



SUMMIT COUNTY PUBLIC HEALTH

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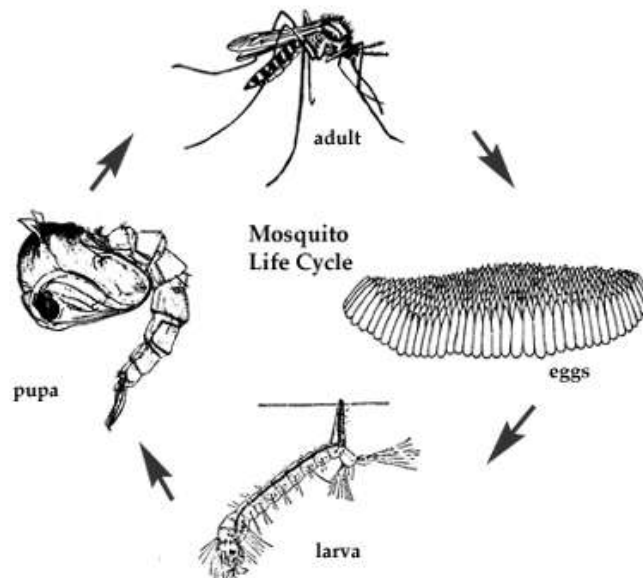
Mosquitoes in Ohio

There are about 60 different species of mosquito in Ohio. Several of them are capable of transmitting serious, possibly even fatal diseases, such as mosquito-borne encephalitis and malaria to humans. Even in the absence of disease transmission, mosquito bites can result in allergic reactions producing significant discomfort and itching. In some cases excessive scratching can lead to bleeding, scabbing, and possibly even secondary infection. Children are very susceptible to this because they find it difficult to stop scratching. Frequently, they are outside playing and do not realize the extent of their exposure until it is too late.

Female mosquitoes can produce a painful bite during feeding, and, in excessive numbers, can inhibit outdoor activities and lower property values. Mosquitoes can be a significant burden on animals, lowering productivity and efficiency of farm animals.

Life Cycle

Adult mosquitoes are small, fragile insects with slender bodies; one pair of narrow wings (tiny scales are attached to wing veins); and three pairs of long, slender legs. They vary in length from 3/16 to 1/2 inch. Mosquitoes have an elongate "beak" or piercing proboscis. Eggs are elongate, usually about 1/40 inch long, and dark brown to black near hatching. Larvae or "wigglers" are filter feeders that move with an S-shaped motion. Larvae undergo four growth stages called instars before they molt into the pupa or "tumbler" stage. Pupae are comma-shaped and non-feeding and appear to tumble through the water when disturbed.



Habits and Diseases Carried

Mosquitoes may over-winter as eggs, fertilized adult females or larvae. Eggs, larvae, and pupae must have water to develop. Some female mosquitoes lay their eggs directly on the water surface. Others lay their eggs on substrates above the water line (flood pool mosquitoes); the eggs hatch upon flooding. In some cases, the eggs will remain viable for several years until further flooding occurs. Mosquitoes belonging to the genus *Culex* lay their eggs in bunches or "rafts." Each raft may contain up to 400 individual eggs. Larvae feed on bits of organic matter dispersed in the water, becoming full grown in about one week. The pupal stage lasts two to three days. Female mosquitoes are ready to bite one to two days after adult emergence. Male mosquitoes do not bite but feed on flower nectar or plant juices. Some mosquitoes have only one generation per year, whereas others may have four or more. Adults may fly 5 to 10 miles, but usually rest in grass, shrubbery or other foliage close to the water breeding area.

Mosquitoes may transmit diseases such as dengue, yellow fever, and malaria to humans. Mosquito-borne encephalitis is a viral inflammation of the brain. Encephalitis can infect humans, horses, and a variety of other mammals and birds. Eastern equine encephalomyelitis (EEE), although very rare is frequently fatal. A small rural outbreak in late 1991 resulted in more than 20 farm animal fatalities, most of which were horses. Transmission of the disease occurs when an infected mosquito takes a blood meal. Birds serve as natural hosts for EEE and St. Louis encephalitis (SLE). St. Louis encephalitis, like EEE is an epidemic disease, meaning that it is usually rare. It can be absent from an area for several years and then reoccur suddenly without warning. LaCrosse encephalitis (LAC) is the third type found in Ohio.

