

Animal Disease Surveillance Report 2017

Los Angeles County | Veterinary Public Health



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Table of Contents

Message from the Director	2
Background	3
1. About Veterinary Public Health	3
2. Abbreviations, Definitions and Technical Notes	4
3. Surveillance Methods	7
2017 Data Highlights for Los Angeles County	8
Diseases in Detail	10
1. Rabies	10
2. Heartworm	16
3. Leptospirosis	23
4. Parvovirus in Dogs	29
5. Valley Fever (Coccidioidomycosis)	36
6. West Nile Virus in Dead Birds	41
7. Methicillin-Resistant Staphylococcal Infections and Co-infections	47
8. Imported Pets and Public Health	53
9. Canine Influenza H3N2	58
10. Other Diseases, Studies, and Investigations	62
Helpful Resources	69
References	70
Appendix – Priority List of Reportable Animal Diseases	74

Message from the Director

I am pleased to present the Los Angeles County Department of Public Health, Veterinary Public Health (VPH) Program's 2017 Animal Disease Surveillance Report. This document adds to the data published in three previous Animal Disease Surveillance Reports. It provides the reader with an analysis of the most commonly reported diseases affecting local pets and wildlife in Los Angeles (LA) County, as well as summaries regarding a few unique and unusual animal diseases.

Our department recognizes that human, animal and environmental health are intricately linked, a concept called One Health.¹ There are some diseases that spread from animals to people (zoonotic diseases), and a few that spread in the opposite direction (reverse zoonotic diseases). Three of every five new infectious diseases affecting humans originated in animals.² With approximately 40% of people in the County having at least one pet,³ and wildlife often living in close proximity to homes, human-animal interactions are common. Therefore, tracking and controlling infections in pets and wildlife may help reduce the risk of certain diseases in humans. It also provides our agency with a baseline understanding of local natural disease cycles in animals, information which is critical when assessing potentially new or emerging diseases, or bioterrorist attacks affecting animals.

LA County has one of the most comprehensive animal disease surveillance programs in the nation. The basis for the program is our county's unique animal disease reporting ordinances; however, effective surveillance would not be possible without the support of our many partners. These include local veterinarians, animal control agencies, wildlife experts, vector control specialists, animal diagnostic laboratories, the Los Angeles Quarantine Station of the Centers for Disease Control and Prevention (CDC) at the Los Angeles International Airport, and many others.

This document provides further evidence of the importance of integrating human and animal disease surveillance and the promotion of public health from a One Health perspective in LA County, uniting the fields of human, animal and environmental health.

Sincerely,



Karen Ehnert, DVM, MPVM, DACVPM
Director
Veterinary Public Health Program
Los Angeles County Department of Public Health

Background

1. About Veterinary Public Health

Mission

To take advantage of the relationships between human and animal health in order to promote a healthy community environment for residents of LA County.

Vision

The residents of LA County are protected from zoonoses and animals are free of reportable diseases.

Animal disease surveillance and outbreak investigations. The Veterinary Public Health (VPH) Program performs animal disease surveillance for Los Angeles (LA) County. VPH is an integral part of the Los Angeles County Department of Public Health (DPH), serving all of LA County, except for cities that operate under their own health departments: Long Beach, Pasadena and Vernon. The program is staffed by veterinarians, animal sanitation inspectors, a registered veterinary technician, administrative staff, a health educator, and an epidemiology analyst.

LA County has unique animal disease reporting requirements. After a devastating foot-and-mouth disease outbreak in local livestock in the 1920s, a wide-range of animal disease reporting ordinances were passed. These ordinances stated that all infectious diseases in animals were reportable.⁴ Such laws enabled better detection, control, and prevention of diseases in animals. As the county urbanized and the amount of livestock declined, disease surveillance in animals also declined. After the anthrax attacks on people in the United States in 2001, concerns grew about bioterrorism threats, including those from infectious diseases that could infect both people and animals.⁵ VPH re-instituted the legal requirement that local veterinarians report infectious diseases in animals, including pets (companion animals). To further improve disease tracking, in 2007 VPH created a Reportable Disease Priority List, which was last updated in 2019 (Appendix). Readers can review both the human and animal disease reporting requirements for LA County at publichealth.lacounty.gov/cdcp/proreporting.htm. Additionally, the California Department of Public Health requires reporting of six diseases in all animals: anthrax, brucellosis (except *B. canis*), plague, rabies, tularemia, and viral hemorrhagic fevers (e.g., Crimean-Congo, Ebola, Lassa and Marburg viruses).⁶

Veterinary practices and animal control agencies are the eyes and ears of the community when it comes to detecting animal diseases. Reporting by veterinarians has allowed VPH to uncover trends and discover new diseases in a way that is unique to LA County. These data inform veterinarians about diseases that are circulating in the community. It may also guide clinical decisions on testing, treatment and prevention of disease in animals. In addition, these data can inform physicians about local zoonotic and vector-borne diseases to which their patients may be exposed, including emerging infectious diseases.

Pets imported from abroad. Imported animals may carry diseases that can subsequently infect people and other animals in the United States.⁷ VPH assists federal authorities at the Los Angeles International Airport (LAX) to ensure that dogs entering the county are healthy and are accompanied by accurate paperwork. During visual inspections, it is not unusual for VPH staff to identify instances of fraudulent documentation (e.g. describing the animals as older than their actual age), presumably to avoid federal quarantine (see

page 53). VPH also hosts quarterly meetings to bring together multiple agencies to discuss animal importation concerns, including the variety of species being imported, the diseases that may be imported, and humane issues that arise for the animals themselves.

2. Abbreviations, Definitions and Technical Notes

Abbreviations

CDC – Centers for Disease Control and Prevention

CDPH – California Department of Public Health

DFA – Direct Fluorescent Antibody

LACDPH – Los Angeles County Department of Public Health

ELISA – Enzyme-linked immunosorbent assay

LA County – Los Angeles County

LAX – Los Angeles International Airport

MRSA – Methicillin-resistant *Staphylococcus aureus*

PEP – Post-exposure prophylaxis

PCR – Polymerase chain reaction

USDA – United States Department of Agriculture

VPH – Los Angeles County Department of Public Health, Veterinary Public Health Program

WNV – West Nile virus

Data Sources

Most data are obtained from disease reports from veterinary practices and animal shelters in the jurisdiction of LACDPH. Diseases in animals in Long Beach, Pasadena and Vernon are occasionally reported by veterinarians LACDPH’s jurisdiction, and these cases are included. Data on rabid bats and canine parvovirus is received directly from animal control agencies in Long Beach and Pasadena and is included in this report. Additional data is received from two veterinary diagnostic laboratories. The California Department of Public Health provides data on West Nile virus (WNV) in dead birds for the entire County of Los Angeles. Finally, some data are obtained from disease investigations and surveys.

Case Definitions

A case definition is a set of criteria used to evaluate reported cases of a disease and determine how they should be counted. Each disease has its own case definition. Cases are categorized as “confirmed,” “probable” or “suspected” based on the level of laboratory, clinical, and epidemiologic evidence that the

animal has the disease. Laboratory test verification is required for a case to be considered confirmed. VPH is currently the only public health program in the United States consistently tracking numerous infectious diseases in companion animals. Therefore, this program has established case definitions for multiple animal diseases described in this report.⁸ Exceptions are: rabies, West Nile virus (WNV), and psittacosis. These diseases are also tracked by state and Federal programs, and case definitions for these diseases in animals already existed.⁹⁻¹¹ Case definitions for diseases tracked by VPH are available at: publichealth.lacounty.gov/vet/surveillance.htm

Types of Animal Disease Data



Directly-transmitted zoonotic disease. Zoonotic diseases (or zoonoses) can infect both humans and animals and can be transmitted between humans and animals. According to the Centers for Disease Control and Prevention (CDC), about 60% of infectious diseases infecting humans emerged from animals.¹² Examples from this report include rabies and leptospirosis.



Vector-borne. Vector-borne diseases are infections transmitted to people and animals by arthropods such as fleas, ticks or mosquitoes. Examples from this report include heartworm disease and WNV.



Environmental. Environmental diseases are those transmitted to people and animals from a common source in the environment. An example from this report is the fungal disease valley fever (coccidioidomycosis) which is transmitted to people and to animals from soils in some areas.



Sentinel. Sick animals can serve as sentinels, or warnings that a disease may be present nearby. Dead birds diagnosed with WNV can help identify areas in the community where the risk of exposure to the disease is higher.



Reverse zoonosis. Reverse zoonotic diseases are those primarily transmitted from people to animals. An example from this report is methicillin-resistant *Staphylococcus aureus* (MRSA).



Animal disease only. Although animals and humans may suffer from the same diseases, many infections of pets are not transferred to people. An example from this report is canine parvovirus.

Counts versus Rates

Most animal disease data in this report are reported as raw case counts instead of rates. Because there is no census for animals, the total number of animals in LA County is unknown. Therefore, disease rates and percent cannot be accurately calculated.

Under-Reporting and Reporting Delays

Under-reporting is a problem with surveillance of both human and animal diseases. Therefore, reported data typically reflect the minimum number of cases. Factors contributing to under-reporting include the following: misdiagnosis; animals with mild illness not seen or tested by a veterinarian; owners declining to pay for diagnostic tests; veterinarians neglecting to report diseases; or cases of disease reported months or years after they initially occurred. These factors may further complicate analysis.

Disease Dates

Animal diseases are tracked by the date the animal was first presented to a veterinarian in LA County for evaluation for the condition. In contrast, human disease is typically tracked by the date of onset of illness. The date of disease onset is often unclear in animals, since clinical signs may remain undetected until they are overt or at an advanced stage.

Incidence versus Prevalence

Animal disease data in this report consist of new cases reported within the year (incidence), as opposed to the total number of cases present at a given time (prevalence). Note: the animal disease data is not reported in incidence *rates*, since the total population of animals is not available.

Geographic Trends

Some cases of disease reported in LA County may have been acquired outside of the County. For several diseases, such as heartworm disease in dogs and cats, the animal's history is evaluated to determine whether the disease was locally acquired.

For the purpose of geographic information in this report, the southern California area is considered to include the following counties (in alphabetical order): Imperial, Kern, Los Angeles, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, and Ventura.

VPH is the only program in the country consistently tracking companion animal diseases; therefore, comparing local animal disease data trends with other jurisdictions (state or national) is difficult or not possible.

3. Surveillance Methods

A surveillance system is a way of monitoring disease conditions and events which affect a community's health. Disease data is reported, analyzed and then shared with the public so that protective actions can be taken.¹³

The majority of data in this report are derived from *passive surveillance*, which is dependent upon veterinarians (and as of 2014 – veterinary laboratories) reporting specific diseases. Animal health professionals submit case reports of animal diseases, which VPH then analyzes and summarizes so that the data may be utilized by the public. Because passive surveillance systems require community participation, many cases of animal disease are likely to be unreported. Therefore, the data in this report describe the minimum amount of disease present locally. VPH occasionally performs *active surveillance* by conducting surveys, some of which are published elsewhere.¹⁴

At the beginning of 2014, VPH began Electronic Laboratory Reporting (ELR) for three conditions in animals: heartworm infection, Valley fever (coccidioidomycosis), and leptospirosis. Veterinary diagnostic laboratories performing certain tests for these diseases on animals from LA County began reporting positive results to VPH electronically. VPH followed up on each ELR report by contacting the veterinarian caring for the animal to request a full case report. The use of ELR significantly increased the amount of available data for these three conditions. VPH plans to expand the number of animal diseases tracked by ELR in the future. Numerous human diseases in LA County are tracked the same way. For a complete list of human diseases tracked by ELR, visit: publichealth.lacounty.gov/cdcp/proreporting.htm.


Reporting and participation by local veterinarians in disease surveillance has allowed for the uncovering of trends and the discovery of new pathogens in a way that is nearly impossible in areas where animal disease reporting laws do not exist. This disease tracking program has also been of direct benefit to local veterinary practices. Disease reporting allows veterinarians to inform their peers about diseases they have been seeing, uncover local disease risks, identify emerging threats, and provide an evidence base for recommended tests, treatments and preventive medications.

VPH also provides access to diagnostic testing of animal specimens in certain situations to enhance surveillance. For example, through 2016, the program continued to arrange for free rabies testing of neurologic or biting animals. VPH also offered free necropsies and other diagnostic testing in cases where a potential disease outbreak was identified (three or more animals affected), or when an emerging, dangerous or foreign pathogen was suspected. Updated information on the disease surveillance services offered by VPH is available at: publichealth.lacounty.gov/vet.

2017 Data Highlights for LA County

Zoonotic Diseases


Rabies




33 Rabid bats found

3 Rabid bats found indoors

1 Rabid bat found at a school




Heartworm*




118 Cases reported in 111 dogs and 6 cats and 1 lion

27% Of cases in past decade had no travel outside of southern California.

68% Of cases in past decade were asymptomatic when diagnosed




Leptospirosis *



14 Cases reported in dogs


20% Of cases reported in the past decade had a fever (i.e. most did not)

72% Of cases in the past decade had not been vaccinated against leptospirosis.



Sentinel Diseases


Valley Fever (Coccidioidomycosis)*



37 Cases reported, all in dogs

34% Of cases in the past decade had not traveled outside of Southern California.

20% Of the cases in the past decade were in dogs that frequently dig in the soil



* Excludes cities of Long Beach and Pasadena. See page 4 for more information.

West Nile virus (WNV) in Dead Birds



100 WNV-infected dead birds discovered

63% Of dead birds tested were WNV-positive.

95% Were detected in July-November



Non-Zoonotic Diseases

Parvovirus in Dogs



363 Cases reported

78% Of cases reported in the past 5 years came from animal shelters

90% Of the cases reported by animal shelters in the past 5 years were infected in the community before entering the shelter, not in the shelter itself.



Diseases in Detail

1. Rabies



Background and Significance

Rabies is caused by a virus that infects the brain of both humans and animals. It has one of the highest fatality rates of any known infectious disease – almost all cases are fatal once illness begins.¹⁵ Rabies is transmitted through the bite of an infected animal. There are multiple animal reservoirs which are the sources different variants (strains) of rabies virus around the world.¹⁶

In the past 50 years, cases of human rabies in LA County have been very rare, and were reported only in persons who had been bitten by rabid animals in other countries (Table 1A). However, people have been exposed to rabies in LA County through encounters with rabid bats. In such cases, development of rabies was prevented via administration of rabies post-exposure prophylaxis (PEP) soon after exposure. Rabies has been nearly absent in local pets for decades because of the legal requirement to vaccinate dogs, and the frequent, but not always legally-mandated vaccination of cats. The last locally-acquired case of rabies in a dog occurred in 1978 from immunization with a live-type rabies vaccine (vaccine discontinued in the 1980s). Prior to that, the last naturally infected and locally-acquired case in a dog was in 1966. A rabid cat and a rabid dog were imported into LA County in 1987 and 2004, respectively. Both were imported from countries where rabies is more common in pets (Table 1A).

Historically, skunks were a reservoir for rabies in LA County. A skunk variant of rabies was established in skunk populations in the Malibu area. The last year in which a rabid skunk was detected in that area was in 1979. It is likely that a wildfire killed the last infected colony of skunks in 1979. A skunk infected with rabies was found more recently, in 2014 (Table 1A), but it was infected with a bat variant of rabies, so it did not represent a return of the skunk variant.

For over 35 years, insect-eating bats have been the only known reservoir for rabies in LA County. Cases of rabies in bats have been detected every year since bat testing began in 1961 (Figure 1A). Local data show that approximately 10-15% of bats that appear ill or are acting unusual are rabid; however, it is estimated that only about 1-3% of bats in nature are likely to be rabid.¹⁷ Although bats are the primary reservoir for rabies in LA County, bites from other wildlife are treated as potential rabies exposures, because bats may transmit rabies to other wildlife, or rabid wild animals from other areas may be imported into LA County.

