

## The war on bugs

Scientists and anti-spraying activists clash over which is deadlier: Zika, West Nile—or the pesticides used to control outbreaks

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This article was published on [11.03.16](#).

For as long as Jessica Denning can remember, the airplanes have come to drop their poison.

The 72-year-old Carmichael resident usually locks up and takes off on a two-day road trip when authorities announce they are going to spray the area with insecticide. This summer, though, Denning stayed, as did most residents. She says she could smell the chemical for days afterward.

“We closed the windows and doors like they tell you to, but it still got in,” said Denning, the West Coast director of Moms Across America, an activist group that protests public exposure to toxic chemicals. “It was this awful, putrid aroma throughout the house. You couldn’t get away from it.”

That was in late June, right after the Sacramento-Yolo Mosquito and Vector Control District sprayed diluted yet extremely potent mists of an insecticide called naled over Carmichael. A similar dousing would take place a month later over 17,000 acres surrounding Woodland.

In Butte County, too, and elsewhere in California, the aerial application of insecticide has become one of several routine tactics used by health officials as they wage chemical warfare on disease-carrying mosquitoes. West Nile virus has been a serious health concern in California since 2003. In Butte County, West Nile was first detected in 2004, and since then nine people have died from it.

Today, the newer scare is the Zika virus, transmitted by *Aedes aegypti*, a mosquito species that has recently appeared in scattered points around California, and caused widespread concern that it may be linked to microcephaly, a rare neurological condition in which an infant’s head is smaller than normal.



Butte County Mosquito and Vector Control District Manager Matt Ball with the indoor tanks used for breeding larva-eating mosquitofish.

FILE PHOTO BY EVAN TUCHINSKY

Matt Ball, district manager at the Butte County Mosquito and Vector Control District, the department at the front lines of the local battle against mosquitoes, says Zika may actually be the least of the threats that could come with *Aedes aegypti*.

“Even more serious are dengue fever and yellow fever,” Ball said. “Those two, combined with malaria, are global killers.”

Chemical means are the primary tactics for keeping these diseases at bay. But many people believe the use of potent insecticides in public spaces could be causing more harm than good. These chemical agents include probable carcinogens, neurotoxins and endocrine disruptors. Hundreds of independent studies show that insecticide use is causing health problems—including cancer, birth defects and developmental disorders—in humans.

From an ecological perspective, insecticide applications are almost certainly causing a host of issues. They are killing bees and other pollinators while also becoming less effective over time as the target insects build genetic resistance—a potential time bomb that will affect future generations.

However, there is also science that defends insecticides, and this is the research that seems to influence many university scientists and health officials. Indeed, those leading the battle against biting bugs in California say there’s little to fear from even the most deadly insecticides, as long as they are administered as U.S. Environmental Protection Agency regulators recommend.

“When the EPA registers things for use for mosquito control, we believe the risks are minimal to none,” Ball said.

But many people and groups, like the Washington, D.C.-based industry watchdog Beyond Pesticides, contend the EPA is not to be trusted.

Denning cites history as evidence that government regulators may be misleading the public when telling Americans that poisons are safe for use.

“They said the same thing for years about Agent Orange. They said the same thing about PCBs,” she said, referring to the coolant widely used in the 1950s and 1960s until scientists learned that polychlorinated biphenyls cause cancer and other health problems, which led to a national ban in 1979. “We have such moneyed interests in the chemical industry, and they’ve got control over the regulators.”

Other skeptics think mosquitoes and the diseases they carry are being hyped up for the financial benefit of the industry.

“The [Centers for Disease Control] is making the Zika virus out to be a major health crisis, which it isn’t,” said Julie Ostoich, a Sacramento resident outraged by the ongoing use of pesticides. “The whole industry is based on fear. They get us all worked up so that people will say, ‘OK, go ahead and spray because I’m afraid.’”

### **Zika hype, West Nile reality**

Every night in Oakdale, the mosquitoes come out in droves. To guard herself against their bites, Stacy Beason lathers herself with natural plant oils, like lemongrass, eucalyptus and citronella, which she says work as well as commercial bug sprays.

“Mosquitoes hate the smell of these oils,” she said.

But that’s almost irrelevant now for Beason. In late July, she tested positive for West Nile virus. She is among at least five other people in her Stanislaus County town of 25,000 who now carry

the virus. Beason did not lose her life to the disease, but she lives with achy joints, chills, headaches, flu-like symptoms and, for now, little hope of a cure.