It is considered endemic to Ohio and occurs year after year at low levels. Ohio has more recorded cases of this disease than any other state. LaCrosse encephalitis is the least severe of the three types of mosquito-borne encephalitis that are found in Ohio, and occurs most often in children. Small woodland mammals, such as chipmunks and squirrels serve as the natural host for the virus, however LAC virus can also be passed, transovarially, from mother mosquito to her offspring.

Mosquitoes can also transmit filariasis (heartworm) to animals. Dog heartworm is the most significant of these, however in some areas, veterinarians are beginning to see more heartworm in cats.

Common Name	Scientific Name	Importance
Asian Tiger Mosquito	<i>Aedes albopictus</i>	AC, EEE, SLE, Pest
banded spring mosquito	<i>Aedes canadensis</i>	LAC, Pest
Eastern Treehole Mosquito	<i>Aedes triseriatus</i>	LAC
flood-water mosquito	<i>Aedes tivittatus</i>	Pest
Vexans Mosquito	<i>Aedes vexans</i>	Pest
Malaria Mosquito	<i>Anopheles quadrimaculatus</i>	Malaria, Pest
Cattail Mosquito	<i>Coquillettidia perturbans</i>	EEE, Pest
Northern House Mosquito	<i>Culex pipiens</i>	WNV, SLE
WNV=West Nile Virus LAC = LaCrosse Encephalitis EEE = Eastern Equine Encephalomyelitis SLE = St. Louis Encephalitis		

Biology

Aedes albopictus

Adults are known as tiger mosquitoes due to their conspicuous patterns of very black bodies with white stripes. Also, there is a distinctive single white band (stripe) down the length of the back. The body length is about 3/16-inch long. Like all adult mosquitoes, Asian tiger mosquitoes are small, fragile insects with slender bodies, one pair of narrow wings (tiny scales are attached to wing veins), and three pairs of long, slender legs. They have an elongate proboscis (beak) with which the female bites and feeds on blood. Eggs are elongate, usually 1/40-inch long, and dark brown to black near hatching. The egg stage will successfully overwinter in Ohio. Breeding occurs in used tires holding water in addition to tree holes, tin cans, bottles, etc. Scientists are almost positive that this mosquito entered this country in shipments of used tires from Northern Asia (probably Japan). The U.S. imported 4.5 million tires from Asia from 1983 to 1985 and the interstate commerce of used tires spread the mosquito to new locations.

Aedes canadensis

This dark mosquito has the tarsi banded with white at both ends of the segments. It is a serious pest in woodlands. This species overwinters in the egg stage and is one of the first mosquitoes to appear in early spring. Larvae breed in woodland pools filled by melting snows or by spring rains. It shows preference for pools with a bottom of dead and decaying leaves, although it is sometimes found in roadside puddles, sink holes, wooded swamps, etc. There is one generation per year with the adults living for several months. Eggs are laid singly on the ground or above the waterline in woodland pools. Eggs hatch only after they have been flooded. Eggs are able to survive long periods of drying. Biting occurs most frequently during the evening hours, but can occur during the day or night. *Aedes canadensis* is a secondary vector of LaCrosse encephalitis in Ohio.

***Aedes (Ochlerotatus) triseriatus* (TreeHole Mosquito)**

These black mosquitoes have silvery white scales at the sides of the thorax. They breed principally in tree holes, tires and other artificial containers. The bites are painful and sometimes very troublesome in the woods. They do not wander far from the breeding places. Larval development is rather slow with nearly a month required to reach maturity. *Aedes triseriatus* is the principal vector of LaCrosse encephalitis in Ohio. This species has several generations a year and overwinters in the egg stage.

Aedes trivittatus

The upper surface of this mosquito's thorax is marked with two conspicuous whitish stripes. It is a fierce biter and can be extremely annoying. Larvae occur mostly in floodwater pools and temporary rain pools. Young larvae feed at the water surface with later instars spending most of their time concealed in the vegetation at the bottom of the pool. Larvae are seldom encountered, even though adults can be present in large numbers. Adult emergence begins about eight days after hatching. Adults rest among shaded grasses and other vegetation during the daytime but bite if disturbed. They bite mostly in the evening and do not migrate far. This species overwinters in the egg stage.