All encounters with bats must be carefully assessed for the risk of exposure to rabies. In situations where a person or pet is directly exposed to a bat, the bat should be contained and tested for rabies. The reasons include the following:

- (1) Rabies is a highly fatal disease and effective PEP must be administered soon after exposure.
- (2) Bat bites are small injuries that may go undetected. Therefore, when a bat is found near a sleeping or impaired person, small child, or pet, a bite from a bat cannot be ruled out.

- (3) The results of bat testing play a pivotal role in determining whether PEP is needed. If a bat tests negative for rabies virus, PEP is not necessary. If a bat is not tested, or tests positive for the rabies virus, PEP must be given if there was any chance a bite occurred.

Elsewhere in the United States, there are multiple important reservoirs of rabies, and multiple variants, including skunks (northern California and the Midwest), foxes (Alaska, Arizona, New Mexico, and Texas), and raccoons (eastern states). In 2007, the United States was declared free of the dog strain of rabies.¹⁸ This was achieved through several decades of strict legal rabies vaccination requirements for all dogs. Animal control agencies continue to enforce these requirements today to maintain this status. However, it is important to understand that any strain of rabies can infect wildlife or pets (including local bat rabies strains), and dog rabies continues to be a major problem in other countries. Furthermore, local residents must be aware that animals incubating the rabies virus could be imported into LA County through global travel and trade, creating the risk of new variants becoming established in local wildlife. Because of these risks, VPH provides a strong rabies surveillance program for the county. Rabies testing is not limited to animals that have bitten a person - VPH also tests suspected animals with neurologic illnesses or abnormal behaviors.

Surveillance for rabies in animals is critical to evaluate the risk of the disease for the public as well as animals. Local rabies data support the importance of rabies prevention through vaccination in pets, and help physicians make decisions on administration of rabies PEP to people bitten by animals.

Table 1A. Selected Historical Rabies Cases in LA County			
IN HUMANS			
Year	Age and sex	Probable virus source	Comments
2004	22 year old man	Dog bite in El Salvador	Imported case
1975	16 year old girl	Dog bite in Mexico	Imported case
1949	24 year old man	Bite from the patient's dog	Last locally-acquired rabies case in a human
IN PETS			
Year	Species	Probable virus source	Comments
2004	Dog	Dog bite in Thailand	Stray dog rescued in Thailand by an American tourist. Dog flew into LA County, died in Santa Barbara County
1987	Cat	Dog bite in Mexico	Stray cat rescued in Acapulco by an American tourist. Cat bitten by a rabid dog
1978	Dog	Live-type rabies vaccine	Live vaccines involved no longer used. All rabies vaccines changed to killed-type 30+ years ago
1966	Dog	Local skunk bite	Last locally acquired, naturally acquired rabies case in a dog
IN WILD ANIMALS			
Year	Species	Probable virus source	Comments
2014	Skunk (Long Beach)	Local bat bite	Example of how local bat variant of rabies can "spill over" into other species
1979	Skunk	Local skunk bite	Last case of skunk variant of rabies
1973	Raccoon	Local skunk or bat bite	Likely raccoon had been bitten by a local rabid skunk or bat

Table 1A. Selected Historical Rabies Cases in LA County (continued)			
IN WILD ANIMALS (continued)			
1964	Fox	Local skunk or bat bite	Four rabid foxes diagnosed during the year
1946	Coyote	Local dog bite	Rabid dogs common locally in the 1940s
1944	Opossum	Local dog bite	Rabid dogs common locally in the 1940s

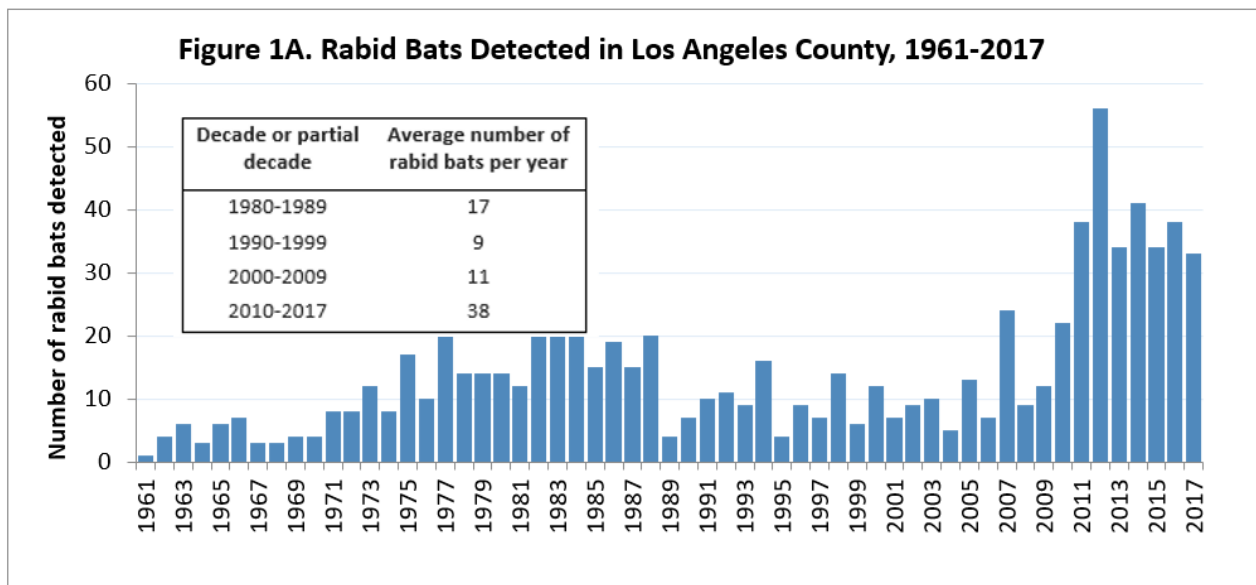
Data Sources

Reports of animal bites and contact with bats are received from animal control agencies, physicians, veterinarians and the public. Animal control agencies and veterinarians submit deceased animals to VPH for rabies testing. The LA County Public Health Laboratory tests brain tissues of submitted specimens using the Direct Fluorescent Antibody (DFA) test. All samples which test positive by DFA are considered confirmed cases. Rabies data from Long Beach and Pasadena are included in this report, and were shared by the Long Beach Department of Health and Human Services and the Pasadena Department of Public Health.

Findings

Rabid Bats

- 33 rabid bats were detected in 2017. This was a decrease from the 38 rabid bats detected in Los Angeles County in 2016.
- So far in this decade, an average number of 37 rabid bats have been detected per year. This number is higher than the average number in previous decades (9-17 per year). The highest annual count of rabid bats ever recorded in LA County occurred in 2012, with 56 rabid bats (Figure 1A).
- 13% of bats submitted for diagnostic testing in 2017 were positive for rabies. This is within the expected range of 10-15%.

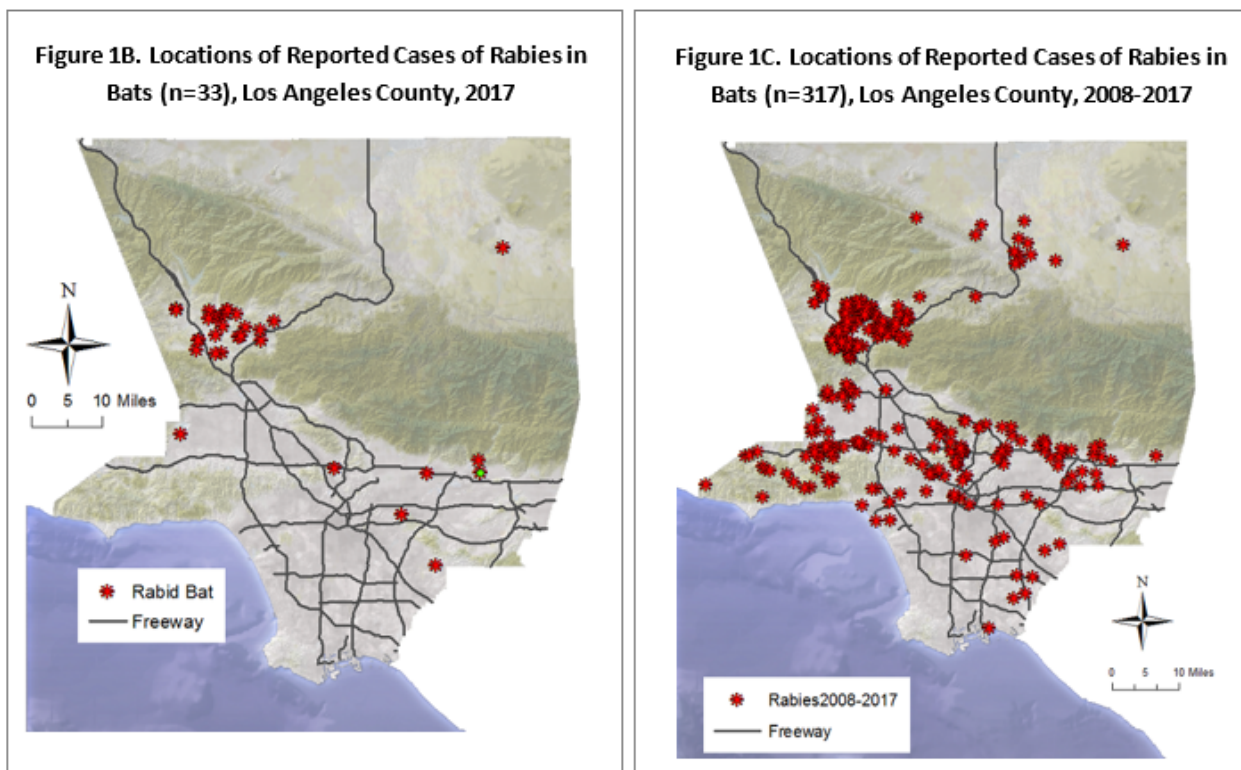


Exposures

- In 2017, 4 people and 6 pets were exposed, or potentially exposed, to the 33 rabid bats. This was a decrease compared to the 13 people and 14 pets exposed in 2016.
- Humans exposed to rabid bats were referred to physicians for rabies PEP.
- Exposed pets were vaccinated, quarantined at home and observed for clinical signs of rabies. Quarantines after rabies exposure lasts 30 days for pets that were up-to-date on their rabies vaccine at the time of the exposure, and 6 months for pets that were not up-to-date on rabies vaccination.

Geographic Pattern

- Rabid bats were found throughout LA County, including urban, suburban, and rural settings, in 2017 and in earlier years (Figures 1B and 1C).
- 20 (60%) of the 33 rabid bats found in LA County were found in the city of Santa Clarita. The rest of the rabid bats were found in various cities throughout LA County. The reason for the clustering is unknown.

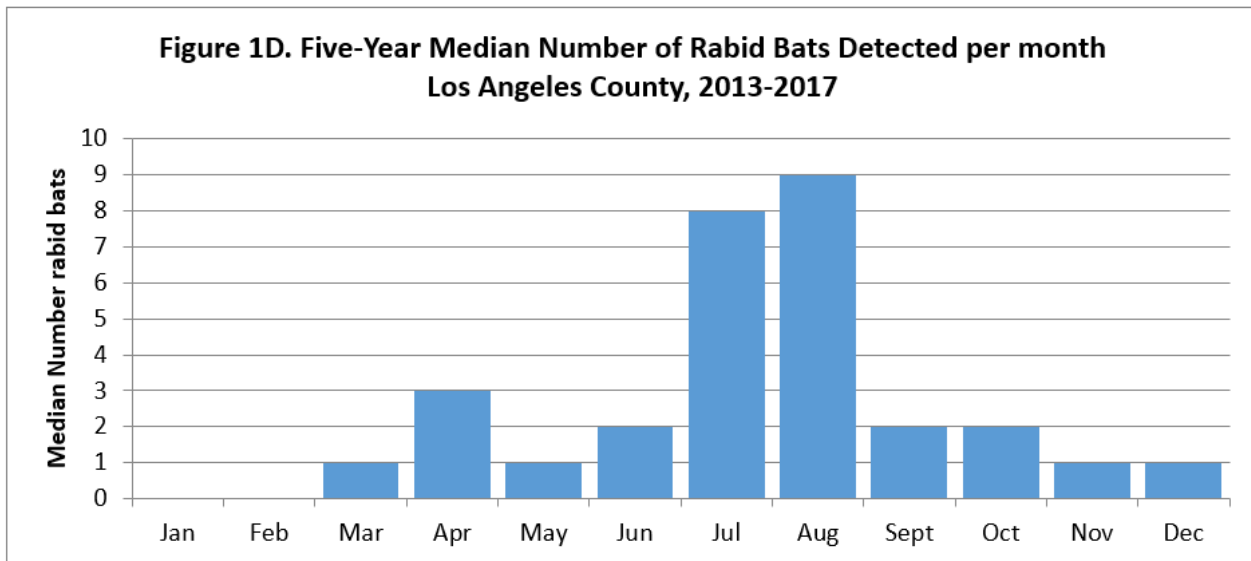


Settings where found

- In 2017, the majority of rabid bats (29 or 88%) were found at private residences. This is an increase from 2016 where 23, or 61% of rabid bats were found at private residences.
- In 2017, 3 (9%) of rabid bats were detected indoors (2 bats inside homes, 1 bat inside a business). Rabid bats found indoors present an increased risk for people and pets for rabies exposure. This number has fortunately decreased from 2016 where 10 (27%) of rabid bats were detected indoors.
- In 2017, one rabid bat was found outdoors at an elementary school. The principal confirmed that no students or staff had any direct contact with the bat.
- In 2017, one bat was found inside the garage of a home.

Temporal pattern

- Rabies in bats is seasonal (Figure 1D). Just as in prior years, in 2016 and 2015, most rabid bats were detected in late summer and early autumn, during the times when new young bats are learning to fly.



Limitations

- Cases of rabies in animals are likely under-counted because:
 - Not all bites from, or encounters with, bats or other animals are reported to VPH.
 - Rabies may not always be considered in veterinary clinics because of its rare occurrence in pets in LA County.
 - The public may be unaware that bats and abnormally behaving or ill wildlife can be tested for rabies through the Public Health Lab, and therefore may not report them to VPH.

Implications

- Most rabid bats are found at private homes, and have been found across a wide range of Los Angeles County. Any LA County resident may potentially encounter a rabid bat at some point.
- The number of rabid bats detected has been sustained at an elevated level since 2011, compared to past decades.
- Rabid bats may be found indoors in LA County. Three confirmed rabid bats were found indoors in 2017. Ten confirmed rabid bats were found indoors during 2016, and two were found indoors in 2015.

Recommendations

- Local residents should be educated about the occurrence of rabies in bats in LA County, and the potential for other animals to become infected, especially wild animals.
- Schools and camps should educate all staff about bats and rabies, including custodial staff. Children are often unaware of the risk of rabies from bats.
- All dogs and cats should be vaccinated against rabies, including indoor-only animals.
- Residents should be informed to not feed wildlife. Wildlife routinely fed by people often become more accustomed to being near people and pets. Some species become more aggressive and territorial and are more likely to bite.

- **Bat encounters should be reported to VPH at 213-288-7060.** This includes bats that have been found near pets, small children and sleeping or incapacitated adults.
 - Because of their small teeth, marks from bat bites can disappear rapidly and bites themselves may not wake a sleeping person. Therefore, an unrecognized bite may have occurred if a bat was not observed the entire time it was near people or pets.
 - Bats found inside homes should be tested to ensure that they are not rabid. Bats should not be allowed to fly away, and should be safely contained if possible.
 - Bats should not be touched with bare hands. If possible, they should be covered with a bucket or similar object, and the local animal control agency should be contacted. A list of animal control agencies in LA County is available at: publichealth.lacounty.gov/vet/animalcontrollist.htm.
 - The risk of rabies may be higher in imported animals. Rabies suspicion should be high if a sick dog, cat, or other animal comes from another country, especially where rabies is endemic or common in dogs.

For More Information: publichealth.lacounty.gov/vet/rabies.htm.