Now, as the *Aedes aegypti* (pronounced “ee-deez Egypt-ee”) mosquito spreads across the southern United States and into Southern California, grabbing headlines as it goes, Beason wants the public’s foremost attention to remain on West Nile. The virus is thriving in California and, especially, across the agricultural sprawl of the Central Valley. It lives in the blood of animals—mainly birds—and is transmitted to people via *Culex tarsalis* and *Culex pipiens*, the mosquito species that most commonly carry the virus in California.

“I know that a few Californians have had Zika, but being more afraid of Zika than West Nile doesn’t make sense,” said the 53-year-old Beason, who founded the Facebook support group West Nile Disease California. “After Zika came to the table, people put West Nile on the back burner. People need to be talking about it, and they need to protect themselves from mosquitoes in general. I know that Zika causes problems for pregnant mothers, but West Nile will kill you.”

West Nile virus was first detected in a human in 1937 in Uganda. In the decades since, it became recognized as a deadly threat to humans. In 1999, the virus appeared in New York City—the beginning of an ongoing event that has killed at least 1,800 Americans, including more than 230 in California. In Butte County alone, 229 people have tested positive for West Nile since 2004. The virus, asymptomatic in about four out of five people, tends to proliferate along major bird migration routes, like the Central Valley.

The Zika virus was also first detected in humans in Uganda. That was in 1952. Small outbreaks occurred almost worldwide for decades before the first large outbreaks took place this century. The latest scare has been centered in Brazil, where the virus, which is rarely fatal and often without symptoms, has infected thousands.

While Zika and its insect carrier have surged onto the radar of Californians, West Nile is still getting a lot of attention.

All summer, local agencies were dousing the Sacramento Valley with highly diluted poison solutions that destroy mosquitoes on contact, but which are supposedly harmless to people. From June 20 through Sept. 29, the Butte County Mosquito and Vector Control District dispensed clouds of insecticides more than 120 times, according to its online “fogging advisories” inventory. From June 24 to Sept. 10, the Sacramento-Yolo district dropped aerial applications of insecticides 115 times.



Sacramento resident Julie Ostoich says she believes the Centers for Disease Control is “making the Zika virus out to be a major health crisis, which it isn’t.”

PHOTO BY EVAN DURAN

registered chemical tactics against insects. The quantities released into the air are simply too miniscule, he says.

“The insecticides we use are approved for use,” he said. “The toxicity effects of any insecticide we use according to label are a very low threat to humans.”

### **Cancer from the sky?**

Originally of African origins, *Aedes aegypti* has spread across much of the planet. Where its presence has been confirmed across the southern United States, near hysteria over Zika has followed. Currently, Florida and the southeast remain in a Zika-induced panic while officials spray naled from low-flying aircraft.

In California, the odds of a major Zika outbreak are probably slim to none, even if the mosquito that carries the virus establishes itself here, according to Chris Barker, a UC Davis

Ball says the drought has actually increased the presence of the virus, probably because the decreased acreage of standing water has meant more birds and mosquitoes sharing the same space. The rise in temperatures also has been a boon to mosquitoes in areas of available habitat, like rice fields. Ball says transmission of West Nile virus has dropped in 2016, but in prior drier years it was rampant. In fact, 2015 was California’s deadliest year on record for West Nile, with 53 people killed by the virus.

Ball’s department regularly treats standing pools of water, like swimming pools and small ponds, with larvicides. These chemicals destroy mosquitoes at the source—by most accounts the most effective way to control the insects and far more so than bombing adult mosquitoes from the air. However, once they leave the water and take flight, there is little choice but to use adulticide sprays.

To do the job, Ball’s department uses a variety of chemicals. Chief among them is a product called Trumpet EC, whose main active ingredient is the organophosphate naled. This neurotoxin kills mosquitoes and other insects midflight before biodegrading into the environment. In the disintegration process, it produces dichlorvos, believed to cause cancer. Trumpet EC also contains naphthalene, another possible carcinogen.

UC Davis entomologist Anton Cornel, who works at the university’s Mosquito Control Research Laboratory in Parlier, Fresno County, says Californians have nothing to fear from

epidemiologist. However, Barker supports efforts to eradicate the insect simply because of its extremely irritating bites, usually delivered to the back of the legs.

“Even without the diseases, they’re pretty bad pests,” he said. “They bite humans very aggressively.”

While *Aedes aegypti* also transmits dengue fever and a virus called chikungunya, which recently caused a health scare in India, entomologist Jim Northup doesn’t think the concern merits a chemical offensive.

“There certainly is a lot of hype around how serious these diseases really are,” said Northup, a resident of Davis.

Northup says *Aedes aegypti* will never establish itself permanently in California because the semi-desert climate is simply not suitable for the tropical insect.