Aedes vexans

A medium-sized brown mosquito, it has narrow rings of white scales on the hind tarsi and a "V" shaped notch at the middle of each band of white scales on the upper surface of the abdomen. This mosquito is very abundant and breeds in rain pools, flood waters, roadside puddles and most all temporary bodies of fresh water. Eggs are laid on the ground above the water line, hatching when flooding occurs. Larvae can be found in huge numbers. In receding water, up to 500 or more larvae are found to each pint of water. Development of the aquatic stages requires ten days to three weeks, depending on the temperature. Adults fly long distances from their breeding places with flights of five to ten miles being rather common. Adult females are vicious biters and are especially annoying at dusk and after dark. Adults live for nearly two months and are attracted to light. They rest during the day in shaded grass and other vegetation. *Aedes vexans* overwinters in the egg stage. It is considered the principal pest mosquito in Ohio and in many parts of the United States. It may also be a secondary vector of the Eastern equine encephalitis virus.

Anopheles quadrimaculatus (Malarial Mosquito)

These large, dark brown mosquitoes have four dark spots near the center of each wing. The tarsi are entirely dark. Eggs are laid singly on the water surface with lateral floats to keep them at the surface. One hundred or more eggs are laid at a time. A single female may lay as many as 12 batches of eggs and a total of more than 3,000 eggs. This species is the most important vector of malaria attacking humans in the eastern United States and can be found frequently in houses and other shelters. Their bites are less painful than many other mosquitoes and often go unnoticed. These mosquitoes breed chiefly in permanent freshwater pools, ponds and swamps that contain aquatic vegetation or floating debris. Common habitats include borrow pits, sloughs, city park ponds, sluggish streams and shallow margins of reservoirs and lakes. During the daytime, adults remain inactive, resting in cool, damp, dark shelters such as buildings, caves, under bridges, etc. Feeding occurs at night. These mosquitoes enter houses to feed on humans. Cows, horses, mules, pigs and chickens are also attacked. Adults fly about one half mile from their breeding site but are not taken in light traps in great numbers. Breeding occurs throughout the summer months, with overwintering taking place as an adult fertilized female.

Coquillettidia (Mansonia) perturbans

The scales on the wings of this mosquito give the wings a "peppered" appearance. The mosquito also has a rounded abdomen and white bands on the tarsi and proboscis. It breeds in permanent water, especially marshes with emergent plants. Larvae and pupae attach to the roots and underwater stems of a wide variety of aquatic plants, most commonly cattails (*Typha* sp.). Overwintering occurs as larvae in mud. There may be more than one generation produced in a year. There is usually a very large emergence of adults in May, with the population peaking in June and declining through July and August. It is primarily a mammal feeder and readily attacks humans. This species can fly long distances from its breeding site and is primarily a pest species in Ohio.

It has been shown to be involved in the transmission cycles of California group viruses, Eastern equine encephalitis virus, and dog heartworm in other areas of the U.S.

Culex pipiens (Northern House Mosquito)

These brown mosquitoes of medium size have cross bands of white scales on the abdominal segments, but are without other prominent markings. They commonly enter houses.

This mosquito is a vector of St. Louis encephalitis. Breeding occurs in rain barrels, tin cans, tires, stormsewer catch basins, street gutters, polluted ground pools, cesspools, open septic tanks, etc.

Eggs are laid in clusters of 100 to 400, known as egg rafts, which float on the water surface. Hatching occurs in a day or two in warm weather. Eight to ten days are needed for completion of the larval and pupal stages. In cooler weather of early spring or late fall, two weeks or more may be required. Breeding continues throughout the warm months of the year. One subspecies can survive and produce fertile eggs without a blood meal. This mosquito does not fly far, except when great numbers are produced. Adults are active only at night and can be found resting during the day in and around houses, outbuildings and various shelters near their breeding places. They are readily attracted to carbon dioxide (CO₂) baited light traps. This mosquito overwinters as a fertilized adult female.

Control Measures

What Doesn't Work

There have been a number of natural and man-made mosquito repellents, attractants, and predators touted as effective against mosquitoes. In truth, they don't do much good and cannot be used to effectively control mosquitoes.

A company has been marketing a "mosquito repellent plant" that produces citronella and consequently repels mosquitoes. Citronella oil is produced by a number of different plants. At relatively high concentration, Citronella oil is repellent to mosquitoes. Thus far, there does not appear to be adequate scientific literature to substantiate the claim that enough Citronella is released by a stationary plant to repel mosquitoes. Most likely the plant would have to be physically damaged in order to release enough citronella to repel mosquitoes and the effect would be very short lived.

