City of Los Alamitos

Agenda Report	March 23, 2015
Consent Calendar	Item No: 8I

To: Mayor Richard D. Murphy & Members of the City Council

From: Gerri L. Graham-Mejia, Orange County Vector Control District Representative for Los Alamitos

Prepared by: Windmera Quintanar, CMC, City Clerk

Subject: Orange County Vector Control District (OCVCD) Update

Summary: This report provides an update on the Orange County Vector Control Board.

Recommendations: Receive and file.

Background

On December 16, 2013, the City Council appointed Gerri L. Graham-Mejia to the Orange County Vector Control District Board (OCVCD) for a two-year term. Her term of service will end the first Monday of the year at 11:59 a.m., which will be January 4, 2016. OCVCD bylaws dictate a representative may be appointed for two or four year term of office which commences at noon on the first Monday in January. As a resident of the City, Gerri L. Graham-Mejia will continue to serve as the City's representative until January 4, 2016.

Discussion

The Council has requested an update regarding OCVCD. Ms. Graham-Mejia has provided the following information. She was instrumental in establishing the Board's Monthly Items of Discussion for each agenda. Board Member's use the information to report back to their respective cities. She has also provided the Vector Management Updates which highlight a new known vector to be aware of. Ms. Graham-Mejia will continue to written reports and is available to make presentations upon Council's specific request.

<u>January 15, 2015 – Monthly Items of Discussion</u>

- In Orange County in 2014, there were 282 human cases of West Nile virus and seven deaths from the virus. This number is higher than a combination of all the years West Nile virus has been in Orange County (252 cases; 2004-2013)

- In Orange County in 2014, the District collected and tested 3,052 mosquito samples and found 505 West Nile virus positive samples. In 2013, the District collected and tested 1,982 samples and found 48 West Nile virus positive mosquito samples.
- In Orange County in 2014, the District collected and tested 728 dead birds for West Nile virus and found 440 positive dead birds. In 2013, the District collected and tested 388 dead birds for west Nile virus and found 41 positive dead birds.

February 19, 2015 – Monthly Items of Discussion

- Continued rain and warm weather this year have produced numerous mosquitoes that have been collected in the District's surveillance traps. Please report any mosquito activity to the District.
- All of the recent rain has created potential mosquito sources around homes and workplaces. Please look for any containers holding water and dump the water out.

March 19, 2015 – Monthly Items of Discussion

- Recent rains have filled pools, buckets, pots, and anything else that will hold water on your property. Please remember to dump and drain any container that can become a mosquito breeding source, even in the " winter" months.
- The warm winter and continued rains are leading to mosquito breeding throughout the county. Be on the lookout for "wigglers" in containers in your yard. Dump the water out or contact the District for help.
- Unseasonably warm weather has triggered crane flies to emerge from the soil earlier than normal this year. Reports of "huge mosquitoes" (crane flies) should not be confused with mosquitoes which are approximately 1/ 4 inch in total length.

Ongoing Items of Discussion

- District Staff are looking for unused or dry swimming pools that can become mosquito breeding sources from the lack of maintenance. Please contact the District if you know of any unused swimming pools. The District will deliver mosquito fish free of charge to stop the pool from becoming a mosquito problem.
- Visit www.ocvcd.org for more information on rats, mosquitoes, Red Imported Fire Ants, and other pests you could have on your property.
- Follow the Orange County Mosquito and Vector Control District on Facebook and Twitter to receive important vector control tips and information about disease outbreaks that will help protect you and your family this summer. www.facebook.com/OCVectorControl www.twitter.com/OCVector

Fiscal Impact

None.
Approved By:

Bret M. Plumlee
City Manager

Attachments: 1. *January15, 2015 – Vector of the Month and Vector Management Update*
2. *February 19, 2015 – Vector of the Month and Vector Management Update*
3. *March 19, 2015 – Vector of the Month and Vector Management Update*

Vector of the Month

The Roof Rat
Rattus rattus

By Steven Reinberg, HealthDay News
November 4, 2014

The roof rat (*Rattus rattus*) is the leading rodent problem in Orange County. The Orange County Vector Control District receives more roof rat service requests from county residents than all other services combined.

