

Scientists find widespread ear tumors—and promising solution—for endangered Catalina Island foxes

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Winston Vickers, a UC Davis wildlife veterinarian, swabs the ears of a Santa Catalina Island fox. A team of scientists led by UC Davis initiated ear mite treatments for the foxes, which have dramatically reduced ear mites and signs of ear canal tumors in the foxes. Credit: Megan Moriarty/UC Davis

Until recently, endangered foxes on California's Catalina Island were suffering from one of the highest prevalences of tumors ever documented in a wildlife population, UC Davis scientists have found. But treatment of ear mites appears to be helping the wild animals recover.

Roughly half of adult [foxes](#) examined between 2001 and 2008 had tumors in their ears, with about two-thirds of those malignant, according to a UC Davis study published this month in the journal *PLOS ONE*.

More than 98 percent of the foxes were also infected with ear mites. These mites appear to be a predisposing factor for ear tumors in the Santa Catalina Island fox.

Luckily for the foxes, the story doesn't stop there.

"We established a high prevalence of both tumors and ear mites, and hypothesized that there was something we could potentially do about it, which now appears to be significantly helping this population," said Winston Vickers, lead author of the prevalence study and an associate veterinarian with the UC Davis Wildlife Health Center at the UC Davis School of Veterinary Medicine.

Working closely with researchers from the Institute for Wildlife Studies and Catalina Island Conservancy, the scientists conducted one of the few studies to estimate disease prevalence in an entire free-living wildlife

population.

A RARE SUCCESS STORY

A complementary study, also led by UC Davis and published in *PLOS ONE* today, found that treatments with acaracide, a chemical agent used to kill ear mites in dogs and cats, reduced the prevalence of ear mite infection dramatically, from 98 percent to 10 percent among treated foxes at the end of the six-month trial. Ear canal inflammation and other signs of developing ear tumors also dropped.

"It's rare to have a success story," said the ear mite study's lead author, Megan Moriarty, a student with the UC Davis School of Veterinary Medicine when the study began and currently a staff research associate at the UC Davis Wildlife Health Center. "It was interesting to see such striking results over a relatively short time period."

Santa Catalina Island foxes are intensively managed by the Catalina Island Conservancy. In 2009, when the mite treatment study began, the Conservancy added acaracide to the variety of preventative treatments they administer to the foxes each year.

The Conservancy confirms that, in the years since, the overall prevalence of ear mites has dramatically declined in the areas they normally catch and treat foxes, as have the rates of tissue masses in the ear canals, suggesting reduced tumor presence.



A male fox is in Banning Meadow on Santa Catalina Island. A team of scientists led by UC Davis found alarming rates of ear mites and ear canal tumors in the endangered foxes. Ear mite treatments they initiated have since dramatically reduced the problem, their studies show. Credit: Julie Lynn King/Catalina Island Conservancy

"The annual prophylactic acaracide treatment has greatly improved the overall condition of the foxes' ear canals," said Julie King, the Conservancy's director of Conservation and Wildlife Management and co-author of both studies. "Within just a few months post treatment, the presence of wax, infection, inflammation, and pigmentation virtually disappear. We have also noted an apparent reduction in the number of

tumors observed, despite the fact that the absence of wax and other obstructions has made them easier to detect."

Conservancy biologists have also documented a cascade effect on the foxes' offspring, since most young foxes get the ear mites from their parents.

"Prior to treatment in 2009, approximately 90 percent of all pups handled had ear mites, whereas by 2015, mites were detected in only 15 percent of new pups." King said.

GENETICS MAY PLAY A ROLE

The studies pose new questions. For instance, the mite treatment certainly reduces the prevalence and severity of mite infection, as well as risk factors for tumor development, but what effect will it have on overall [tumor](#) and cancer rates for these foxes in the long term?

Also, ear mites infect other Channel Island foxes, but those foxes don't develop ear canal tumors. So why are Santa Catalina Island foxes predisposed to these tumors and not other Channel Island foxes? Vickers and colleagues are preparing to research possible genetic reasons for this.

"Catalina foxes have an over-exuberant tissue reaction to the same stimuli—the mites—and that appears to lead to the tumors," Vickers said. "That's why we gravitate toward genetics in addition to other factors."

SANTA CATALINA FOX HISTORY

The Santa Catalina Island fox is one of six subspecies native to the Channel Islands off the coast of Southern California. Its population

declined dramatically in 1999 when a distemper epidemic decimated up to 90 percent of the population, prompting the federal endangered species listing for the roughly 150 foxes remaining. The population has since rebounded to an estimated 1,717 foxes.

More information: T. Winston Vickers et al. Pathology and Epidemiology of Ceruminous Gland Tumors among Endangered Santa Catalina Island Foxes (*Urocyon littoralis catalinae*) in the Channel Islands, USA, *PLOS ONE* (2015). [DOI: 10.1371/journal.pone.0143211](https://doi.org/10.1371/journal.pone.0143211)

Moriarty ME, Vickers TW, Clifford DL, Garcelon DK, Gaffney PM, Lee KW, et al. (2015) Ear Mite Removal in the Santa Catalina Island Fox (*Urocyon littoralis catalinae*): Controlling Risk Factors for Cancer Development. *PLoS ONE* 10(12): e0144271. [DOI: 10.1371/journal.pone.0144271](https://doi.org/10.1371/journal.pone.0144271)

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