2. Heartworm



Background and Significance

Canine heartworm disease is caused by a parasitic worm, *Dirofilaria immitis*, which is spread to animals through the bite of infected mosquitoes.¹⁹ Mosquitoes breed in standing water, therefore removal of stagnant water is a critical step in reducing the risk of heartworm exposure. In LA County, the Western Treehole Mosquito (*Aedes sierrensis*) has historically been considered the best local vector for this parasite, although other species can also transmit the disease.²⁰ In recent years, two additional potential vectors for heartworm, the Asian Tiger Mosquito (*Aedes albopictus*) and Australian Backyard Mosquito (*Aedes notoscriptus*), have been spreading in LA County.²¹ The eggs of these mosquitoes are drought-resistant, increasing the challenge for preventing heartworm transmission. These new mosquitoes are potential vectors for human diseases as well, highlighting the importance of mosquito control in protecting both human and animal health.

Once heartworm is transmitted to a pet, the parasites mature in the pet's body over 6 months, and then migrate to the heart and lungs. An infected dog or cat may appear healthy for months or years after infection. Eventually, heartworm infection can cause a wide range of clinical signs such as fatigue, exercise intolerance or cough. If untreated, an infected pet may develop severe heart failure, lung disease and even die. Dogs are the most commonly diagnosed animals; however, the parasites can also infect cats, ferrets, wolves, coyotes and marine mammals.¹⁹ The disease is maintained in areas where mosquitoes can feed on infected coyotes and infected, untreated dogs.²² Infection in humans is rare,¹⁹ but data may be lacking.

Historically, heartworm was not thought to be present in LA County. However, locally-acquired cases are on the rise. The local transmission of this disease may be facilitated by a warming climate and movements of infected pets or wildlife into the county. Epidemiologic data on local heartworm disease can help veterinarians make clinical decisions on heartworm testing and prevention. Since heartworm disease is mosquito-borne, local data can also reveal patterns in local mosquito ecology.

Data Sources

In LA County, cases of heartworm in dogs and cats are reportable to VPH by local veterinarians. Starting in 2014, VPH began receiving electronic laboratory reports (ELR) from veterinary diagnostic laboratories for every positive heartworm antigen and antibody test result. These positive laboratory reports prompt VPH to further investigate by contacting the veterinarian treating the animal, and occasionally the animal owner, in order to obtain the full report. Laboratory tests commonly performed to diagnose heartworm in animals include: antigen testing, microscopic identification of parasite larvae (microfilariae) in the animal's blood, antibody testing, and occasionally echocardiography. Heartworm testing is routinely done in veterinary clinics prior to starting heartworm preventive medications. Animals may have no overt clinical signs at the time testing is performed.

Cases in animals that did not travel outside of southern California for at least the two years prior to diagnosis were considered southern California-acquired. Cases were categorized as confirmed, probable or suspected based on the results of diagnostic tests performed.* The data exclude cases seen by veterinary practices in the cities of Long Beach and Pasadena (see page 4); however, veterinary practices in LACDPH reported seven cases that live in Long Beach and nine case that lived in Pasadena in the decade 2007-2016; these are included in this report.

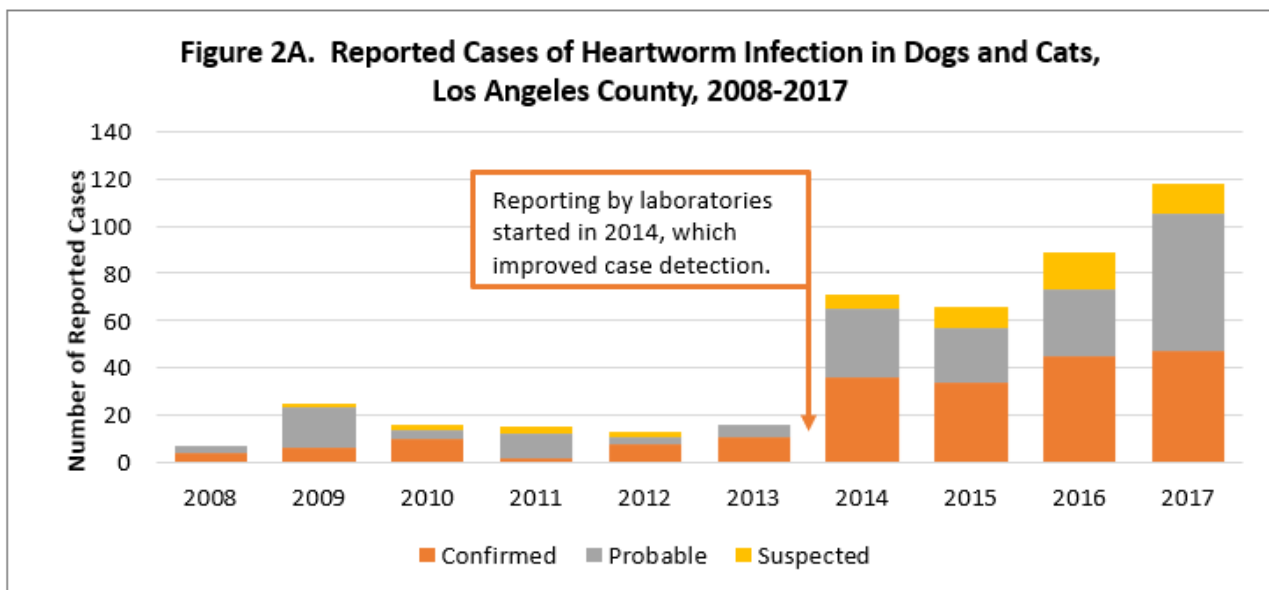
All data on the locations of Australian Backyard mosquitoes (*Aedes notoscriptus*) were provided courtesy of three vector control districts in Los Angeles County: The Los Angeles County West Vector Control District, the greater Los Angeles County Vector Control District, and the San Gabriel Valley Mosquito and Vector Control District. See Figure 2D.

* Heartworm case definition available at: publichealth.lacounty.gov/vet/HeartwormCaseDef.htm

Findings

Dogs and cats with heartworm

- In 2017, 118 cases of heartworm infection were reported in 111 dogs, 6 cats and 1 lion. This was an increase from the 87 cases reported in 2016.
 - The lion case was a report of a positive heartworm antibody test (negative antigen test) for a lion at the Los Angeles Zoo. The lion had no reported travel history.
 - In 2014, veterinary laboratories began to report cases electronically (ELR). The median number of cases reported during 2007 through 2013 was 15 per year. Between 2014 and 2017, the median number increased to 80 per year. Therefore, ELR likely improved surveillance, and it is unknown whether the true incidence of heartworm increased in 2014.
- Over the decade between 2008 and 2017, a total of 435 cases were reported in 408 dogs and 27 cats (see Figure 2A).
 - 47% were categorized as confirmed, 41% probable and 12% suspected.
 - The median age of dog cases was 5 years, with a range of 6 months to 16 years.
 - The median age of cat cases was 7 years, with a range of 1 year to 17 years.



Clinical Findings

- Information on clinical signs was available for 378 of the cases reported during 2008-2017. Most (68%) had no signs. Of the 80 cases with signs, 70% had cough, 49% had fatigue, and 11% had heart failure. (Note: Since one pet could have multiple clinical signs, percent totals exceed 100%).

Treatment

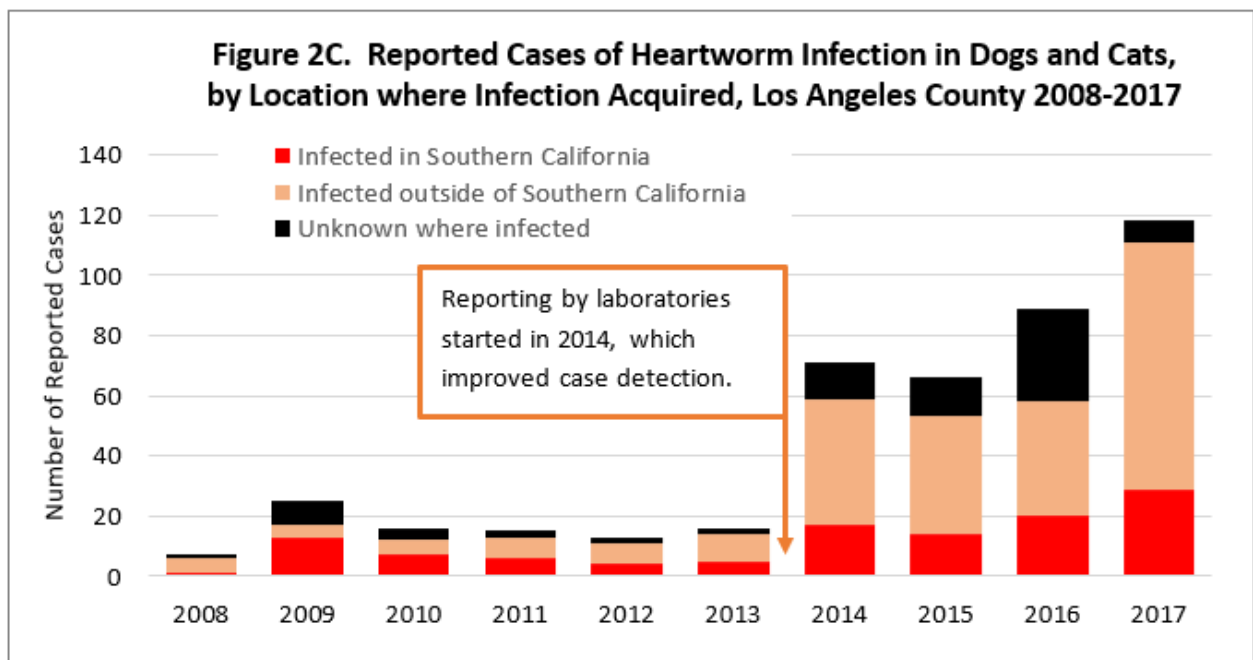
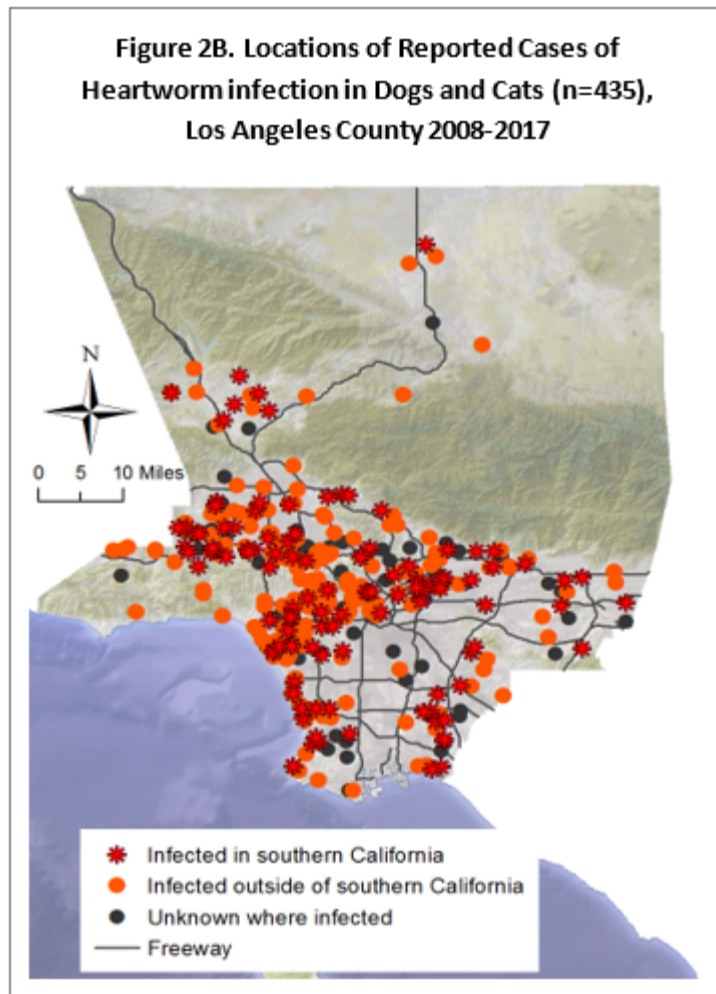
- Information on treatment was reported for 373 of the cases. Of these, 64% were receiving some treatment for heartworm diseases at the time of reporting, and 36% were either untreated or treatment information was not known.

Geographic Pattern

- Cases appeared to be more common in the western San Fernando Valley, the western and eastern edges of the San Gabriel Valley, and along the western coastline.
- Several clusters were identified:
 - 2009:
 - 3 dogs on one property in South Pasadena
 - 2 dogs on one property in West Hills
 - 2011:
 - 2 dogs on one property in Castaic
 - 2014:
 - 7 dogs in the same area in Pacoima. All of these dogs had been rescued, and all had become infected outside of southern California.
 - 2015:
 - 2 dogs on one property in Palos Verdes Estates
 - 2 dogs in Altadena
 - 2015-2016:
 - 2 dogs in Playa del Rey (one in December 2015 and one in January 2016)
 - 2016:
 - 2 dogs in Culver City
 - 2 dogs in Los Angeles (90211)
 - 2017
 - 24 dogs in Sherman Oaks (17 cases on one property had been rescued from Asia, 4 cases on one property had been rescued from South Korea, 1 case was rescued from the East LA area and 1 case was from San Diego)
 - 4 dogs on one property in Los Angeles (90019). All of these dogs had been rescued from Houston after Hurricane Harvey.
- There was a lack of cases in the South Los Angeles area. However, this may be due to lack of veterinary services and testing (Figure 2B).

Where Infections Acquired

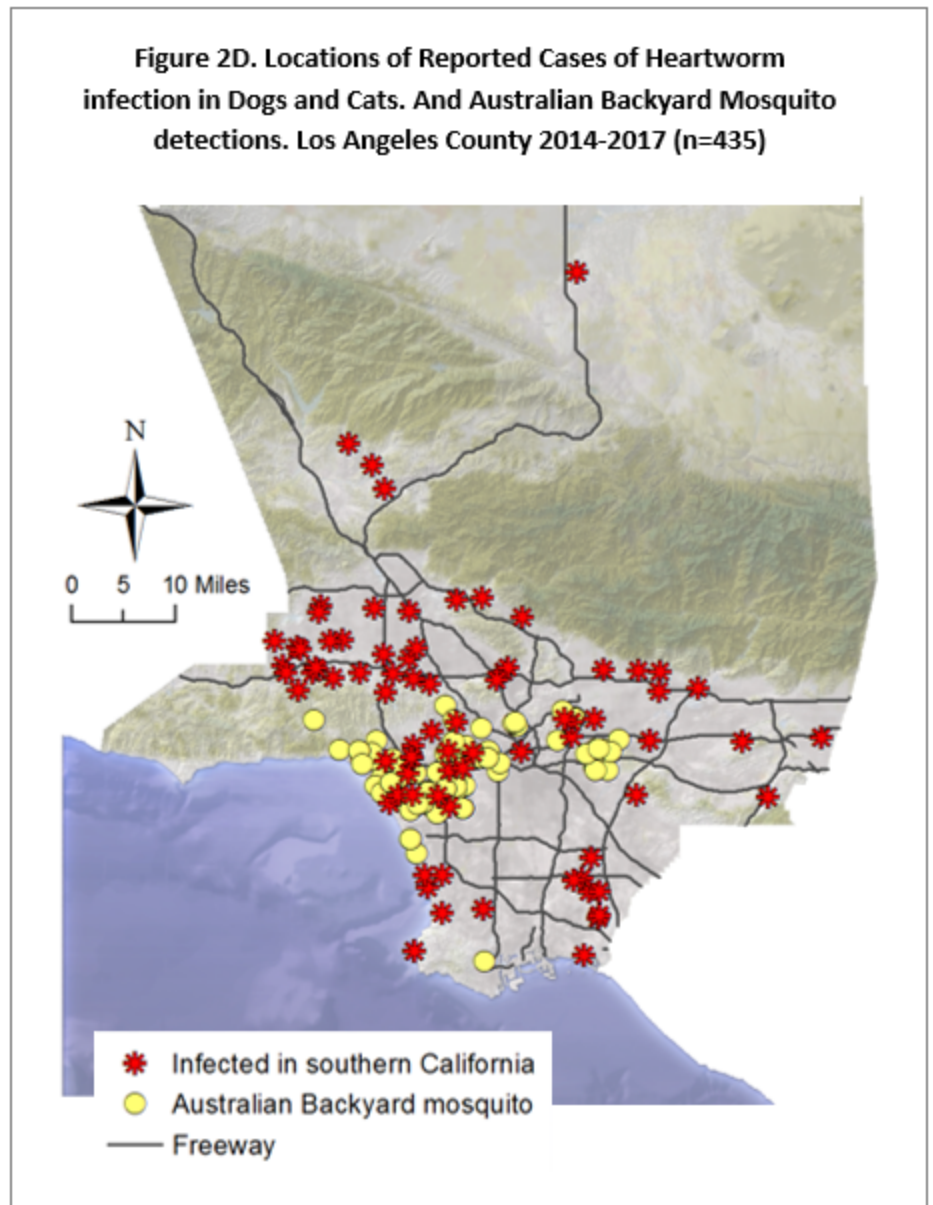
- 116 of the 436 cases (27%) reported during 2008-2017 had not traveled outside of the region and likely acquired heartworm infection from mosquitoes in southern California. Over half (238 cases, 55%) were likely infected while outside of southern California. For 82 cases (19%), not enough travel history was available to assess exposure (Figures 2B and 2C).
- In 2017, of the 82 cases that had been infected while the pet was outside of southern California:
 - 40 cases (49%) were infected in the United States. The top two states were Texas (15 cases) and Florida (3 cases).
 - 42 cases (51%) were infected in other countries. The top two countries or regions were Asia, either South Korea or China (35 cases) and Costa Rica (2 cases).