The roof rat is not native to North America, but was introduced into the western hemisphere by colonists from Asia and Europe (Old World). The Norway rat (*Rattus norvegicus*) and the house mouse (*Mus musculus*) were also transported into North America from the Old World. With its introduction into North America at major sea ports on the east and west coasts, the roof rat quickly adapted to local conditions and spread unchecked across the continent. The roof rat is now found in all major cities in the United States where it has become a significant nuisance and public health threat.

Historically, the roof rat was distinguished by its habits and association with human activity. This close association with humans represents the attribute of a "commensal" species that derives benefit by exploiting the actions of other species.

A typical roof rat reaches a total length of 15 to 18 inches, including the tail, at maturity. Most individuals have large eyes, prominent ears, a scaly tail that is one third longer than the body. Coloration of the fur among individual rats is highly variable with some appearing light brown, others dark brown, and a few nearly jet black. The color of the "belly" fur ranges from white to dark gray or charcoal. Roof rats rarely survive beyond 1 to 2 years of age under favorable conditions. The reproductive potential of this species is phenomenal. Females bear an average of six litters per year with each litter containing from 6 - 8 young demonstrating why this species is capable of rapidly infesting and overwhelming urban neighborhoods.

Roof rats move about urban neighborhoods by using overhead utility lines, interconnecting walls and fences, alley ways, and occasionally underground drains. Their movements are related to foraging and maintaining territories. Roof rats will consume almost all types of foods, including backyard fruits and vegetables, seeds and nuts, dog and cat food, and garden snails. Their foraging habits frequently cause structural damage and loss of personal property. It is not uncommon for the wiring of the family car to either be gnawed, stripped, or severed.

Roof rats carry a variety of disease agents that affect humans. Outbreaks of bubonic plague during the "Dark Ages" were attributed to poor sanitation, abundant populations of "urban" rats, and heavy flea infestations on both roof and Norway rats. Today, plague does not pose a significant health risk to the residents of large metropolitan areas. The disease is largely restricted to rural settings where domestic cats, infected by wild rodents (e.g., ground squirrels), are becoming increasingly involved with pneumonic transmission to humans. Orange County residents are extremely fortunate because existing ecological conditions apparently do not support a consistent and detectable level of plague activity. This is perplexing as most communities in peri-urban habitats support sizable populations of rats, cats, ground squirrels, and fleas. Although infrequent, evidence of bubonic plague, Salmonella bacteria and Seoul (hantavirus) virus has been found in roof rats by the OCVCD laboratory.

Vector Management Update

Morbidity and Mortality Weekly Report (MMWR) Notes from the Field: Fatal Rat-Bite Fever in a Child - San Diego County, California, 2013

By Jessica K. Adam, MD[1,2,3]; Aiden K. Varan, MPH[2,3,4]; Alice L. Pong, MD[5,6]; Eric C. McDonald, MD[2]
Centers for Disease Control and Prevention
December 19, 2014

In August 2013, the County of San Diego Health and Human Services Agency was notified of a fatal case of rat-bite fever (RBF) in a previously healthy male, aged 10 years, who owned pet rats. Two days before his death, the patient experienced rigors, fevers, vomiting, headaches, and leg pains. His physician noted a fever of 102.6°F (39.2°C), documented a normal examination, diagnosed viral gastroenteritis, and prescribed anti-nausea medication. During the next 24 hours, the patient experienced vomiting and persistent fever. He was confused and weak before collapsing at home. Paramedics reported the patient was unresponsive and had dilated pupils; resuscitation was initiated in the field and was continued for >1 hour after arrival at the emergency department but was unsuccessful. A complete blood count performed during resuscitation revealed anemia (hemoglobin 10.0 g/dL [normal = 13.5–18.0 g/dL], thrombocytopenia platelets 40,000/μL [normal = 140,000–440,000/μL]), leukocytosis (white blood cells 17,900 cells/μL [normal = 4,000–10,500/μL]) with 16% band neutrophils; the patient also had evidence of disseminated intravascular coagulation. No rash or skin breakdown was noted. Lung, liver, and epiglottis tissue collected postmortem was positive for *Streptobacillus moniliformis* DNA by polymerase chain reaction.

During the 10 days before his death, the patient had obtained his second pet rat; *S. moniliformis* was detected by polymerase chain reaction in oropharyngeal tissue from this rat. Oropharyngeal swabs of the first pet rat were negative for *S. moniliformis* by polymerase chain reaction. The autopsy report noted that patient had been scratched by his pet rats.

