NATURE'S LABORATORY

"*If you prick us, do we not bleed?*"
-- William Shakespeare

In the United States, there are approximately 200 different mosquito species. In California alone, 53 different species take to the skies. They might all look the same to us, but each species is adapted to specific habitats, displays its own behavior, and preys on different types of animals. Some mosquitoes can survive in the parched climate of Death Valley, while others cling to the icy ranges of the Sierra Nevadas, more than 14,000 feet in altitude.

Mosquitoes belong to the phylum Arthropoda, invertebrate animals including insects, arachnids, and crustaceans that have segmented bodies, jointed appendages, and an exoskeleton. Mosquitoes are insects — True Flies, in fact — and have a reputation that precedes them. We all know mosquitoes are blood-suckers, but do you know why?

Mosquitoes are actually nectivorous; they drink the sugary nectar from flowers and fruits for sustenance. The reason mosquitoes are so bothersome is that the females have to suck blood, known as a "blood meal", to obtain the proteins necessary for their eggs to develop. In addition to humans, female mosquitoes will feed on cattle, horses, goats, all types of birds including chickens, and wild animals including deer, rabbits, snakes, lizards, frogs, and toads. Male mosquitoes never bite.

When the females land on a potential victim, they plunge six needle-like stylets into the skin. One of our body's natural defenses against wounds is the coagulating (clotting) of blood to prevent excess blood-loss. Since coagulation would interfere with a mosquito's meal, they're armed with an anti-coagulant in their saliva. After the stylets tap an artery, mosquitoes inject their saliva into the artery to keep the blood flowing, then suck their hosts blood in through their proboscis. Although we don't always notice the bite, it's only a matter of time before we realize we've been bitten. One side effect to the mosquitoes bite is an itchy welt due to an allergic reaction caused by allergens in their saliva.

Once the female has fed on enough blood for her eggs to develop, she lays the eggs in some nearby stagnant water. Choice breeding sites are species-specific. Certain mosquitoes prefer rock holes along rivers, some prefer temporary snow-melt pools, and others prefer grassy meadow pools. Once the eggs hatch, mosquito larvae (known as wrigglers) emerge to feed and develop in the water. The wrigglers eventually develop

into pupa (known as tumblers), during which time they cease feeding. At the end of three days, an adult mosquito will emerge from the tumbler's pupa casing.

When a mosquito bites, she can introduce an arbovirus (from **ar**thropod-**bo**rne), any of a number of viruses carried by mosquitoes. Among the diseases they can transmit to humans are malaria, dengue fever, encephalitis (St. Louis, Japanese, western equine, and Venezuelan), and yellow fever. Only St. Louis encephalitis and western equine encephalitis have caused significant outbreaks in humans.

More recently, West Nile virus has become a growing threat. Birds, most often crows, jays, ravens, and magpies, can carry West Nile virus. The birds act as hosts, while mosquitoes serve as vectors, biting birds and then humans, transmitting the disease from the former to the latter. Mosquitoes can also transmit West Nile virus to horses. Fortunately, those infected (humans and animals alike) usually only have a mild illness, or have no symptoms at all.

The species most dangerous to humans include the western encephalitis mosquito, common house mosquitoes, western malaria mosquitoes, and western pasture mosquito. Despite their species, all mosquitoes are aquatic insects, and thus need water to breed, and to survive the initial stages of their life cycle. Standing water can come appear in any number of places, including not only the obvious ponds, lakes, marshes and creeks, but also the less obvious locales; tree holes, discarded tires, buckets, potted plant trays and containers, saucers and pet food bowls, bird baths, fountains, wading pools, and plastic covers/tarpaulins. Even an old Tonka truck left in the sandbox can pond enough water to attract mosquitoes.

To detect arboviruses, scientists use a number of techniques, one of which is the sentinel chicken. Mosquitoes bite chickens as often as they do humans, so chickens provide the perfect opportunity to monitor the occurrence of arboviruses in local mosquito populations. Scientists regularly take blood samples from sentinel chicken flocks and send the samples to local labs to be tested. In the war against arboviruses, chickens are often our first line of defense.

Hands On*:* The next time you are outside, explore all the nooks and crevices you can find that might retain water. Mosquito eggs only take three days to develop, so check everywhere — tree trunks and rock depressions, pails and planters — for a miniature pond. If you find any potential egg rafts, wrigglers or tumblers, inspect them closely with a hand lens. Bring a field guide and try to identify their different parts, and what stage of development they're in.

When you're finished, pour out the water to prevent the mosquitoes from completing their developmental cycle. That will also discourage future mosquitoes from breeding there again. Bats are natural predators of mosquitoes, so if you have a mosquito problem, perhaps you should consider building a bat box. Bat box kits or assembled models should be available at any place that sells bird houses.

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