New mosquito vectors in LA County

- With the presence of a newer, drought-resistant mosquito species (*Aedes notoscriptus*) in LA County, there is the potential for increased locally-acquired infections in pets. As the mosquito spreads and then concentrates in certain areas (South Bay), there appears to be clusters of locally-acquired heartworm infection cases in the same region (Figure 2D).

Mosquito data sources: The Los Angeles County West Vector Control District, the greater Los Angeles County Vector Control District, and the San Gabriel Valley Mosquito and Vector Control District.



Limitations

Identification of heartworm cases by VPH is affected by various steps during the reporting process. Under-reporting can occur if: 1) Owners do not bring their pets to a veterinarian, 2) The veterinarian decides not to test the pet for the disease, or 3) The client declines to accept or pay for the test. Identification of southern California-acquired cases vs. cases imported into the area may be affected by the ability of animal owners to recall travel done with their pet in the previous two or more years before diagnosis (recall bias).

Additionally, with the increased importation of pets from domestic and international locations by rescues or shelters there is usually no known medical or travel history for that pet or the history is not passed along to the new owners. Furthermore, with large numbers of pets being surrendered to shelters or re-homed, these pets rarely have complete medical or travel histories accompanying them at the time of adoption.

This can result in a large number of adopted pets who have had multiple owners with various histories, and the origins of their heartworm infections are unknown.

Implications

- Monitoring trends in heartworm cases in animals is an important part of monitoring LA County for mosquito-borne disease in general. The local incidence of heartworm appears to be increasing.
- Although 55% of the cases were infected outside of southern California, a significant proportion (27%) were infected in southern California. This provides evidence that local mosquitoes are spreading heartworm to local pets.
- The majority of cases (68%) were diagnosed before developing clinical signs, most likely during routine screening tests for heartworm.
- Increased numbers of heartworm infected pets being imported from domestic and international locations means that there are more reservoir cases in LA county and potentially more pets that are being adopted without complete histories of where the pets originated from or what diseases they are harboring.
- Treating pets for heartworm helps prevent spread of the disease. Untreated pets (36% of reported cases) and coyotes may act as reservoirs for the disease.²² When local mosquitoes bite untreated pets, they may spread it to another pet.
- The arrival and spread of new vectors for heartworm, *Aedes notoscriptus* and *Aedes albopictus* in LA County in 2014, may increase the risk of transmission. Additionally, increases in ambient temperatures may shorten the life cycles of local mosquitoes, leading to larger mosquito populations. This presents new challenges to the control of these vectors and calls for increased awareness and education on how to protect both humans and animals.

Recommendations

- Prevention
 - Reduce mosquito populations. Areas of standing water around a property should be identified and removed 1-2 times weekly. Items that are harboring mosquito eggs should be cleaned or removed. This is especially important for *Aedes* species of mosquitos who will lay eggs on dry surfaces. This step is cost-free and helps protect people and animals from heartworm, West Nile Virus and other mosquito-borne diseases.
 - Veterinarians should promote these simple methods of mosquito control and educate owners about the importance of mosquitos as related to heartworm disease in LA County.
 - Monthly heartworm preventive medication is recommended. Many of these medications also protect against a variety of other diseases and parasites of pets, some of which can cause infection in humans, such as roundworms, hookworms, fleas and ticks.
 - Prevention is advisable, as treatment of infected pets can be costly and presents some risk to their health.
- History
 - If relinquishing or rehoming a pet, be sure to provide the pet's complete history (medical, vaccination, travel, behavior).
 - If adopting a pet, be sure to inquire about the pet's prior history and share this history with your veterinarian so that the proper recommendations about care and screening tests can be made.

- Veterinarians should always inquire about the history of newly adopted or rescued pets, particularly if the pet originates from a region outside of Southern California. Increased vigilance for zoonotic or foreign animal diseases is paramount for both animal and public health.
- Treatment
 - Treatment of infected pets as recommended by a veterinarian will reduce the number of animals serving as reservoirs for the disease. Reservoirs include the increased numbers of rescued pets from domestic and international locations being brought into LA County with heartworm infections. Coupled with the presence of more efficient vector mosquitos, there is a greater opportunity for pets to acquire heartworm locally in southern California from these reservoirs.
 - Quality of life for the pet can be improved significantly when staging of the infection (according to the American Heartworm Society Canine and Feline Guidelines)** and subsequent treatment of the infection is completed.
- Screening tests
 - It is recommended that pets be tested annually for heartworm infection.^{23, 24}
 - If the history of a pet is not known, testing at the time of adoption and then annually will allow for early diagnosis and treatment, and is a marker for overall responsible pet ownership.

For More Information: publichealth.lacounty.gov/vet/heartworm.htm.

** <https://www.heartwormsociety.org/veterinary-resources>

3. Leptospirosis



Background and Significance

Wildlife can carry several zoonotic pathogens of importance. One of them is the *Leptospira* bacteria, which causes leptospirosis. These bacteria thrive in water and can be found in the urine of commonly infected wildlife such as raccoons, skunks, opossums or rats.²⁵ Therefore, the risk of this disease being transmitted to animals and people exists even in urban and suburban environments. People and animals become infected with leptospirosis when the bacteria enter the body through mucous membranes (gums, eyes) or breaks in the skin. This occurs most often through contact with water contaminated with animal urine.

There are many different strains (serovars) of *Leptospira* bacteria that circulate among specific animal species (reservoir hosts). Disease usually occurs when an animal-specific serovar infects another species, including humans.²⁵ The bacteria most commonly attack the liver and kidneys of infected hosts. Depending on the strain involved, clinical signs in animals may include: fever, vomiting and dehydration.²⁵ Signs in people can vary but most often, individuals present with: fever, headache, chills and muscle pain.²⁶ In dogs, vaccines are available that protect against four serovars: canicola, icterohemorrhagiae, grippityphosa, and pomona.

Animals act as sentinels for the disease. Infected dogs indicate that the bacteria are present in the animal's environment, such as water sources (pets' food/water bowls or fountains) that have been contaminated by infected wildlife. Pets may also be a direct source of infection to people through shedding of the pathogen in infected urine.

Data Sources

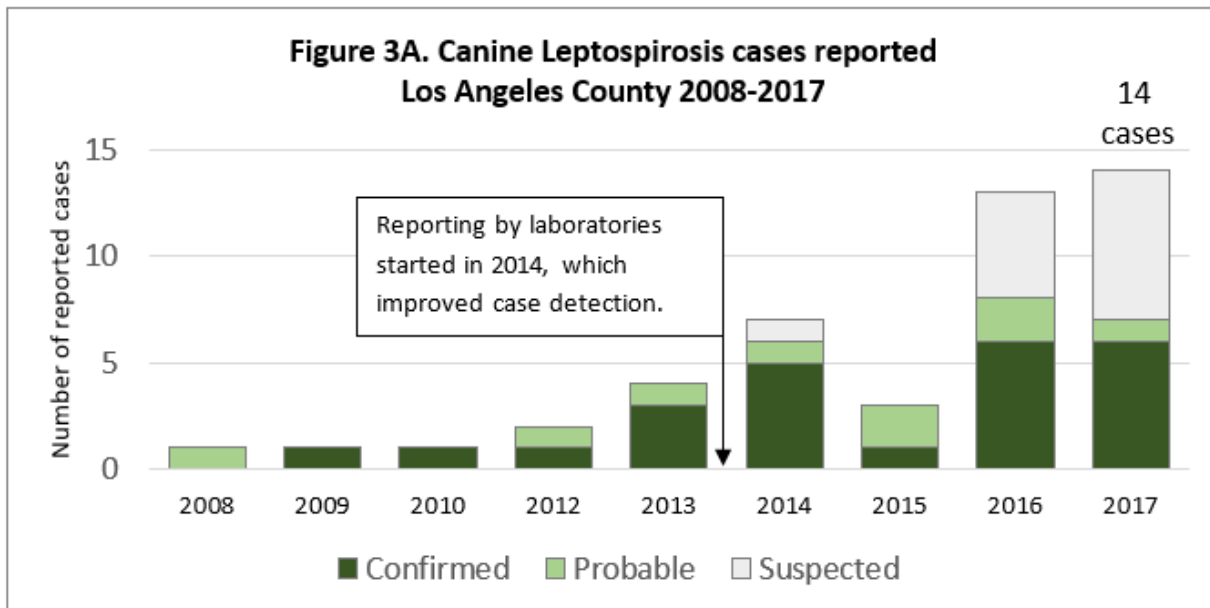
Pets diagnosed with leptospirosis in veterinary clinics were reported to VPH. As of the beginning of 2014, veterinary diagnostic laboratories also began to report positive leptospirosis test results to VPH, a procedure known as Electronic Laboratory Reporting, or ELR. These positive laboratory reports prompt VPH to contact the veterinarian treating the animal to obtain the full report. Diagnosis was typically made through serology or polymerase chain reaction (PCR) on urine or blood. Serology measures the level of antibodies against *Leptospira* and is best performed by testing two blood samples taken at 2 to 4-week intervals. It provides insight into the serovar of *Leptospira* likely involved in the infection. A single positive PCR test confirms leptospirosis but gives no information on the infecting serovar. VPH veterinarians investigated each leptospirosis case to identify risk factors involved and provide recommendations for testing and prevention of additional infections. Cases of leptospirosis are classified as confirmed, probable or suspected based on test results and the presence of clinical signs*. The data do not include any reports from veterinary practices in the cities of Long Beach and Pasadena; however, two cases were reported for dogs that live in Pasadena and once case was reported for a dog that lives in Long Beach (see page 4 for more information on jurisdictional issues).

* Case definition available at: publichealth.lacounty.gov/vet/LeptospirosisCaseDef.htm

Findings

Leptospirosis cases in dogs

- In 2017, 14 cases were reported in dogs. This was just slightly more than the 13 cases reported the year before. (Note that one confirmed case reported in the 2016 report was later removed as it was found the dog had a high but *unchanging* antibody titer).
- Between 2008 and 2017, 46 cases in dogs were reported (Figure 3A).
 - 67% of cases were confirmed (n=24), 20% were probable (n=9), and 28% were suspected (n=13).
 - 63% were diagnosed by serology alone (n=29), 33% by PCR alone (n=15) and 4% by both methods (n=2);
 - 20% died (n=9)
 - Vaccination history was available for 42 cases. Of these, 72% had not been vaccinated against leptospirosis (n=33).
- Electronic Laboratory Reporting (ELR) led to an increase in reports in 2014. Before that, surveillance was dependent on veterinarians remembering to report cases. The median number of cases reported per year during 2008-2013 (before ELR) was two, and the median number per year during 2014-2017 was 10.



Clinical Findings

- Azotemia (elevated kidney-related blood values) was the most common laboratory test finding (70% of cases). Azotemia typically indicates involvement of the kidneys, dehydration, or both (Table 3A).
- Evidence of liver involvement (elevated liver blood values) was reported in 48% of cases.
- Fever was reported in only 20% of cases.
- Vomiting was the most common sign, reported in 52% of cases.

	Number of cases	Percent of cases
Increased kidney values on blood test (azotemia)	32	70%
Vomiting	24	52%
Increased liver values on blood test	22	48%
Urinating larger amounts (polyuria)	15	33%
Drinking more water (polydipsia)	13	28%
Diarrhea	10	22%
Fever	9	20%
Yellowing of whites of eyes (icterus)	4	9%

Serovars of *Leptospira*

- In 8 cases, two serologic tests (paired serology) were performed. The suspected serovar(s) of leptospirosis infecting the animal were identified based on a documented 4-fold increase or decrease in the antibody titer against each serovar. In four cases, more than one serovar was implicated in infecting the animal.
 - *L. autumnalis* – implicated in 6 cases
 - *L. pomona* - implicated in 3 cases
 - *L. canicola* – implicated in 1 case
 - *L. grippityphosa* - implicated in 1 case

Exposures

- The most common wildlife exposures experienced by infected dogs included to raccoons, mice, rats, opossums, skunks and deer (Figure 3B).

Geographic Pattern

- Cases lived in areas throughout LA County (Figure 3C). No clear geographic pattern has emerged to date. Due to the cost of testing, leptospirosis may be more likely to be diagnosed in dogs in higher income areas.

Temporal Pattern

- Over half of the cases (57%) were diagnosed in the fall and winter months (September-February).