RBF is a systemic illness of humans caused principally by *S. moniliformis*, a gram-negative bacterium that is commensal among rats (1). The organism can be transmitted to humans through rodent bites or scratches; approximately one in 10 bites might cause infection (2). Infection can also occur after handling infected rodents without a bite or scratch, or through ingestion of food or water contaminated with the bacteria (1). Symptoms include fever, rash, vomiting, and muscle or joint pain. RBF is treatable with antibiotics (3); approximately 13% of untreated RBF illnesses are fatal (2).

Nearly all domestic and wild rats carry *S. moniliformis* (2). An estimated 0.1% of U.S. households owned one or more pet rats during 2011 (Sharon Granskog, American Veterinary Medical Association, personal communication, April 25, 2014).

RBF is not a reportable condition in California or nationally. To estimate RBF incidence in San Diego County, hospitals in San Diego County that discharged any patients during 2000–2012 with International Classification of Diseases, Ninth Revision codes 026.0–026.1 (for streptobacillary fever and spirillary fever) were identified based on data from the California Office of Statewide Health Planning and Development. Medical records were requested, and 16 cases were identified. One additional RBF case was reported to the County of San Diego Health and Human Services Agency during 2013 as an occurrence of unusual disease.

Among the 17 cases, the median patient age was 10 years (range = 4–67 years); 59% of patients were female, and 65% were healthy before infection. Most infections (94%) were pet-associated; one patient had an occupational exposure (rat breeder). Sixteen of 17 patients reported exposure to rats. Of these, 44% reported only having handled a rat, 38% reported being bitten, and 13% reported a

scratch. All patients had blood drawn for cultures; only 29% tested positive for *S. moniliformis*; the remainder were treated presumptively for RBF on the basis of exposure and clinical presentation. All patients survived except the patient described in this report.

RBF is a rare but potentially fatal illness that should be considered in persons with rash, fever, and joint pain and when a history of rodent exposure is reported. Clinicians suspecting *S. moniliformis* infection should promptly alert laboratory staff because microbiologic diagnosis is difficult, requiring specific media and incubation conditions. Clinicians should also consider requesting diagnosis assistance from their state public health laboratories. Because rapid laboratory confirmation might not be possible, empiric treatment for RBF in the setting of appropriate exposure history might be considered.

Pet rat owners should wear gloves and wash their hands thoroughly after handling rats or cleaning rat cages, avoid rat secretions, and promptly seek medical care if they have RBF symptoms (4) after contact with rats.

Acknowledgments

Infectious Diseases Pathology Branch, Division of High-Consequence Pathogens and Pathology, National Center for Emerging and Zoonotic Infectious Diseases, CDC. County of San Diego Medical Examiner's Office.

[Author affiliations]

[1]Epidemic Intelligence Service, CDC;

[2]County of San Diego Health and Human Services Agency, San Diego, California;

[3]Division of Global Migration and Quarantine, National Center for Emerging and Zoonotic Infectious Diseases, CDC;

[4]CDC and Council of State and Territorial Epidemiologists Applied Epidemiology Fellowship;

[5]Rady Children's Hospital, San Diego, California;

[6]Division of Pediatric Infectious Diseases, University of California San Diego, San Diego, California (Corresponding author: Jessica K. Adam, xdc5@cdc.gov, 619-692-5571)

References

(1) CDC. Rat-bite fever (RBF). Atlanta, GA: US Department of Health and Human Services, CDC; 2012. Available at http://www.cdc.gov/rat-bite-fever/index.html.

(2) Elliott SP. Rat bite fever and Streptobacillus moniliformis. Clin Microbiol Rev 2007; 20:13–22.

(3) CDC. Rat-bite fever (RBF): treatment. Atlanta, GA: US Department of Health and Human Services, CDC; 2012. Available at http://www.cdc.gov/rat-bite-fever/treatment.

(4) CDC. Rat-bite fever (RBF): symptoms and signs. Atlanta, GA: US Department of Health and Human Services, CDC; 2012. Available at http://www.cdc.gov/rat-bite-fever/symptoms/index.html.

