

OCTOBER 18, 2022 CITY COUNCIL MEETING

CONSENT CALENDAR ITEM NO. 10 – COUNCIL COMMITTEE AND AGENCY REPORTS

ADDITIONAL MATERIAL RECEIVED AFTER POSTING OF AGENDA

Vectors of the Month
Invasive *Aedes aegypti* and *Aedes albopictus*

Detections of invasive mosquitoes, the yellow fever mosquito, *Aedes aegypti*, and the Asian tiger mosquito, *Aedes albopictus*, have increased since their discovery in Orange County during 2015. Collections have been highest in yards with backyard ornamental plants and small containers with water. One or both of these invasive mosquitoes have been established in the U.S. for years and have now been found in 12 California counties.

Both species are primarily associated with urban areas and are dependent on humans not only for their breeding sources, but often as a source for their blood meals. Adult mosquitoes are relatively small and are black with white stripes. Females (males do not bite) are active during the day and will readily bite indoors and outdoors in shaded areas around the home. Once established, they can become a severe nuisance to both people and pets, and are potential vectors of several mosquito-borne diseases, such as yellow fever, dengue, chikungunya, and dog heartworm.

Larvae of *Aedes aegypti* and *Aedes albopictus* usually do not develop in typical open water sources characteristic of most of our local mosquitoes; instead, they breed in water held in both natural and artificial containers. The range of sources include leaf axils, tree holes, discarded tires, flower pots, buckets, cemetery urns, discarded cups/cans, and occasionally larger sites, such as storm drains and even septic tanks.

Their eggs can survive desiccation for long periods of time, facilitating their spread to new locations with the movement of contaminated containers, or their ability to re-emerge after control efforts.

The yellow fever mosquito, *Aedes aegypti*, originated in tropical Africa and spread around the tropical and sub-tropical world with the movement of people and commerce. It likely reached the Americas by the 1600s and has been responsible for outbreaks of yellow fever, as its common name implies, in Africa and in many parts of the New World. The Asian tiger mosquito, *Aedes albopictus*, on the other hand, originated in Southeast Asia and did not reach the Americas until the 1980s. In both instances, the spread of these species has been facilitated by the worldwide movement of goods and people; both are now found in Europe as well.

Historically, the failure of either mosquito to become established locally in prior years may be related to our dry climate and lower humidity levels that reduce survival of adult mosquitoes. However, this scenario has been breached because human development has progressively changed arid regions of the American southwest into a well-irrigated, pseudo-rain forest system with suitable conditions throughout many areas of California. No longer confined to regions of the United States with high summer humidity, these mosquitoes are appearing in many arid regions of the U.S.

Because of their ability to live in close proximity to humans, the most effective method to control these invasive *Aedes* mosquitoes is to prevent containers around the home from collecting water. To stop their spread in Orange County, the District is requesting residents to do their part by following these steps:

- CALL and REPORT any sightings of small, black-and-white mosquitoes, or if you are being bitten by mosquitoes during the day! Residents can contact the Orange County Mosquito and Vector Control District at 714-971-2421, or online at www.ocvector.org.
- DUMP and DRAIN all stagnant water around your home. Eliminate plant saucers and other unnecessary containers; thoroughly scrub outdoor pet water dishes weekly to remove eggs.
- DO NOT transport or share plant stems rooted in water, or keep outdoor buckets full of water.
- USE INSECT REPELLENT containing EPA-registered active ingredients such as DEET, Picaridin, or oil of lemon eucalyptus to avoid bites.



Figure 1. *Aedes aegypti*. Note the black and white color pattern on body and legs.



Figure 2. *Aedes albopictus*. Note black and white color pattern on body and legs.

Why are some people mosquito magnets and others unbothered? A medical entomologist points to metabolism, body odor and mindset

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Mosquitoes need to feed on blood in order to reproduce. But how do they choose whom to feed on? boonchai wedmakawand/Moment via GettyImages

It's rare to attend an outdoor party in warm weather without hearing people complain about mosquitoes. They swat away, sit in campfire smoke, cover up with blankets and eventually just give up and go indoors. On the other end of the spectrum, there are plenty of people who don't seem bothered by mosquitoes in the slightest.

As a medical entomologist who's worked with mosquitoes for more than 40 years, I'm often asked why some people seem to be mosquito magnets while others are oblivious to these blood-feeding pests buzzing all around them.

Most mosquito species, along with a host of other arthropods – including ticks, fleas, bedbugs, blackflies, horseflies and biting midges – require the protein in blood to develop a batch of eggs. Only the female mosquito feeds on blood. Males feed on plant nectar, which they convert to energy for flight.

Blood-feeding is an incredibly important part of the mosquito's reproductive cycle. Because of this, a tremendous amount of evolutionary pressure has been placed on female mosquitoes to identify potential sources of blood, quickly and efficiently get a full blood meal, and then stealthily depart the unlucky victim. If you check some, or all, of the mosquito's search boxes, then you may find that you are a mosquito magnet.

Sensing CO2 and scent signals

Depending on when during the day they are active, mosquitoes use sight, sound and olfactory cues to identify a potential source of blood. Most night-active species rely on olfactory or receptor cues. The most important chemical cue is the carbon dioxide that all vertebrates, including humans, release with each breath and through their skin.

