part of their lives as adults, they emerge over a long period of time. Attempts to control adult mosquitoes only suppress the population for a day or two.

Larval control

Find breeding sites and treat them with one of the approved pesticides as soon as mosquitoes are active in spring and again whenever you find larvae. Monitor the breeding sites all season to see if they require retreatment. You will probably need boots and a long-handled net to do the sampling. Because most wet areas affect more than one property, perhaps you can organize your neighbors to help.

Use one of the approved pesticides according to its label. *Bacillus thuringiensis* var. *israelensis* (BTI) is a bacterium that specifically kills the larvae of mosquitoes and other aquatic flies. Altosid is a growth regulator that kills insects when they molt. Petroleum-based oils used on the water surface suffocate the larval and pupal stages of surface-breathing insects. The other insecticides commonly used kill mosquitoes and other aquatic insects on contact.

CAUTION: The contact insecticides and altosid will kill all the insects in the water body, including natural predators of mosquitoes, and could interfere with the food chains of insect-eating animals such as frogs and fish.

Adult control

Attempts to control adult mosquitoes have no lasting effect on the mosquito population. **Residual sprays** of approved insecticides can be applied around the outside of your house and outbuildings and in protected places where mosquitoes rest during the day. Such places are under the eaves, in the crawl space, and in the shade of trees and buildings. These applications can last about a week but will have little effect upon mosquitoes coming from outside the sprayed area.

Fogs or area sprays can eliminate the nuisance of biting for a special event such as a yard party, picnic, ball game, or community event. They can be applied with an aerosol can, hand-held fogger, or vehicle-mounted fogger.

Electronic grid traps (bug zappers) and **ultrasound devices** have been found to be ineffective.

Ultra low volume sprays applied by ground or aircraft are used by some abatement districts. If used often in a wide area they can kill enough adults to lower mosquito populations so that outdoor activities can take place.

CAUTION: Any time you treat a large area for mosquitoes you also kill beneficial insects such as pollinators, predators, and parasites.

Insecticides for controlling mosquito larvae

Abate
Altosid
Bacillus thuringiensis var. *israelensis*
DDVP (Vapona)
Dursban
fenthion (Baytex)
malathion
paraffin-based oil

Insecticides for controlling adult mosquitoes

Baygon — residual spray
Baytex — residual spray
carbaryl (Sevin) — residual spray
cypermethrin — residual spray
Dursban — residual spray
DDVP (Vapona) — fog or residual spray
malathion — residual spray
Malathion ULV — residual spray
methoxychlor — residual spray
naled (Dibrom) — fog or residual spray
pyrethrin — fog

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Pesticide residues — These recommendations for use are based on currently available labels for each pesticide listed. If followed carefully, residues should not exceed the established tolerances. To avoid excessive residues, follow label directions carefully with respect to rate, number of applications, and minimum interval between application and reentry or harvest.

Groundwater — To protect groundwater, when there is a choice of pesticides, the applicator should use the product least likely to leach.

Trade names — To simplify information, trade names have been used. No endorsement of named products is intended nor is criticism implied of similar products not mentioned.