Vector of the Month

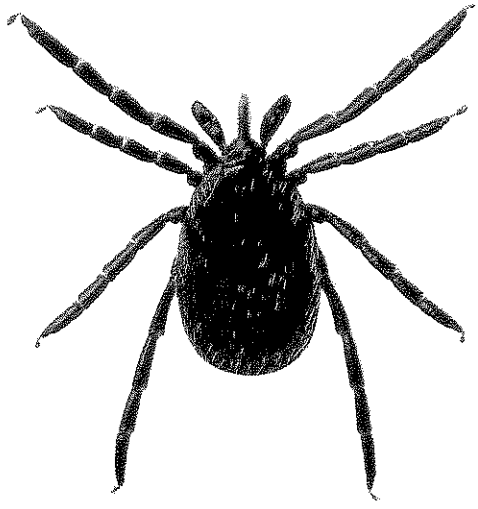
Western Black-Legged Tick
Ixodes pacificus

Ixodes pacificus is a species of hard tick that has been recovered from a variety of hosts along the Pacific Coast from Washington and Oregon through California. Included in the host records are birds (quail), mammals (cats, dogs, deer, chipmunks, pocket mice, deer mice, horses, and man), and lizards (fence and alligator lizards).

In the early 1980s, *I. pacificus* was incriminated as a potential vector of the spirochete that causes Lyme disease. This disease was first recognized in 1975 in Lyme, Connecticut and is characterized by annular skin lesions (erythema chronicum migrans) that may be followed by arthritic, neurologic, or cardiac symptoms several weeks or months later. The disease is caused by a microbe called a spirochete (scientifically referred to as *Borrelia burgdorferi*), which may be seen moving in a serpentine fashion under a microscope.

Relatively few cases of Lyme disease were diagnosed in California in 1983 and 1984; however, a significant increase occurred in 1985 and 1986. One hundred and twenty-five cases were diagnosed in 1986, and 182 cases in 1987. In the period from 1983 through 2001, a small number of cases have occurred in Orange County. Because this disease is not well-known to physicians, it is likely that many undiagnosed victims of Lyme borreliosis may exist in southern California.

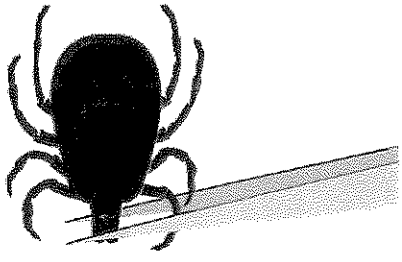
In November of 1983, OCVCD personnel began collecting hard ticks and testing them for spirochetes at the Orange County Department of



Health Services under the supervision of Dr. J. R. Greenwood. A monitoring and testing program for ticks and spirochetes was initiated in 1984, and continued through 2014. In March of 1991, spirochetes were isolated from a male *I. pacificus* collected near San Clemente in February. Nearly 4,000 *I. pacificus* from Orange County were checked for spirochetes during this time and all other specimens were negative for *B. burgdorferi*. State health officials identified the spirochetes as *B. burgdorferi* in May, 1991.

The principal protection against Lyme disease is awareness. Individuals are encouraged to avoid problems by learning more about the vector ticks and their natural habits and habitats.

Tick Removal



- Use tweezers and grasp the tick's mouthparts as close to the skin as possible.
- Gently pull the tick straight out with steady pressure.
- Do not twist or jerk the tick.
- Do not try to remove the tick by burning it or applying salve or lotion.
- Apply an antiseptic to the bite area after removing tick.
- Wash your hands with soap and water.

Vector Management Update

Managing Mosquitoes by Cracking a Few Eggs

By Brian Stallard
January 21, 2015

It's no secret that mosquitoes are the cause of a lot of suffering in the world. Malaria, Dengue fever, chikungunya, and West Nile [virus] are just a few names infamously associated with those little bloodsuckers that we all hate. Now researchers are proposing a new way to control their numbers without eliminating the bugs entirely - by attacking egg production.

It's not exactly like the world doesn't have many means of controlling mosquito populations already. Pesticides have long been a last resort that third-world countries will still employ. Other, more modern and less environmentally harmful approaches have also started seeing use, including experimental DNA manipulation and designer bacterial infection. Many countries are even introducing sterile males into a population to help "dilute" the number of successful reproducers.

However, many of these options pose the threat of eliminating mosquitoes entirely, which could gravely impact certain delicate ecosystems. Even the safest solution - the dilution approach - requires the regular release of thousands of sterile males, meaning that an expensive lab - often called a "mosquito factory" - has to be set up in the hub of an affected region.

Now, researchers are claiming in a study recently published in the journal Proceedings of the National Academy of Sciences (PNAS) that they have identified an essential regulator in female mosquito egg production, opening up the best chance yet at limiting mosquito populations in a safe and inexpensive way.