Figure 3B. Wildlife Exposure in Reported Leptospirosis Cases
 (reported for N=42 cases), Los Angeles County, 2008-2017

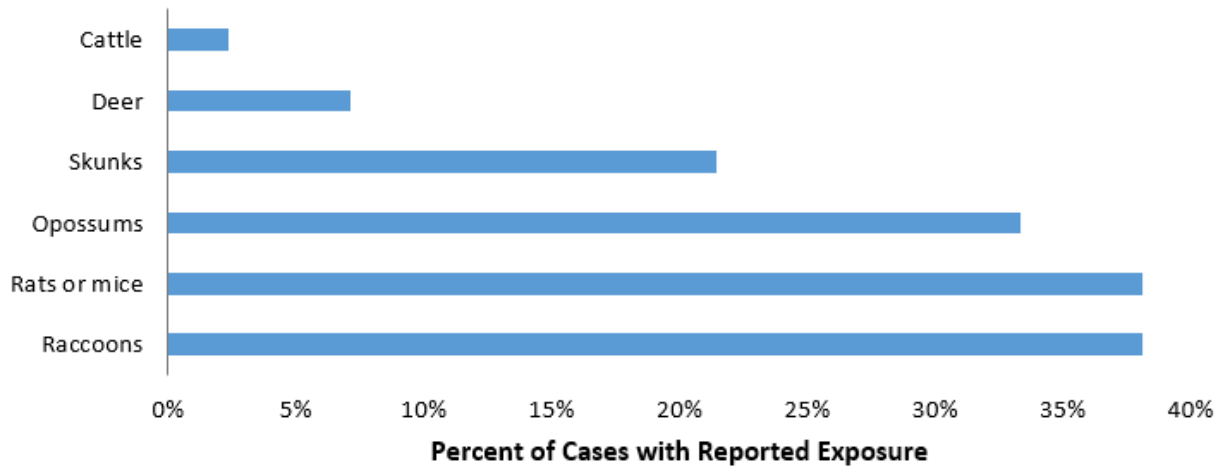
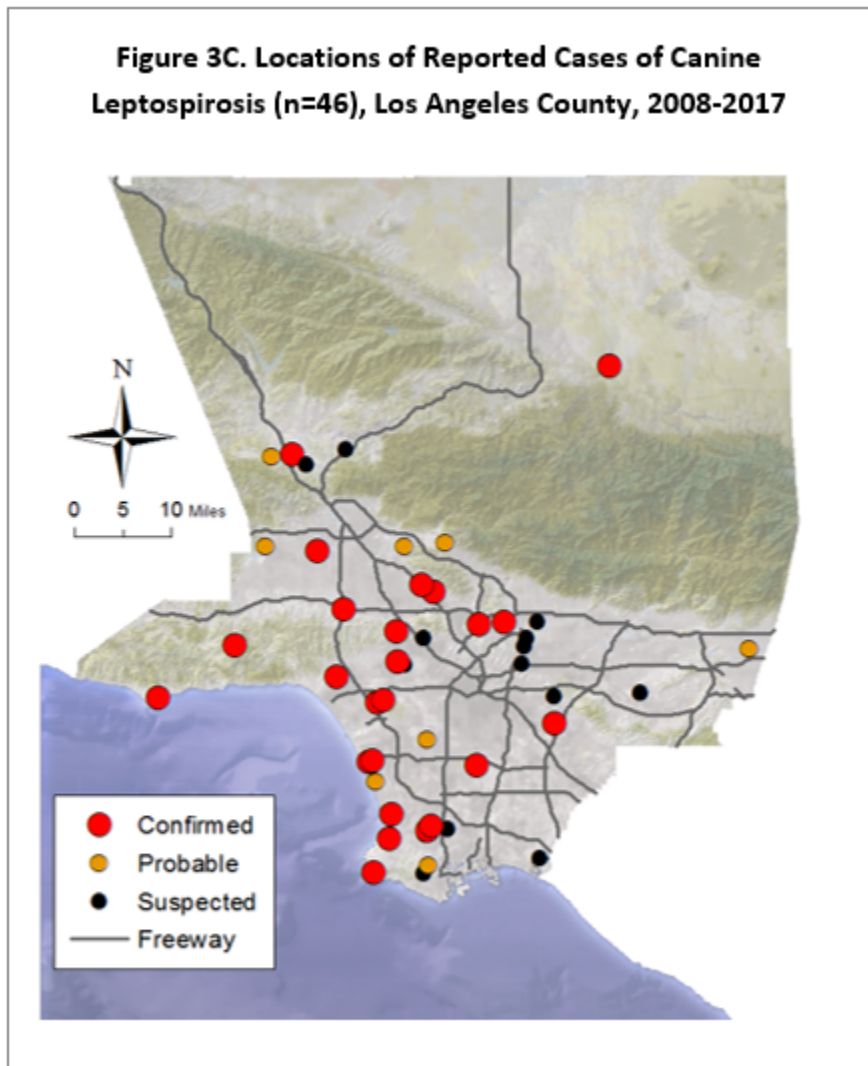


Figure 3C. Locations of Reported Cases of Canine Leptospirosis (n=46), Los Angeles County, 2008-2017



Limitations

- Some cases may not be reported. The data represents the minimum number of local cases.
 - Veterinarians who are not aware that leptospirosis is present in LA County may not test for it.
 - Cases of leptospirosis in dogs without azotemia present may be missed.
 - The cost of testing may be a barrier for some pet owners and testing for the disease may not always occur in dogs with signs of the disease.
- Some cases of leptospirosis could not be confirmed because:
 - Only one serologic test was performed or reported.
 - Lack of vaccine history. Vaccination may increase antibodies detected through serology.
- Due to cross-reactivity among *Leptospira* serovars in standard diagnostic testing, the serovar responsible for infection is rarely identified.

Implications

- Leptospirosis is present in LA County. Although the total number of cases remains low, local pets may be at risk of infection.
- Although leptospirosis often affects multiple organs, and may cause systemic disease, infected animals often do not develop a fever.
- Backyard wildlife is a suspected source of leptospirosis in dogs of LA County. Wildlife likely contaminate backyard sources of water (water bowls, fountains) consumed by dogs.
- Epidemiological data on leptospirosis in dogs is highly valuable to veterinarians and physicians. It directly affects decisions regarding clinical testing, treatment and prevention of the disease in animals and people.

Recommendations

- Consider vaccinating dogs against leptospirosis.
 - Especially important in dogs that share an environment with wildlife such as raccoons or rodents.
 - Four-way leptospirosis vaccines are protective against more serovars than the two-way vaccine. The Pomona serovar is likely present in LA County and is not covered by the two-way vaccine.
- Pets should be tested for leptospirosis if they have compatible clinical signs.
 - Performing either PCR, or paired serologic testing, and obtaining a thorough leptospirosis vaccination history is crucial to confirming the disease in dogs.
- Do not attract wildlife into the yard.
 - Keep pets' food and water bowls inside the house, especially at night.
 - Clean pets' bowls daily using soap and hot water.

- Do not feed wildlife and pick up fallen fruits and other potential food sources in a yard.
- Prevent leptospirosis infection in people. Reduce contact to potentially infected urine by:
 - Washing hands frequently.
 - Cleaning potentially infected areas using gloves.
 - Contacting an exterminator if rat infestations are present.

For More Information: publichealth.lacounty.gov/vet/Leptospirosis.htm

4. Parvovirus in Dogs



Background and Significance

Canine parvovirus is a vaccine-preventable viral disease affecting dogs. The virus attacks the intestinal mucosa and immune system, causing vomiting and diarrhea.²⁷ The diarrhea is often severe and bloody, and contributes to rapid dehydration, as well as loss of protein and electrolytes. Cases of parvovirus in dogs are often fatal without hospitalization and intensive supportive care.²⁷ Parvovirus in dogs is commonly diagnosed with a rapid enzyme-linked immunosorbent assay (ELISA) test on feces that can be easily performed in most veterinary clinics.²⁷

Parvovirus is highly contagious, and is transmitted between dogs by direct or indirect contact with their feces. The virus can survive for prolonged periods in the environment without proper cleaning and sanitation.²⁷ Vaccination against parvovirus can prevent infection, and has been a part of the standard vaccination recommendations for dogs for over 30 years. To be fully protected, puppies must receive a series of 3 vaccines at ages 2, 3, and 4 months, followed by a booster one year later. Adult dogs are typically revaccinated every 1-3 years.²⁸

Canine parvovirus is not zoonotic and, therefore, does not pose a health risk to humans. However, cases of parvovirus in dogs serve as a marker for areas in Los Angeles (LA) County where access to, or utilization of basic veterinary preventive health care is low. Lack of basic veterinary care can increase the risk of exposure to zoonotic diseases.

Data Sources

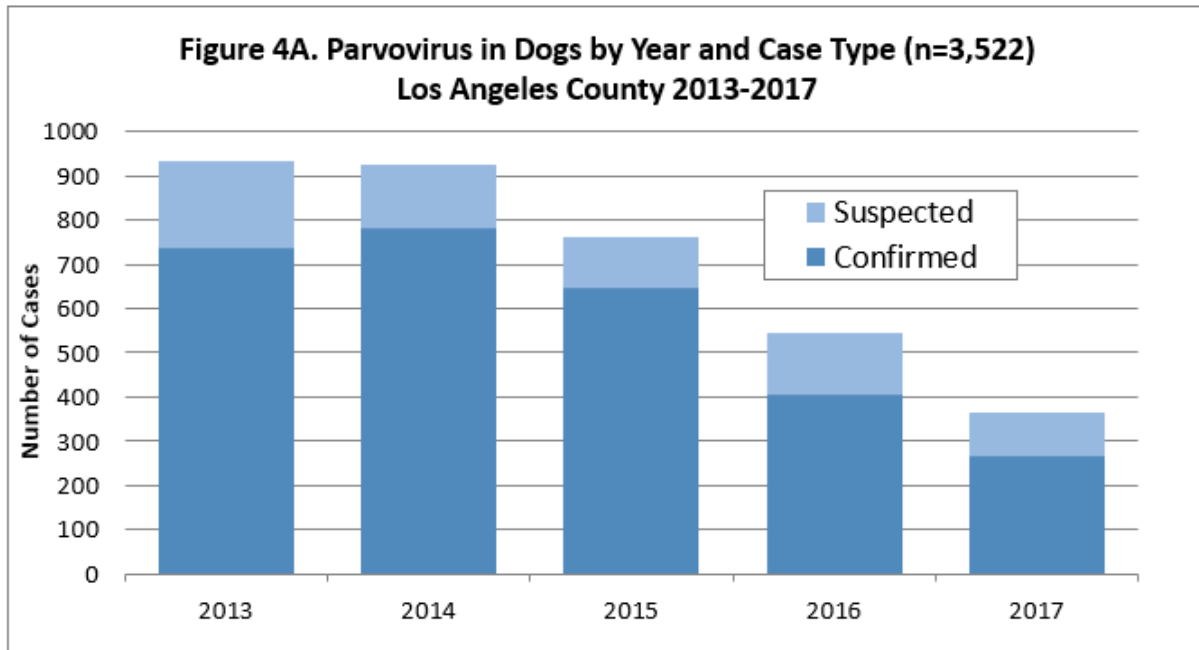
Surveillance for parvovirus in dogs began in 2007, when it was first listed as a priority reportable disease by VPH. Because of the large volume of cases, minimal data is collected in each case. Canine parvovirus is reported using an abbreviated spreadsheet-style reporting form. Data collected include only the dog's breed, age, impound date (if applicable), date diagnosed, clinical signs, diagnostic test results, and the dog's zip code of origin. Vaccine status of the dogs was not available for the majority of cases, since most cases were reported by animal shelters, and medical history is usually not available for stray dogs and dogs relinquished to shelters. Information on the categorization of cases (i.e. the case definition), is available on the VPH website.* Reports were received from Long Beach in years 2010-2016 and from Pasadena in years 2010-2011 and in 2015-2016. Confirmed canine parvovirus cases were those that had compatible clinical signs and a positive ELISA or polymerase chain reaction (PCR) test on feces. Because of the minimal amount of data available on cases, no cases were categorized as probable. Suspected cases were those that had compatible clinical signs and/or epidemiologic links to confirmed cases, and either no diagnostic testing performed, or had a negative ELISA test. Confirmed and suspected cases were analyzed together, except where indicated.

* Case definition available at: publichealth.lacounty.gov/vet/ParvoCaseDef.htm

Findings

Totals - Dogs with parvovirus

- In 2017, 363 cases of canine parvovirus were reported in dogs. This was a significant decrease from the 545 cases reported in 2015 (Figure 4A).
- Between 2013 and 2017, a total of 3,525 canine parvovirus cases were reported.
 - 80% were confirmed, and 20% were suspected.
 - The number of cases reported was highest in 2013 (Figure 4A).
 - Ages. The median age of the cases was consistently 4 months across all five years. The average age fluctuated slightly under and over 6 months.



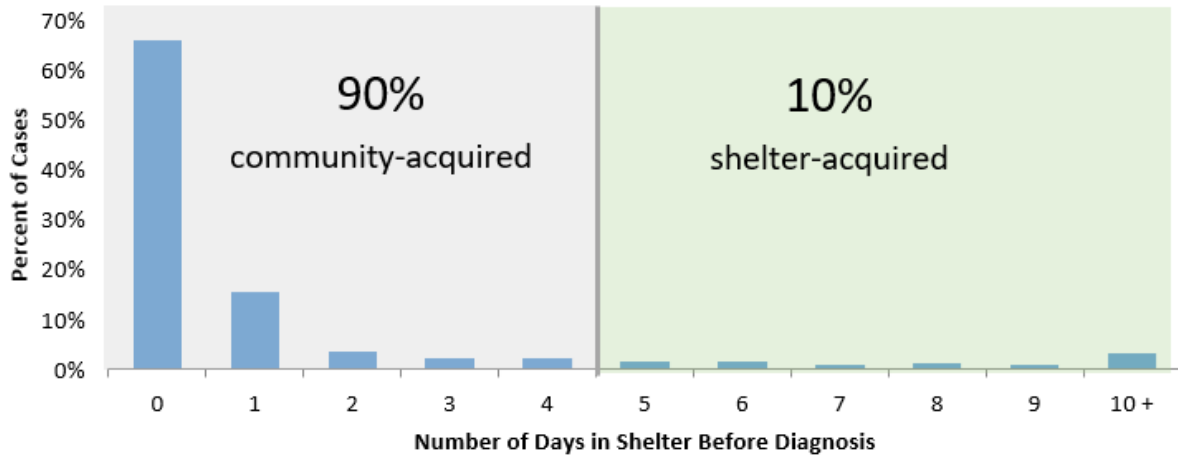
Source of Reports

- Animal shelters contributed the most to surveillance, reporting 78% of cases, while private veterinary practices reported 20% of cases. A small number (2%) were reported by other sources such as pet owners.

Sources of Infection

- While most cases were reported in animal shelters, the vast majority of shelter-reported cases had obtained the infection while living in the community (prior to arriving at the shelter).
 - Shelter-reported cases between 2013 and 2017 were analyzed for length of stay in the shelter before diagnosis. Dates of entry and diagnosis were available for 2,614 cases. Of these:
 - 66% had clinical signs on the day of entry
 - 90% were diagnosed within 4 days of entry, and were therefore likely infected before entry into the shelter (i.e. community acquired) (Figure 4B)

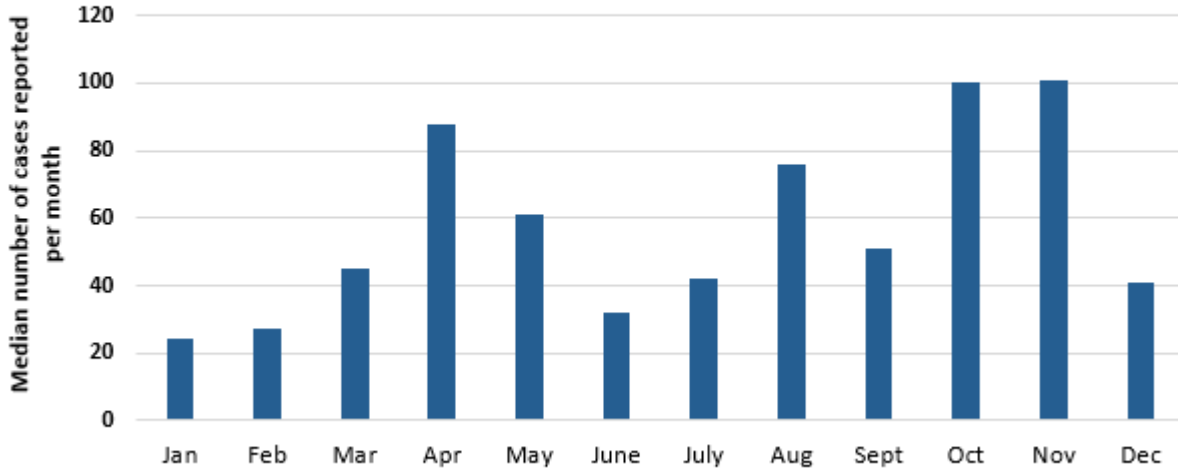
Figure 4B. Parvovirus in Dogs - Days in Shelter Before Diagnosis (data from 15 shelters, n=2,614), Los Angeles County 2013-2017



Temporal Pattern

- Parvovirus infection in dogs followed a bimodal seasonal pattern, with increases in late spring and autumn (Figure 4C).

Figure 4C. 5-year Median Number of Canine Parvovirus cases per by Month, Los Angeles County, 2013-2017



Geographic Pattern

- Cases of parvovirus occurred all over the county during 2013-2017
- Cases clustered in the central part of the Los Angeles Basin, the northeastern part of the San Fernando Valley, the central and eastern parts of the San Gabriel Valley, and in the Antelope Valley (Figure 4D1). However during 2017, the relative number of cases in the LA Basin was lower than in the past. This is an area where low-cost vaccination clinics and preventative services were intentionally focused and offered regularly (Figure 4D2).
- The number of reported cases was higher in zip codes with fewer veterinary practices, particularly in the LA Basin area (Figure 4E).
- The number of reported cases was higher in areas of lower median household income (Figure 4F).