Northup studied entomology at UC Davis before conducting field trials of nonchemical mosquito control methods in the 1980s. His career was interrupted by Lou Gehrig’s disease, which has partially crippled him. He remains an active follower of insect and pesticide research and has done some writing of his own, including contributions to the website [StopWestNileSprayingNow.org](http://StopWestNileSprayingNow.org).

He warns that the effects of spraying insecticides in the air are far more damaging than the chances of being killed by a mosquito-borne virus in California.

“They say the risk of getting cancer from exposure to these insecticides is so slight it doesn’t matter,” Northup said. “Well, I can tell you that the chances of anyone dying from a Zika infection in California are zero. Therefore, even the slight likelihood of killing children with cancer from organophosphate exposure is far more of a risk.”

Unlike Zika, West Nile virus actually is killing people in considerable numbers. Yet the disease’s average death rate in California of about 20 people per year pales in comparison to the 400 Californians who are diagnosed with cancer every single day. It isn’t clear how many cancer cases can be linked to pesticides, and it isn’t known how many deaths from West Nile and other viruses are being prevented by pesticides.

Still, anti-spray activists believe there is a clear connection between the sky-high cancer rate and the millions of pounds of pesticides used in America each year.

“Exposure to these things is cumulative,” said Ostoich, the Sacramento activist. “Cancer rates are soaring. One in two or three people in this country will get cancer, and they’re spraying us with chemicals that cause cancer.”

It’s probably true: Beyond Pesticides has cataloged more than 700 studies that implicate pesticide use in cancer and other health issues, like birth defects, sexual dysfunction, children’s learning disorders and Parkinson’s disease.

UC Davis researcher Janie Shelton led a study that found children with autism were 60 percent more likely to have been exposed during their fetal stages to pesticides applied near their mothers’ homes. Her research was published in 2014 in the journal *Environmental Health Perspectives*.

At Harvard, researcher Philippe Grandjean argued in a report in 2006 in the journal *The Lancet* that pesticides are causing a “silent pandemic of developmental neurotoxicity.” Grandjean told CN&R in an email that, in most countries, health agencies normally don’t test pesticides for effects on brain development before approving them for use.

On the other hand, a few widely cited studies have made the case that spraying mosquitoes with poison has greater social benefits than costs.

A 2014 study from UC Davis scientists found no significant correlation between insecticide applications and disease occurrence or emergency room visits in local communities. For two years beginning in 2005, scientists with the Centers for Disease Control and Prevention studied the spraying activity of the Sacramento-Yolo Mosquito and Vector Control District. Their conclusion, published in 2008: Areas that were aerially sprayed with insecticides saw West Nile human transmission rates six times lower than untreated areas.

**To Beyond Pesticides Executive Director Jay** Feldman, the science does not go equally in both directions.

“The vast majority of independent studies are showing adverse effects associated with pesticide exposure,” he said. The studies that come to the opposite conclusion, he said, “are often studies that are underwritten by the chemical industry or carried out in an academic environment that are supported by industry grants.

“I would definitely not say there is equal data on both sides,” Feldman added.

Neither would Evaggelos Vallianatos.

He worked for decades in the EPA’s Office of Pesticide Programs, in Arlington, Va. Now, the Los Angeles resident and author of the memoir-exposé *Poison Spring*, warns that the EPA is not to be blindly trusted and that many of the chemicals it approves for use are dangerous.

In an interview with CN&R, Vallianatos said the EPA’s pesticide review system is based not on its own lab testing, which was mostly phased out decades ago, but rather on safety data provided by the chemical manufacturers themselves.

“It’s a huge conflict of interest,” Vallianatos said.

He says the EPA has employees who review the data provided by chemical companies hoping to get a new product approved. However, direct inspection of laboratories is rare. There are even cases, he says, in which industry labs have “made up the safety data out of thin air” in the process of getting dangerous products approved for use.

For example, Industrial Bio-Test Laboratories falsified test data for more than 20 years before being exposed by a whistleblower in 1976, according to both Vallianatos and a 1983 article in the New York Times. The lab closed shortly thereafter. During its long and fraudulent run, the IBT lab employed a Monsanto official who helped fake data on a toxic antibacterial cleaning agent, *Poison Spring* claims. IBT handed over the results of its “testing” to the EPA, which Vallianatos says knew about the fraud but allowed it to go on. The saga ended with criminal convictions for some of those involved, the Times reported.

Vallianatos claims the agency has not changed.



Gary Goodman, manager of Sacramento-Yolo Mosquito and Vector Control District, says the Environmental Protection Agency properly vets the safety of the pesticides it uses.

PHOTO COURTESY OF GARY GOODMAN

He told CN&R that the amount of any given chemical that a person can safely be exposed to is almost always totally arbitrary.