This was accomplished after researchers from the University of California paid special attention to the mechanics of micro-RNAs (miRNA) in female mosquito ovary and egg development.

For simplicity, RNA is best described as a sort of "DNA middleman" - where DNA makes RNA, which makes proteins. These proteins are essential for processes in any living being's body, and the researchers were able to identify miRNA-8 as

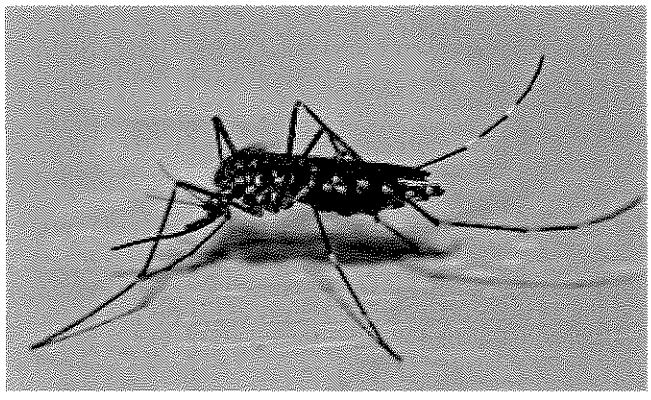


Photo by Pixabay

an essential regulator of mosquito reproductive events. "To our knowledge, this is the first time a mosquito miRNA has been investigated in this specific manner," Alexander Raikhel, who helped lead the study, said in a statement. "In the lab, female transgenic mosquitoes with deficiency in miRNA-8 displayed severely compromised ovary development and reduced egg-laying."

And, as can be expected, reduced egg-lay ultimately leads to smaller populations. However, the researchers are quick to add that this is just the first stage in a long process of developing an ideal "birth control" for mosquitoes.

Vector Of the Month

Cat Fleas

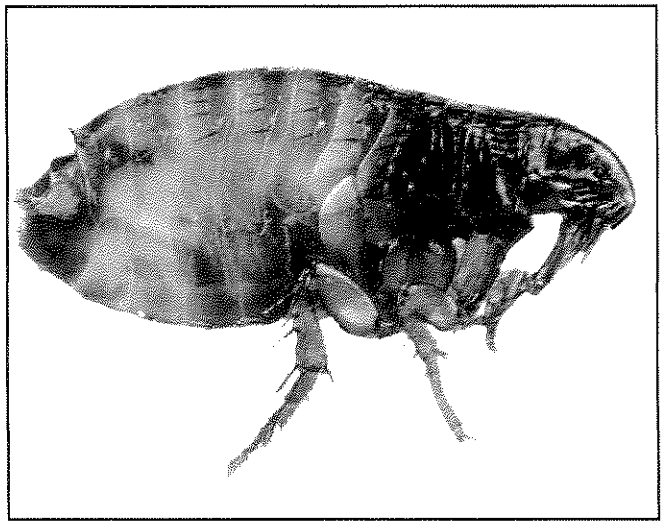
(*Ctenocephalides felis*)

Orange County's Most Abundant Vector of Flea-borne Typhus

The cat flea, *Ctenocephalides felis*, is the most common species of flea on cats, dogs, opossums and other backyard wildlife in southern California. Adult fleas are no larger than 1/8 inch long, so it is difficult to see a number of the characteristics used to describe them. These brown, wingless insects are laterally compressed, undergo complete metamorphosis, and are excellent jumpers. They have piercing-sucking mouthparts through which they obtain blood meals from their hosts.

Unlike most fleas, adult cat fleas remain on the host where feeding, mating, and egg laying occur. Females lay about 20 to 50 eggs per day. Flea eggs readily fall off the pet and land on surfaces such as bedding and carpeting in the animal's environment, where they hatch in about 2 to 5 days. Flea larvae are wormlike and feed on dried blood and excrement adult fleas produce while feeding on the pet. Larval development is restricted to protected places where there is at least 75% relative humidity. The larvae feed and crawl around for 8 to 15 days before building small cocoons in which they pupate and develop into adults. Before starting a control program, look around and in the home to determine areas where larval development occurs. Flea populations are highest in places where dogs or cats regularly sleep and are likely to be present in areas where adult fleas have left dried blood and feces.