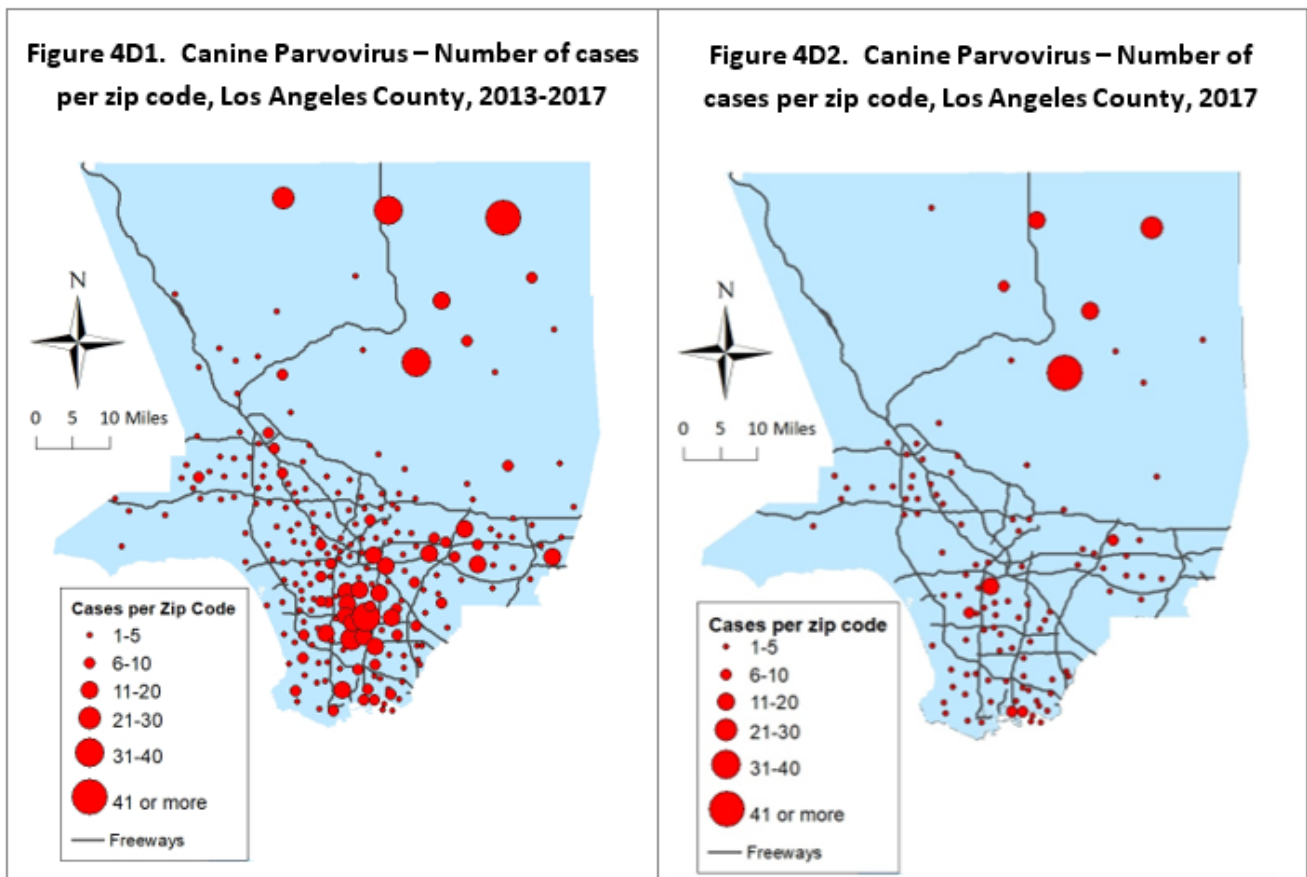


Figure 4E. Locations of canine parvovirus cases vs. veterinary practices, Los Angeles County, 2013-2017

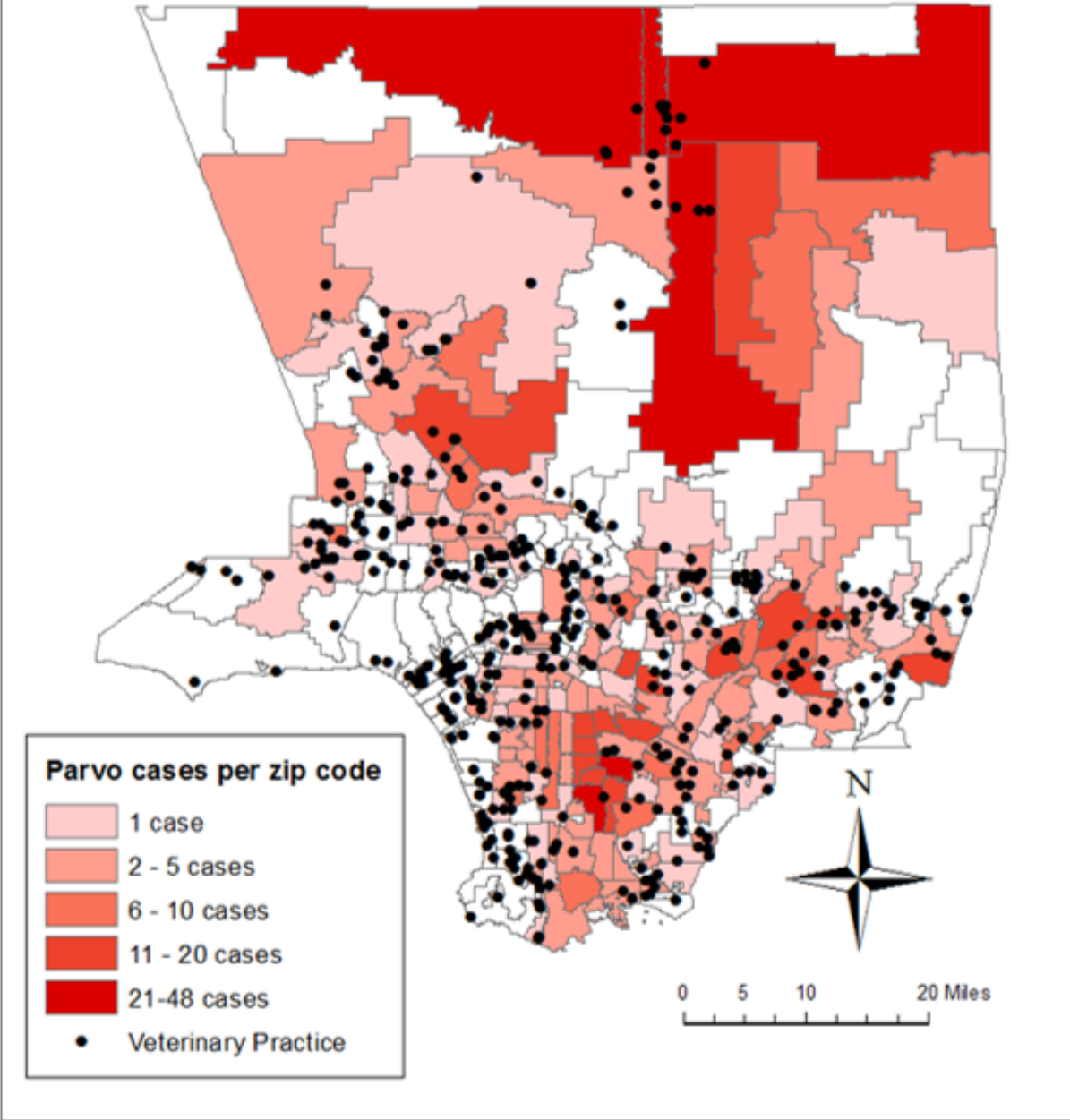
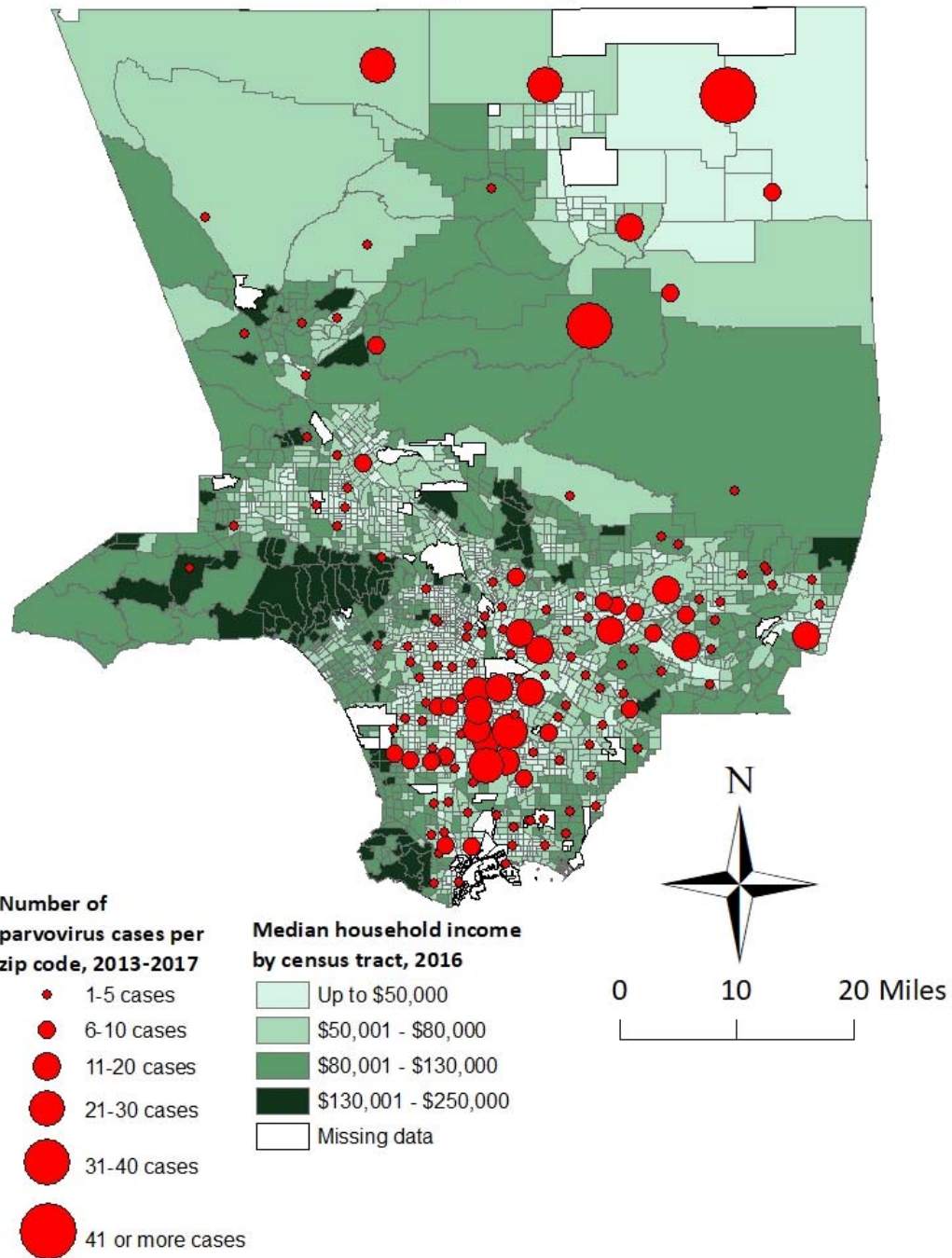


Figure 4F. Number of canine parvovirus cases per zip code 2013-2017 vs. median household income by census tract 2016*, Los Angeles County



*U.S. Census Bureau. (2016). 2012-2016 American Community Survey 5-Year Estimates - Median Household Income in the Past 12 Months (In 2016 Inflation-Adjusted Dollars), Table B19013. Retrieved from <http://factfinder.census.gov>
 *U.S. Census Bureau. (2016). California 2016 Census Tracts [Shapefile]. Retrieved from <https://www.census.gov/geographies.html>

Limitations

- Many parvovirus cases in dogs are likely unreported because veterinarians or shelters may forget to report cases, or dog owners may lack financial resources for, or access to, diagnostic testing for their dog.

Implications

- Canine parvovirus data highlights areas in LA County where more veterinary preventative services are needed. Dogs that have not been vaccinated against parvovirus may be less likely to receive other vaccinations, including rabies, as well as preventive care such as deworming and flea or tick control. Therefore, people in areas with more canine parvovirus may also face a higher risk for exposure to rabies or other zoonotic diseases if their pets become infected.
- Canine parvovirus data highlights areas of the County that have reduced access to, or utilization of, veterinary care. Additionally, in areas of lower income, there are financial limitations of owners to provide basic veterinary care such as vaccinations or wellness visits for their pet. Improving surveillance of canine parvovirus in LA County allows VPH to focus outreach efforts on the most affected communities.
- When outreach efforts such as low-cost vaccination clinics are focused on these identified communities, the number of cases reported is significantly reduced. In recent years, local veterinary medical associations and non-profit agencies have collaborated to offer these preventative services to areas such as Watts and South LA. As a result of these efforts, the number of parvovirus cases in these areas has been significantly reduced.
- The bimodal seasonality of parvovirus indicates opportunities for veterinarians and animal care organizations to focus education efforts and promote vaccination in the months prior to the seasonal rise in cases, with the intention of mitigating the increased number of cases each year.

Recommendations

- Cases of parvovirus in dogs in LA County should be reported by all veterinary facilities and shelters to VPH using the simplified Parvovirus Tracking Sheet.*
- Non-profit, governmental, and community organizations working in animal health are strongly encouraged to use canine parvovirus data to guide the location and timing of their community outreach efforts to improve animal vaccination and to promote responsible pet ownership.
 - Education on the proper vaccination of pets is a critical part of outreach. Dog owners should be educated about the disease, the importance of vaccination schedules (including boosters), and the importance of keeping their pets away from public places (doggy daycare, training, parks, beaches) until the puppy/dog is fully vaccinated to decrease the risks of exposure. They should also be educated on zoonotic and vector-borne disease prevention.

For More Information: publichealth.lacounty.gov/vet/parvo.htm.

* For veterinary practices: publichealth.lacounty.gov/vet/docs/Forms/ParvoTrackingSheet_vet.pdf

For animal shelters: publichealth.lacounty.gov/vet/docs/Forms/ParvoTrackingSheet_shelter.pdf

5. Valley Fever (Coccidioidomycosis)



Background and Significance

Valley fever (coccidioidomycosis) is caused by a fungus (*Coccidioides immitis*) that is common in dry climates of the southwestern United States, parts of Mexico, and Central and South America.²⁹ The fungus is found in the soil and spores can spread through the air, especially when the ground is disturbed such as during earthquakes, construction or excavations.³⁰ Disease occurs when fungal spores are inhaled by a person or animal.²⁹ Thus, exposure comes from the environment and, with extremely rare exceptions, *Coccidioides immitis* does not spread directly between people or between animals. Many people and pets that are exposed to the fungus do not get sick from Valley fever.³¹ Symptoms of Valley fever in humans and animals are generally similar and include: fever, fatigue, cough and sometimes skin lesions.³¹ Dogs may also suffer from weight loss and bone infections that appear similar to some types of bone cancers.³² Some pets, because of specific behaviors (living outdoors, digging into the ground), may be more likely to be exposed to Valley fever compared to people. Therefore, animals with Valley fever may act as sentinels for human disease in areas of LA County where the fungus is present.

