

Mosquito Evolution: Life History and Strategies for Successful Eradication

For mosquitoes to survive, they must have water in which to complete their life cycle. However, water can be present in a multitude of ways. For example, water can range in quality from melted snow to sewage effluent and can be found in any container. Species of mosquitoes differ in their selection of type of water in which to lay their eggs, meaning that each species has a unique habitat necessary for survival. The lifespan of a mosquito depends upon temperature, humidity, gender, and time of year. Higher temperatures and humidity speed up the life span. The lifespan of a mosquito can vary from four days to one month. Female mosquitoes live longer than males and are the only gender that bites humans and other animals.

Traveling through four distinct stages, a mosquito matures from an egg into a larva, then a pupa, and finally an adult. A mosquito seeks out a water source in which to lay eggs, which float on the water surface. The mosquito lays eggs one at a time, but some species clump eggs together to form a sort of raft that floats on the water. The eggs of most species develop into larvae within 24 to 48 hours. The larvae of mosquitoes live in the water, only coming to the surface to breathe. Many species have siphon tubes that allow them to hang from the water surface and breathe without emerging. Feeding on microorganisms and organic matter in the water for 7 to 14 days, larvae grow larger and shed their skin four times prior to developing into a pupa. The pupa stage is a period of rest for the developing mosquito. During this stage, the mosquito does not feed, but it continues to develop for approximately two more days, during which time it emerges from its split skin as

an adult. An adult mosquito initially rests on the surface of the water in order to dry itself, spread its wings, and harden its body.

Clearly, water is paramount for a mosquito to survive. Each stage of development requires access to water. The water can be found in tin cans, ponds, pools, puddles, ditches, animal troughs, or a multitude of other locations. Mosquitoes generally prefer water that is sheltered by the wind by grass, weeds, or human structures. For an eradication program to be successful, it is necessary to target the source of mosquito reproduction.

Some species of mosquitoes transmit diseases through their bites. There are two primary ways to avoid problems from mosquito bites: reducing mosquito populations and avoiding mosquito bites. The best mosquito control program integrates a primary focus on reduction of breeding areas with a secondary focus on killing both mosquito larvae and adult mosquitoes. Rather than relying completely on spraying with a fogging truck, mosquito abatement programs also need to eliminate mosquitoes in their breeding areas.

Because water is essential to mosquito reproduction, it is necessary to control water sources that can breed mosquitoes. Community-based education programs could target ways concerned citizens can reduce mosquito access to water sources. People need to be informed of the potential diseases spread by mosquito bites and simple ways that they can reduce the chances of mosquito bites. For example, people can be instructed to haul trash away from their homes, to avoid having open water areas or containers near their house, to fill tree holes with mortar, to drill holes in the bottom of tire swings, to change water designated for

animals weekly, to keep roof gutters clean, to cover water tanks, and to fix low-lying areas of the yard that can collect water. Additionally, conservation efforts that support natural enemies of insects need to be emphasized. Public relations efforts could target the protection of birds, frogs, lizards, and fish that prey on mosquitoes and other insects. Specifically, one fish has been renamed the “mosquito fish” (a.k.a. *Gambusia affinis*) because it feeds exclusively on mosquito larvae.

Next popular after source reduction in controlling mosquito populations is larvicide. Mosquitoes are concentrated in a relatively small area when they are in the larva stage, making targeting specific areas easier. In addition, killing mosquitoes before they are free to fly around reduces the mosquito population’s ability to bite and transmit diseases. Although there are a variety of insecticides available, the safest are methoprene and a bacteria called *Bacillus thuringiensis israelensis*, or Bti. These bacteria are available commercially in a variety of forms. One such form is a mosquito dunk, a product that floats on water and releases a long-lasting larvicide where water cannot be drained, dunks provide a reasonable alternative to control mosquito populations. Similarly, methoprene can be added to water in bird baths, flower pots, rain barrels, and so on without risk to humans, animals, or vegetation.

Individuals can also protect themselves from mosquitoes by using various sprays and repellants. Killing adult mosquitoes needs to be considered as a last resort, if earlier efforts fail. Sprays, coils, lamps, or strips can be used in designated spaces outdoors or repellants can be sprayed directly on the body. Water-based products are considered to be more environmentally friendly, but products that

contain DEET are probably the most effective in repelling mosquitoes. Another repellent that has met with some success in Europe is IR3535, a synthetic biochemical that closely resembles a naturally occurring repellent. Lastly, there are some plant-based repellents that contain soybean oil, geranium oil, and coconut oil that are effective for some people.

It is imperative that we seek effective and environmentally sound ways to reduce the mosquito population. Mosquito bites have been linked to transmission of encephalitis, malaria, West Nile Virus, and Yellow Fever. These diseases can prove deadly to people and animals alike. With positive efforts toward mosquito control, these diseases can be substantially controlled.

References

Center for Disease Control. <<http://www.cdc.gov/ncidod/diseases/list>> "Mosquito-Born Diseases." Accessed on 15 October 2010. Web.

en.wikipedia. Mosquito Abatement. Accessed on 15 October 2010. Web.

Miller, Kenneth and Levine, Joseph. *Biology*. Upper Saddle River, N.J.: Prentice Hall, Inc., 2006.

Mississippi State Department of Health. <<http://www.msdh.state.ms.us>> Accessed on 15 October 2010. Web.