Fully formed fleas can remain in their cocoons for up to 12 months. Warm temperatures and walking on or vacuuming carpet stimulate emergence from the cocoon. At normal room temperatures, the entire life cycle can occur in about 18 days. An adult cat flea generally lives about 30 to 40 days on the host. You can find fleas on pets throughout



the year, but numbers tend to increase dramatically during spring and early summer when conditions favor larval development.

Cat fleas are capable of transmitting a bacterial disease in humans, sometimes called cat flea typhus, which is similar to murine (rat) typhus. The symptoms of either form are similar and include headaches, chills, fever, vomiting, and rash. The disease agent of cat flea typhus, *Rickettsia felis*, is commonly found in cat fleas worldwide. In Orange County, this disease is believed to have sickened nearly 140 people, some very severely, since 2006.

Cat fleas also serve as intermediary hosts of dog and cat tapeworms. Cats or dogs can acquire this intestinal parasite while grooming themselves if they ingest adult fleas that contain a cyst of the tapeworm. Children occasionally can acquire these tapeworms too. Some people and pets suffer from flea bite allergic dermatitis, characterized by intense itching, hair loss, reddening of the skin, and secondary infection. Just one bite can initiate

With Excerpts from UC IPM *Pest Note*, Publication 7419, September 2010

an allergic reaction, and itching can persist up to 5 days after the bite.

New, safer, and more effective products aimed at controlling adult fleas on pets have made cat flea management without pesticide sprays, shampoos, and dusts feasible in most situations. Management of fleas on pets must occur in conjunction with regular, thorough cleaning of pet resting areas indoors and out. Once fleas infest a home, control will require a vigilant program that includes vacuuming, eliminating fleas on pets, and cleaning up and possibly treating shaded outdoor locations where pets rest.

Several types of products are available to control fleas on dogs and cats. The newer products are either applied topically to the body of the pet or provided orally. If you administer oral or topical products early in the year before flea populations begin to build, the products can prevent fleas from establishing themselves in your home. Contact your veterinarian for advice in selecting the best flea-control product for your situation.

If your home is heavily infested with fleas, take these steps to get the situation under control.

Inside the Home

1. Locate heavily infested areas, and concentrate efforts on these areas.
2. Wash throw rugs and the pet's bedding.
3. Vacuum upholstered furniture. Remove and vacuum beneath cushions and in cracks and crevices.
4. Vacuum carpets, especially beneath furniture and in areas that pest frequent. Use a hand sprayer to treat all carpets with an insecticide that contains an insect growth regulator.
5. Allow carpets to dry, and then vacuum a second time to remove additional fleas the spray caused to emerge.
6. Continue to vacuum for 10 days to 2 weeks to kill adult fleas that continue to emerge from pupal cocoons.

On the Pet

1. Use a spot-on or a systemic oral treatment, which you can purchase from veterinarians or online.

Outside the Home

1. If you treat your pets with spot-on or oral treatments, you'll rarely need to spray outdoors.

Vector Management Update

California's Drought Could Mean Another Bad Year for West Nile Virus

The Sacramento Bee
By Phillip Reese
Updated: February 24, 2015

Abbey Murphy never felt the mosquito bite that eventually swelled her brain and left her unable to walk for weeks.

"I had uncontrollable vomiting, severe migraines," said Murphy, a sophomore at UC Berkeley. "I couldn't get up to get breakfast."

Murphy eventually recovered from her West Nile virus infection, though it took months. She was one of roughly 800 Californians infected last year during the worst West Nile outbreak in a decade, new state figures show.

Experts say the ongoing drought was largely to blame and predict another bad year in 2015.

Primarily transmitted by mosquitoes feeding on infected birds, West Nile causes few symptoms in the majority of people infected. But in a small percentage of cases, the reactions can be severe, even fatal. The disease usually peaks during summer, when mosquitoes are active and people tend to spend more time outdoors.

Just a few years ago, it looked like California health officials had West Nile in check, with severe cases like Murphy's increasingly rare. Public education campaigns reminded people to drain standing water and apply insect repellant. Government agencies eradicated hundreds of thousands of mosquitoes through pesticide spraying by truck and plane.

Then came 2012 and the start of the state's protracted drought. That year, the number of reported human West Nile cases tripled from 158 to 479. Last year, the state saw 798 cases, the most since 2005, according to new figures from the California Department of Public Health.

Twenty-nine of those cases ended in death, tied for the highest number on record in California.