Data Sources

In Los Angeles (LA) County, cases of Valley fever in animals are reportable to VPH by local veterinarians. Starting in 2014, VPH began receiving electronic laboratory reports (ELR) from veterinary diagnostic laboratories for every positive antibody test result for Valley fever. Each report was investigated by a VPH veterinarian in order to obtain a full case report. As a result, the number of reports and completeness of data received increased significantly starting in 2014. Occasionally, cases of Valley fever were not reported until a year or more after they were first diagnosed – this occurs when a laboratory reports a positive test, but the diagnosing veterinarian reports that the condition was initially diagnosed earlier, usually by biopsy or by being tested in another jurisdiction. Cases that were diagnosed outside of LA County were counted as cases in LA County only if they had illness from the disease while in LA County. Healthy dogs that were simply being tested for the disease were not counted as cases. Diagnosis was accomplished by detection of antibodies against the disease (serology) and/or biopsy of lesions or affected tissues, plus recognition of specific clinical signs. Location of probable exposure was assessed by obtaining a travel history. Exposure location was recorded as LA County, southern California other than LA County (Imperial, Kern, Orange, Riverside, Santa Barbara, San Bernardino, San Diego, San Luis Obispo and Ventura Counties) or outside of southern California. If available, travel destinations for those cases outside of LA County were recorded. In addition, each report was categorized as confirmed, probable or suspected based on the case definition for Valley fever in animals in LA County.* The data collected do not include any reports from veterinary practices in the cities of Long Beach or Pasadena (see page 4).

*Case Definition available at: publichealth.lacounty.gov/vet/CoccidioidomycosisCaseDef.htm

Findings

Totals - Dogs and cats with Valley fever

- In 2017, 37 cases of coccidioidomycosis were diagnosed in dogs. This is an increase compared to the 23 cases diagnosed in dogs in 2016 (Figure 5A).
 - In 2014, veterinary laboratories began to report cases electronically (ELR). The median number of cases reported during 2008 through 2013 was 5 per year. Between 2014 and 2017, the median number increased to 19 per year. Therefore, ELR likely improved surveillance, and it is unknown whether the true incidence of coccidioidomycosis increased in 2014.
- In the decade between 2008 and 2017, 120 cases of Valley fever in animals in LA County were reported in 118 dogs, 1 cat, and 1 Northern Elephant Seal.
 - 56% of cases were considered confirmed, 32% probable, and 13% suspected.

Exposures and risk factors

- Forty-one cases (34% of reports) had not traveled outside of southern California
- Sixty-two cases (52% of reports) had traveled outside southern California
- Seventeen cases (14% of reports) had an unknown travel history
- The top three most common places of exposure outside of southern California were Arizona, Central California, and the Mojave Desert.
- Twenty animals (20% of total reports) were reported to dig in the soil frequently. Other exposure factors reported included: being in a dust storm (13%), proximity to construction sites or other locations involving excavation (9%) and living mostly outdoors (8%) (Figure 5B).

Clinical Findings

- Dog cases
 - 58% had fever
 - 51% had cough
 - 43% had pneumonia or lung lesions detected on radiographs
 - 35% had weight loss
 - 33% had lameness
 - 15% had bone lesion(s) detected on radiographs
 - 23% had enlarged lymph nodes
 - 1% had eye lesion(s)
- Cat cases
 - 1 had eye and bone lesions
- Northern Elephant Seal case
 - Weight loss and failure to grow. Fungal lesions found throughout body after its death.

Figure 5A. Valley Fever (Coccidioidomycosis) in Animals, Los Angeles County, 2008-2017 (N=120 animals)

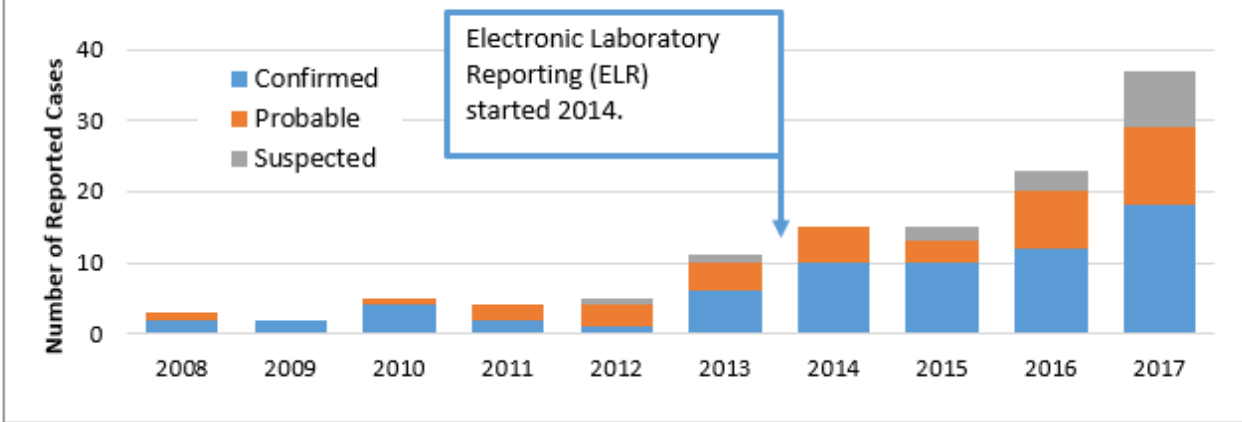
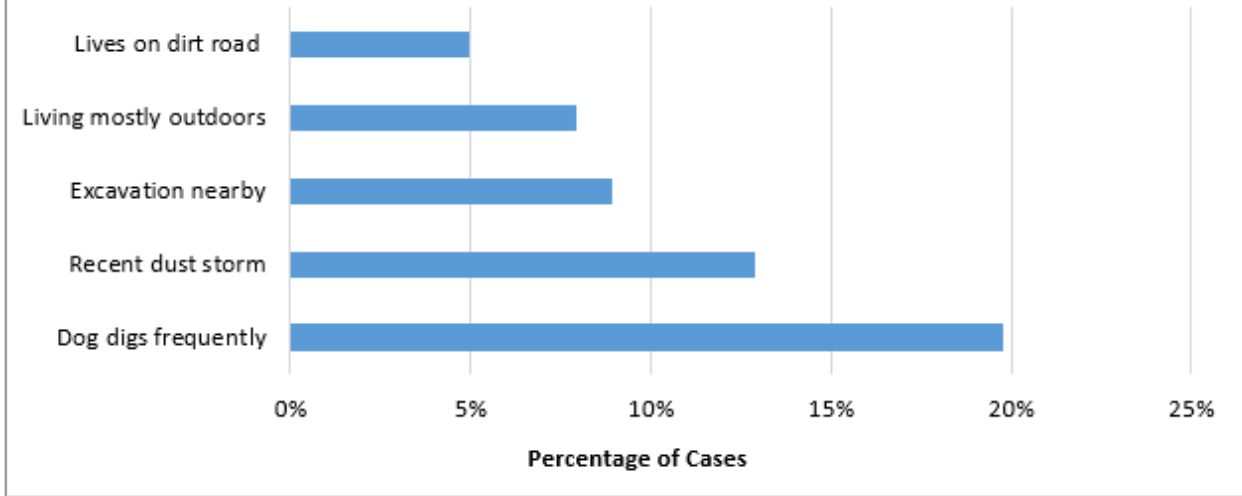
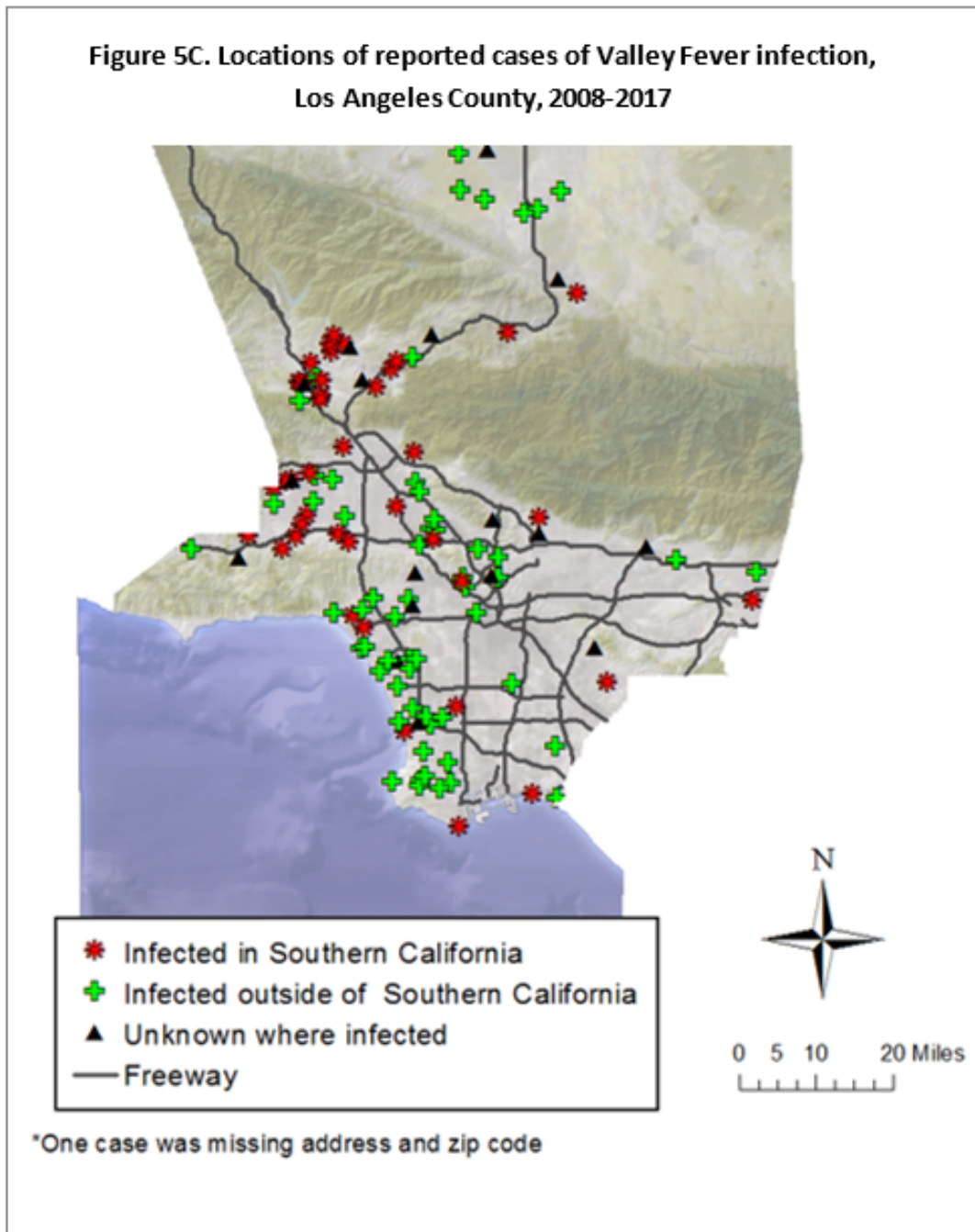


Figure 5B. Reported Exposure Risk Factors for Valley Fever (Coccidioidomycosis) in Animals (N=101), Los Angeles County, 2008-2017



Geographic pattern

- Most southern California acquired cases were reported from the San Fernando Valley. Many imported cases were found on the western coastal area of LA County (Figure 5C).



Limitations

Classification of cases on the basis of exposure location may be affected by the ability of animal owners to remember travel with their pet prior to diagnosis (recall bias). Because antibody levels in affected animals can remain positive for a long time, it may be difficult to differentiate current infection compared to previous exposure.

Implications

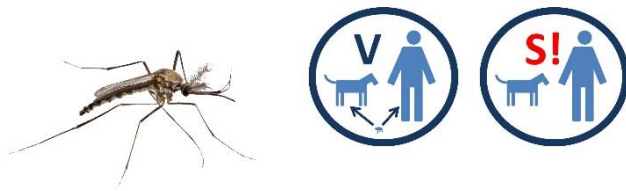
- In LA County, Valley fever is known to be endemic in the Antelope Valley and western San Fernando Valley. Most of the locally-acquired animal cases were reported from the San Fernando Valley. However, other areas of the county also have a low number of cases reported.
- Pets with Valley fever may act as sentinels for risk of exposure for the humans that live in the same area. Monitoring disease in animals may help identify cases in humans.

Recommendations

- Animal owners and their pets should limit outdoor activities during dust storms and nearby excavations. Dust control, such as by wetting down work areas with water, should always be performed during projects that involve excavation; this will reduce the likelihood of inhaling fungal spores. Pet owners should discourage their pets from digging in soil.
- Veterinarians suspecting Valley fever in their patients should obtain a thorough travel history, to help assess the local burden of the disease.
- Veterinarians should rule out Valley fever in local pets with proliferative bone diseases, especially in animals coming from endemic areas.

For More Information: publichealth.lacounty.gov/vet/coccidioidomycosis.htm.

6. West Nile Virus in Dead Birds



Background and Significance

West Nile virus (WNV) is most commonly transmitted to people from the bite of an infected mosquito. Mosquitoes become a vector for WNV when they bite and feed from an infected bird.³³ Although the virus has been found in a number of mosquito species, mosquitoes from the *Culex* genus are the most important vector for WNV in the United States.³⁴ Mosquitoes breed in standing water, therefore elimination of standing water is a critical factor in reducing the spread of WNV. About 20% of humans who are infected may experience flu-like symptoms, but the majority of infected people will not show signs of disease. Less than 1% of infected people may develop a more serious neurologic form of the disease that affects the brain.³³ Currently, there is no vaccine available for humans against WNV.

WNV is maintained in the environment by small song birds, that will only occasionally show signs of illness, but will have high levels of the virus circulating in the bloodstream. Chickens can also become infected by WNV but do not develop symptoms. WNV does, however, cause significant illness and death in some species of birds, including corvids (e.g. crows, ravens, jays, etc.) and birds of prey (e.g. hawks, falcons, owls, etc.). Several other animal species are susceptible to WNV, including squirrels, horses and a few reptiles; dogs and cats rarely get sick from WNV.³⁵ Affected horses with the disease usually develop severe neurologic signs. Fortunately, horses happen to be the only species for which a reliable and effective WNV vaccine exists. Horses and people are considered “dead end hosts” for WNV because even when infected, they do not develop high enough levels of the virus in the bloodstream and are not expected to pass the virus to a biting mosquito.³⁶

Originating from Africa and Europe, the first diagnoses of WNV in the Americas occurred in 1999, when the virus was found to be the cause of a cluster of neurologic disease cases in birds, horses, and people, in the New York City area.³⁷ Within just 3 years, the disease spread across the United States, becoming established in California by the end of 2003.³⁸ Since then, integrated surveillance programs have been put in place to track cases of WNV in humans, horses, wild birds, and mosquitoes. In some areas, chickens are periodically tested for exposure to WNV by checking for the presence of antibodies to the virus in the blood. Throughout LA County, cases of WNV occur every year in both humans and animals. Testing for WNV in deceased wild birds is one of the most cost-effective ways to track the virus in the community and can serve as a predictor for disease outbreaks in the human population.³⁹ Detection of WNV cases in birds often precedes detection of the first human cases by approximately one month. The location where a WNV-positive bird was found may not be the same as the location where the bird initially acquired the infection, as many birds fly long distances. However, a bird infected with WNV increases the risk of WNV in the area where it dies, as it can serve as a source of the virus for local mosquitoes while it is still alive and weakened by the virus. Therefore, mapping of dead birds infected with WNV can highlight areas of heightened WNV risk for humans.

Data Sources

Starting in 2002, animal control agencies, members of the public, and veterinarians began reporting dead birds to the California Department of Public Health (CDPH), to local vector control agencies, and to the Veterinary Public Health Program (VPH). Fresh bird carcasses were collected for WNV testing, and the results were mapped and shared with the community. This surveillance program was temporarily suspended in August 2013, when federal funding for much of the work was no longer available. In August 2015, VPH resumed collecting and testing dead birds for WNV.