“It’s based on no science,” he said. “These quantities, like three parts per million or five parts per million or whatever, are decided by the industry, maybe because at that level a person won’t die of immediate poisoning.” Vallianatos said that such tolerance levels “only provide legal protection for farmers and the people who make the chemicals in case a person gets sick.”

That is, the EPA, according to Vallianatos, is protecting big industries, not the public.

In an email forwarded by Cathy Milbourn of the EPA’s Office of Media Relations, agency officials told this reporter that its pesticide review and approval processes are designed to guarantee the safety of the public.

The email said that “EPA employees are not present when manufacturers test their products, but registered pesticides have met rigorous testing standards to ensure they are safe for the U.S. population when used according to labeled directions.”

Pesticide proponents commonly say this—that following a pesticide’s label instructions means no one will get hurt. UC Davis’ scientists told CN&R this. Officials with both the Butte County and the Sacramento-Yolo vector control districts said this. A scientist with the lead mosquito control agency in Los Angeles said the exact same thing.

Anti-sprayers remain unconvinced.

“That is the refrain that we hear,” Feldman said. “But this idea that compliance with the label protects the public is a fallacy based on inaccurate assumptions.”

For example, he says, it is assumed that pesticides will only hit their target and will not drift off-site with wind. Another common assumption used by regulators, Feldman says, is that chemicals will bind tightly to organic matter, which would prevent toxins from entering water sources.

They don’t, though. Not all soil types will cling to these toxins, Feldman says. “And lo and behold, the chemicals leach into groundwater and run off into surface waters,” he said.

Feldman says the safety testing procedures used by industry laboratories are dangerously inefficient. They don’t take into account how chemicals may affect certain outlying demographics—like people with pre-existing health issues, very young people and the elderly.

Another problem in the testing protocol involves a given chemical’s so-called “breakdown products.” That is, many chemicals will deteriorate after they are released into the environment. As they do so, they turn into other compounds that may be more hazardous than the original chemical. However, Feldman says these breakdown products are often ignored by the EPA’s testing protocol.

In other words, a product that is noncarcinogenic may break down into another that does cause cancer—exactly the way that naled breaks down into dichlorvos.

Yet another dangerous shortcoming of the regulatory process allows the EPA to sometimes test only a product’s active ingredients but not test the final formulation—that is, the product as it will be purchased by consumers.

Feldman says these all add up to serious regulatory loopholes that, in many cases, have essentially allowed toxic chemicals to enter the market without truly being tested for safety—and that, he says, is how chemical manufacturers want it.

“The industry has lobbied heavily to limit the extent to which the chemical review process imposes testing requirements,” he said. “That’s the bottom line.”

### **Pesticide arms race, meet bubonic plague**

In Oroville, the Butte County vector district maintains a cluster of small ponds. They may look like perfect mosquito breeding sites—and they probably are—except that they are filled with fish that eat mosquitoes.

Colloquially referred to as mosquitofish, *Gambusia affinis* occurs naturally in the eastern United States and along the Gulf Coast region, and this tiny fish likes nothing more than to eat mosquito larvae.

Ball’s department is producing them by the millions as a form of mosquito control that has possibly no ecological costs at all. The district’s staff gives the fish to anyone who requests them and each year plants millions in horse troughs, swimming pools and other residential mosquito breeding sites.

“They can be 100 percent effective,” Ball said.

The problem is, the fish eat the mosquito larvae, not the adults. Once the insects leave the water, they are not only safe from mosquitofish but are a nuisance and, potentially, a threat to people.

“Once they become adults, we have to use insecticides, and we have two choices—the pyrethrins and pyrethroids, and organophosphates,” said Gary Goodman, manager of Sacramento-Yolo Mosquito and Vector Control District, which also produces and dispenses mosquitofish.

Pyrethrins are a natural insecticide produced by chrysanthemum flowers. Pyrethroids are a synthetic version of pyrethrins. However, due to high rates of use around the world, mosquitoes are developing resistance to pyrethroids. Cornel, at the UC Davis mosquito lab, says great caution must now be taken when using pyrethroids. Ideally, he said, mosquito control agencies would “use a more potent insecticide that is more toxic.”

But Northup warns that the escalating chemical war on biting bugs is leading us in the wrong direction. He says mosquitoes will eventually develop resistance to virtually any poison that is too liberally used. Other insects, too, will either be killed off or will develop into super-bugs. For instance, he says fleas could develop significant insecticide resistance, which would put the human population at risk of a bubonic plague outbreak.

“And that’s a disease you really have to worry about, not Zika,” he said.