Drought affects water flows, often leaving pools instead of flowing streams. "A lot of water in nature becomes more stagnant," said Dr. Dean Blumberg, an infectious disease specialist at UC Davis Children's Hospital. And stagnant water draws mosquitoes.

The drought has had other effects as well: Lacking enough water in the wilderness, the birds that carry West Nile moved closer to artificial sources in populated areas, where they were bitten by mosquitoes and the infection was spread to more people. "As birds and mosquitoes sought water, they came into closer contact and amplified the virus," said Dr. Gil Chavez, an epidemiologist at the state health department.

The outbreak hit Southern California the hardest, particularly Orange County, which recorded 266 human cases of the disease in 2014. Orange County also led the state in mosquitoes that tested positive for the disease.

"Our infection rate in mosquitoes was off the chart," said Jared Dever, spokesman for Orange County Vector Control. "Essentially every mosquito we captured in Orange County was testing positive."

The county has a broad network of underground storm drain systems and relies on rainwater to flush out those systems. But the drought has effectively created a network of stagnant underground pools. Uncovering a manhole in Orange County last year, Dever said, unleashed a torrent of mosquitoes.

"We had miles of underground water," he said, adding that the district could not use its own water to flush out the system due to conservation efforts. "That was an enormous problem for us."

Orange County officials also found the birds it tested were displaying low immunity to the West Nile virus, a phenomenon they could not fully explain. Birds do not transmit the disease directly, but if more of them have West Nile, more mosquitoes that feed on them will become carriers of the disease.

Another contributing factor: Orange County's Vector Control District did not use trucks or planes to spray pesticides on city streets, something many other communities in California have done for the last several years.

Spraying remains controversial, though the Environmental Protection Agency has judged that it does not "pose an unreasonable risk to public health."

Dever said the district intended to spray when the outbreak peaked but was hampered by weather.

"Up in the Bay Area, they are a lot more familiar with the (spraying) conversation," he said.

Orange County had the most human West Nile cases, but it did not have the highest rate of infection. That distinction belonged to Glenn County, a farming community about an hour's drive northeast of Sacramento. Twelve Glenn County residents were diagnosed with West Nile virus last year, for a rate of four infections per 10,000 residents, roughly 20 times the statewide average.

Glenn County is one of the leading rice producers in California. Rice often is grown in flooded fields, which can become breeding grounds for mosquitoes.

"We have almost 67,000 acres of rice," said Jack Cavier, who runs the county's mosquito-control district. "We are very ag-intense."

Glenn County stepped up its pesticide spraying last year, Cavier said, but it was hampered by the large number of organic crops in the area. The district tried to avoid spraying those crops.

The Sacramento region saw a small increase in human West Nile cases from 2013 to 2014. But the number of human cases in the area – 27 – was dwarfed by the number of cases in other parts of the state.

Sacramento-Yolo Mosquito & Vector Control District spokeswoman Luz Maria Rodriguez noted that the number of mosquitoes testing positive for the disease in the area was extremely high last year and that West Nile activity overall was "very intense and activity started a lot earlier."

Rodriguez credited the relatively small number of human cases in Sacramento and Yolo counties to "a very strong surveillance program that looks for early signs of West Nile virus. We are always promoting that people should be wearing a good repellent. We also have a very strong larvicide program."

Stanislaus County also does regular outreach through its East Side Mosquito Abatement District. But the county reported 47 West Nile human cases last year for a rate of infection about four times the statewide average.

Murphy was one of those cases.

After finishing her freshman year at Berkeley, she went home to Modesto for the summer. In July, she began to feel sick. She developed a rash on her upper body and suffered migraines. Her family took her to a hospital, where she remained for a week.

Doctors diagnosed her with meningitis, which can be caused by the West Nile virus. "It was terrifying," she said. "There were a few nights when my heart was having problems. I didn't think I was going to make it."

After a week, she was sent home, a catheter connected to her arm so medicine could be injected directly into her bloodstream. She took a semester off from school to deal with the illness.

"I was in a wheelchair until the middle of September," she said.

Later, her doctors called and told her she had tested positive for the West Nile virus. "I don't think there was anything I could I have done to prevent it," she said.

Murphy is feeling better today, though she is not completely recovered, and she is back at college.

Several mosquito-control officials said they worry that 2015 will prove to be another bad year for West Nile since the drought shows no signs of abating.

Already, Dever said, "we are getting (mosquito) trap counts that are basically what we usually see in July."