Dietary studies indicate that mosquitoes are insignificant in the purple martin diet. Studies of bat stomach contents show beetles as the dominant food. Ultraviolet or black lights and sonic devices indicate ineffective control.

Prevention

Since most of the mosquitoes that transmit encephalitis will not travel very far, the risk of contracting encephalitis can be minimized by controlling the mosquito breeding sites which are in close proximity to your home. Water management, to prevent mosquito breeding, is essential for control. Eggs do not hatch unless they are in water. Remove old tires, buckets, tin cans, glass jars, broken toys and other water-catching devices. Change water in bird baths and wading pools once or twice a week; clean out roof gutters holding stagnant water; and place tight covers over cisterns, cesspools, septic tanks, barrels, and tubs where water is stored. Never over-apply lawn and garden irrigation; fill, drain or treat tree holes; and drain or fill stagnant water pools, puddles, ditches, or swampy areas. Inspect water in plant containers, water-holding stumps, keep grass mowed around bodies of water, stock ponds and reservoirs with fish. Ohio Department of Natural Resources is discouraging the release of fish such as *Gambusia* since they are not indigenous to Ohio.

Use adequate screens with 16 x 16 or 14 x 18 mesh on windows and doors. Screen doors should open outward and close automatically.

Repellents

Repellents applied to the skin and clothing will prevent mosquito bites for one to five hours depending on the person, type, and number of mosquitoes and the type and percent of active ingredient in the repellent. Repellents are available as aerosol sprays, pump sprays, cream sticks, lotions, or foams.

N, N-Diethyl-m-toluamide (Deet) is very effective and widely used as a repellent but it should not be used indiscriminately as severe allergies can develop. Formulations containing high concentrations of Deet, 50% or more, should not be used on children. Formulations containing 5 to 10% Deet will work just as well as those containing 90% or more, however, they will not last as long.

Avon Skin-So-Soft has been widely used as a mosquito "repellent" for a number of years without being labeled. Avon Products, Inc. has recently obtained EPA approval and is now marketing some of its Skin-So-Soft products for use as a mosquito repellent.

Indoor Control

Space sprays or aerosol "bombs," containing synergized pyrethrins 0.1%, are effective against adult mosquitoes. Frequent treatments may be needed during problem periods.

Outdoor control

Adulticides

Space sprays or aerosol foggers, containing pyrethrins, will give rapid knockdown of adult mosquitoes. However, it is a temporary treatment with little residual effect. Residual sprays applied to tall grasses, weeds, trees, shrubs, and outbuildings, one to two days before use of the area, is effective. Use water solution or emulsions instead of oil-based formulations to prevent plant injury. Some insecticides registered for residual mosquito control include: carbaryl (Sevin), chlorpyrifos (Dursban) and malathion. There are a number of different formulations available. Follow specific label directions when applying.

Note: Malathion and carbaryl (Sevin) are extremely toxic to honey bees. Do not spray plants when in bloom. Mow weedy areas before treatment. Bee losses are minimized by spraying late in the afternoon when bees are gone or when temperatures are below 45 deg F. Malathion and methoxychlor are highly toxic to fish.

Larvicides

Homeowners may apply Mosquito Dunks (made with *Bacillus thuringiensis* Berliner var. israelensis or B.t.i.) to kill mosquito larvae in the water. This natural ingredient is harmless to other living things and is biodegradable.

Methoprene (Altosid XR) is another safe material for control of mosquito larvae. It is an insect hormone which retards the development of larvae (disrupts molting) and prevents mosquitoes from developing into adults.

Altosid XR Briquets can be placed even on ice for season-long control. Treat swamps, ponds, and marsh areas in early spring before thawing. These extended-release briquets will provide up to 150 days of uninterrupted mosquito control once they hit the water. It can be applied by hand and the product is labeled for use in known fish habitats.

NOTE: Disclaimer - This publication may contain pesticide recommendations that are subject to change at any time. These recommendations are provided only as a guide. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. Due to constantly changing labels and product registrations, some of the recommendations given in this writing may no longer be legal by the time you read them. If any information in these recommendations disagrees with the label, the recommendation must be disregarded. No endorsement is intended for products mentioned, nor is criticism meant for products not mentioned. Summit County Public Health assumes no liability resulting from the use of these recommendations.