Mosquitoes are very sensitive to CO₂ and can sense a CO₂ source that is many meters away. Receptor cells on the mosquito's antennae and legs bind CO₂ molecules and send an electrical signal to the brain. When more molecules hit their receptors, the higher the CO₂ concentration and the closer they are to the host.

However, there are many nonliving carbon dioxide sources such as cars, boats, planes and trains. To separate living from nonliving sources of CO₂, mosquitoes rely on the secondary olfactory cues that living animals produce. Metabolic processes like breathing and moving generate these scent cues, including lactic acid, ammonia and fatty acids that act as additional olfactory clues that help female mosquitoes zero in on their next blood meal.

So, carbon dioxide production is the first mark of a mosquito magnet. Because the production of CO₂ and secondary attractants is linked to metabolic rate, the higher the metabolic rate, the more attractants are produced. Metabolic rate can be genetically determined, but it also increases as the result of physical activity.

The human mosquito magnets you can spot at summer parties may have a genetically high metabolic rate or may be more physically active than other attendees. They may also be undertaking other activities that increase their metabolic rate, such as the consumption of alcohol. Increased metabolic rate is why runners attract more mosquitoes during their cooldown stretching exercises. Pregnant women, perhaps due to their increased metabolic rate, attract a disproportionately large number of mosquitoes as well.

Natural body odors are also important cues used by mosquitoes to select a host. For example, some species of Anopheles mosquitoes are attracted to specific components of foot odor. These mosquitoes transmit human malaria and feed indoors in the middle of the night. By feeding on a sleeping person's feet, the mosquitoes avoid the head, where most of the CO₂ is produced, and reduce the chance of waking the victim.

Visual cues

Mosquitoes active during the day and at dawn and dusk also use visual signals to identify a host. Mosquitoes usually fly close to the ground. From this vantage point they view their potential hosts against the horizon. Dark colors stand out and light colors blend in, so the way a person is dressed will determine the number of mosquitoes they attract. Wearing lighter colors may not just help keep you cool, but will help you evade a mosquito's notice.

Mosquitoes can visually detect motion, again by contrasting a silhouette against the horizon. This is why people who walk near a saltmarsh in the middle of the day after a large emergence of saltmarsh mosquitoes are inundated by mosquitoes that visually detect their presence.

Psychological factors

There is also a psychological component to mosquito activity. Some people simply do not notice the mosquitoes around them. A single mosquito flying around some people will elicit a strong response – you've probably seen someone go nuts trying to track down the droning sound of one mosquito in order to finish off the tiny bloodsucker.

Other individuals are not bothered and do not notice the mosquitoes that are attracted to them, even when the insects are feasting on their blood. Some mosquitoes specialize on feeding on parts of the body that are difficult to see and difficult to swat. For example, *Aedes aegypti* is a mosquito species that prefers to feed on humans, mostly around the ankles.

Whether or not you're a mosquito magnet, their bites feel just as itchy!

BOARD MEETING HIGHLIGHTS

For the October 13, 2022, Meeting

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COMMUNITY ENGAGEMENT REMINDS DRIVERS “IT’S TIME TO GET ON THE ROAD AGAIN”

The Transportation Corridor Agencies’ (TCA) Community Engagement team has been active in member cities as part of the Communications and Public Engagement pillar of the Agencies’ seven-year Strategic Plan, adopted earlier this year by the Joint Boards of Directors.

Since the beginning of 2022, the Community Engagement team has hosted booths at regional, city and chambers of commerce events; attended member city state of the city events; and provided monthly updates about the Agencies and The Toll Roads at various community meetings.

The Community Engagement team has also given presentations throughout Orange County highlighting the Strategic Plan and upcoming Capital Improvement Plan projects, including the 241/91 Express Connector.

Community Engagement will continue to visit member cities and share news about The Toll Roads during the next several months as staff continues with the theme of “it’s time to get on the road again.”

DOMESTIC AND INTERNATIONAL PEERS LEARN ABOUT CASHLESS TOLLING FROM TCA

As a testament to TCA's leadership and innovation in the tolling industry, staff recently met with both domestic and international peers to share the Agencies’ experiences converting to all-electronic toll collection, which TCA completed nearly 10 years ago.

Staff recently met with the Kansas Turnpike Authority as they plan for their cashless conversion scheduled for 2024.

In 2025, Malaysia is moving to all-electronic tolling on their highways. To prepare, a delegation of Malaysian transportation officials – led by Senior Minister of Infrastructure Development Cluster Fadillah bin Yusof – visited the 241 Toll Road on September 22 to learn how TCA successfully migrated to a cashless tolling model.

The delegation was greeted by TCA Acting CEO Valarie McFall and Chief Toll Operations Officer Vincent Valdez, who led a tour of the Tomato Springs Mainline Toll Point on the 241 Toll Road. Valdez led a detailed tour of the facility, explained about cashless tolling technology and answered questions regarding customer service and transactions.

TCA continues to be at the forefront of tolling innovation and assists other agencies – and countries – in their tolling initiatives.

AGENCIES INPUT REFLECTED IN NEWLY-SIGNED AB 2594

AB 2594 by Assembly Member Ting was signed on September 30 by Governor Newsom. While this bill initially would have had numerous unintended consequences on TCA's tolling operations and its customer service policies, amendments were proposed and accepted that brought the rest of the state up to the Agencies’ standards in these areas.

This successful outcome was achieved through the work of staff, state legislative advocates and fellow tolling agencies as well as the support of the TCA Joint Boards of Directors. This was a great win for the Agencies.