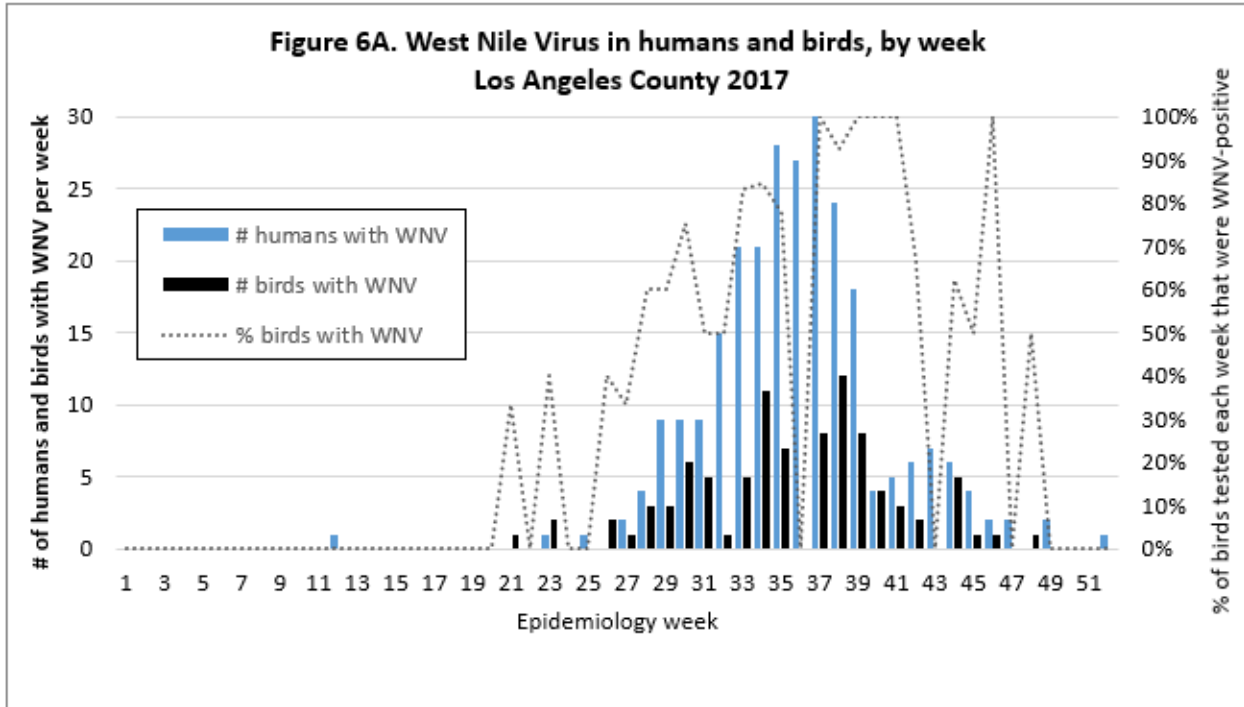
During 2013 and earlier years, multiple bird species and tree squirrels were accepted for testing. Since 2014, most testing has been limited to corvids and birds of prey, with occasional testing of other species. The majority (95%) of bird carcasses since 2014 were tested by polymerase chain reaction (PCR) performed by the Center for Vectorborne Diseases at the University of California, Davis. Before 2013, an in-house rapid-antigen test strip (VecTest™, Medical Analysis Systems, Camarillo, CA) was periodically used to test corvids. Using this procedure, only animals testing positive were considered confirmed cases and counted. The data reported here reflect the cumulative data for LA County, including tests arranged by both VPH and local vector-control agencies across the entirety of the County, and including data from the cities of Pasadena, Long Beach, and Vernon.

Data on human WNV cases were obtained from the Acute Communicable Disease Control Program of the LA County Department of Public Health, and does not include data from Pasadena, Long Beach, and Vernon.

Findings

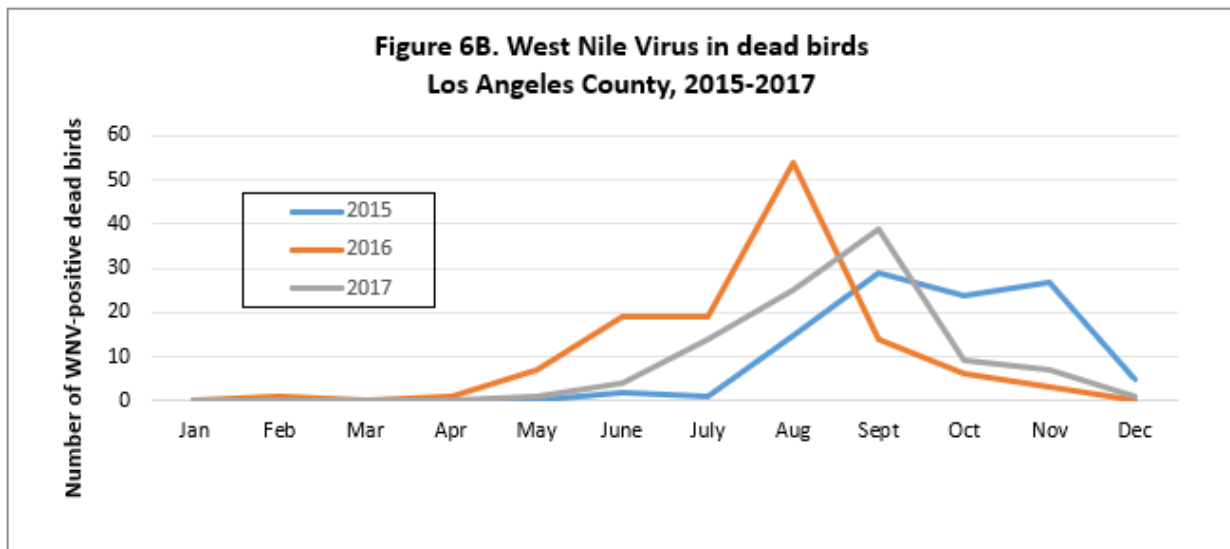
Totals – Birds and Humans with WNV

- In 2017, 159 dead wild birds from LA County were submitted for testing and 63% (100 birds) tested positive for WNV. These numbers have remained consistent over the past 4 years. The most commonly reported and tested bird species was the American crow (110 birds). Of the 100 WNV-positive birds, 88 were American crows.
- There were 268 people infected with the virus in the jurisdiction of the LA County Department of Public Health (i.e. excludes Pasadena, Long Beach, and Vernon) during 2017, which is a 75% increase from the 153 people infected in 2016.
- Unlike the previous year, where the first bird cases of WNV appeared approximately 6 weeks prior to the first human cases of WNV, in 2017 human and bird WNV cases began to appear and peak concurrently. The WNV season for both human and bird cases started in mid-June and peaked in mid-September. (Figure 6A)⁴⁰
- For 2017, the percentage of birds tested that were positive for WNV also followed the same trend as the absolute numbers of WNV positive human and bird cases; during the peak season, over 80% of birds tested in those weeks were positive for WNV.



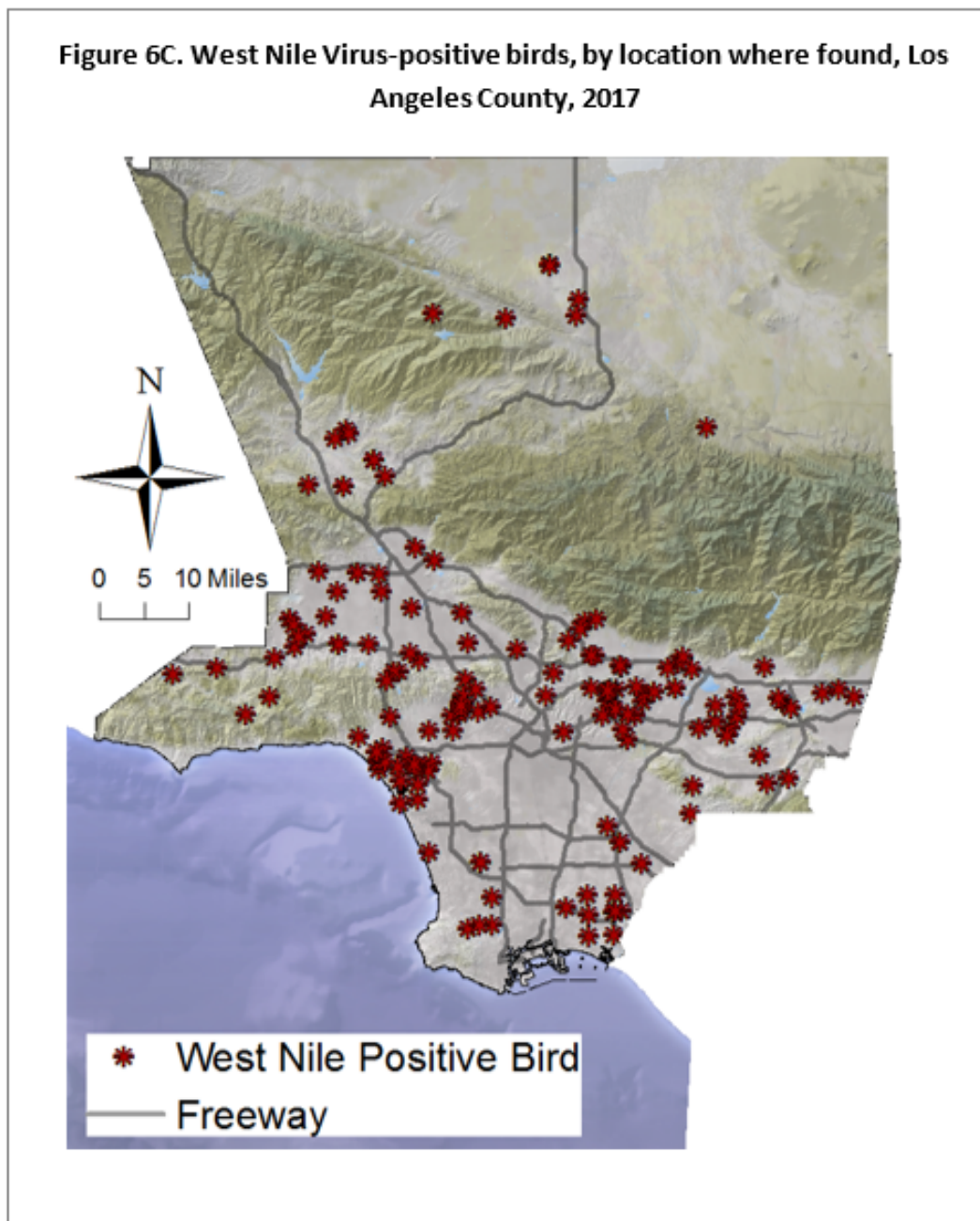
Seasonal Pattern

- The WNV season typically peaks during late summer. The number of WNV-positive birds in 2017 peaked in September, which is a month later than the peak during 2016, but similar to the peak in 2015 (Figure 6B).



Geographic pattern

- During 2017, WNV-positive dead birds were detected in multiple areas in LA County (Figure 6C).
- In 38 cities, 100% of the birds tested from that city were positive for WNV. The cities with the highest number of WNV-positive birds, and thus potentially at higher risk of human exposure to WNV, were:
 - Los Angeles (n = 16)
 - Santa Monica (n = 6)
 - Arcadia and Culver City (each n = 4)
 - Covina, San Gabriel, and Tarzana (each n = 3)
- There was a notable lack of WNV-positive birds from the middle of the LA Basin, but this may be due to lower levels of reporting of dead birds from that area.



Limitations

The total number of wild birds in LA County is unknown, therefore, it is impossible to calculate the total percentage of birds affected by WNV. Due to the reduction of federal funding for WNV surveillance for the State of California in 2013, VPH discontinued testing of birds for WNV in late August 2013. VPH restarted testing in 2015, however, public reporting of dead birds did not return to the levels seen in 2013; fewer birds have been reported and tested annually over the last 4 years. Additionally, not all dead birds reported are able to be tested for WNV. Specimens are not submitted for testing if the bird has been dead for more than 24 hours before collection, or if the reporting party is unable to collect the specimen into a plastic bag.

Implications

- WNV cases in both birds and humans continue to present in a strong seasonal pattern, with the number of cases and exposure risk peaking in the late summer months of August and September.
- Monitoring WNV in dead birds offers many benefits human public health, as WNV occurrence in birds appears to correlate with WNV occurrence in humans.
 - Bird cases are typically first detected about one month before the detection of the first human cases, thus the occurrence of WNV in birds can be used as a predictor for the disease in people.
 - Since the severity of WNV varies each year, bird testing can help identify shifts in the timing and the location of WNV exposure risk in humans in an ever-changing environment
 - Areas within LA County most severely affected by WNV-positive birds may correspond to areas of increased human exposure risk.
 - Years in which the number of bird cases is high, representing an elevated environmental risk, but the number of human cases is low may, may reflect success in human WNV prevention programs.

Recommendations

- Implement good mosquito control helps to reduce environmental exposure risk, protecting people and animals from WNV, heartworm disease, and other mosquito-borne disease
 - Mosquitoes breed in standing water, thus, any areas of standing water around a property (e.g. fountains, bird baths, pet water bowls, buckets, gutters, etc.) should be identified and emptied 1-2 times weekly.
 - Large bodies of stagnant water, such as neglected swimming pools, can breed extremely large numbers of mosquitoes and should be reported to the local vector control agency.
 - Try to avoid being outdoors in the evening, between dusk and dawn, as most mosquitoes are active during this time. When outdoors, applying and using mosquito repellent, in addition to wearing clothing that provides overall coverage (e.g. long-sleeved shirts, long pants, etc.), can reduce risk of mosquito bites.
- Report dead birds in LA County to VPH at (213) 288-7060. Only birds that are freshly dead, collected in a bag, and put aside in a secure place, can be tested.
- While there have been no reports of a human infection from handling live or dead infected birds, the public should avoid bare-handed contact when handling any dead animal. Birds that are to be collected for WNV testing, or are to be discarded, should be picked up using gloves or a shovel, before placing the

bird's carcass in a bag. The hands of the person bagging the dead bird should be washed thoroughly afterward.

- Communities should engage in targeted interventions to prevent WNV infections between mid-spring and late autumn.

For More Information: publichealth.lacounty.gov/vet/WNV.htm

7. Methicillin-Resistant Staphylococcal Infections and Co-infections



Background and Significance

Antibiotics have played a significant role over the past century in reducing illness and death from bacterial infections.⁴¹ Although bacteria may become resistant to antibiotics naturally, continuous overuse and misuse of these products are facilitating the development of more widespread resistance.⁴² Today, antibiotic resistant bacteria, such as methicillin-resistant *Staphylococcus aureus* (MRSA), represent a major threat to public health, especially in human healthcare settings.⁴³

Antibiotic resistance has been a concern in food-producing animals for many years and is becoming an increasing concern in small animal veterinary medicine.⁴⁴ Unlike humans, dogs and cats do not usually harbor *Staphylococcus aureus*; any MRSA diagnosed in these species is thought to be the result of reverse zoonosis, in which the animals became temporarily colonized through contact with humans harboring the bacteria.⁴⁵ However, dogs and cats do commonly carry a related species of bacteria, *Staphylococcus pseudintermedius*, which has also demonstrated antibiotic resistance.⁴⁶

Laboratory tests such as bacterial culture and antibiotic sensitivity are useful in determining the most efficient treatment against a specific infection. Unfortunately, when cost is a limiting factor, veterinarians may not be able to submit every suspect bacterial infection for culture and sensitivity testing. The treatment plan in these cases usually involves empirical antibiotic use, which could contribute to increased bacterial resistance.

While some antibiotic resistant bacteria do not cause disease, severe infections can occur if the bacteria enter open wounds (e.g. surgical sites) or when they infect immunocompromised individuals.⁴⁷ Collecting data on antibiotic resistance from small animal veterinary clinics may help uncover trends of antimicrobial resistance in Los Angeles (LA) County.

Data Sources

Methicillin-resistant staphylococcal infections in animals are reportable in LA County to Veterinary Public Health (VPH) by local veterinarians. Reports were also received for non-methicillin-resistant staphylococcal infections that were resistant to other antibiotics, as well as for co-infections with other species of bacteria. Bacterial resistance to methicillin was not directly recorded by the veterinary diagnostic laboratories; an assessment of resistance to methicillin was based on resistance to oxacillin, another antibiotic in the same class, which can be used to predict methicillin sensitivity.

Findings

Totals – Mammals with staphylococcal infections

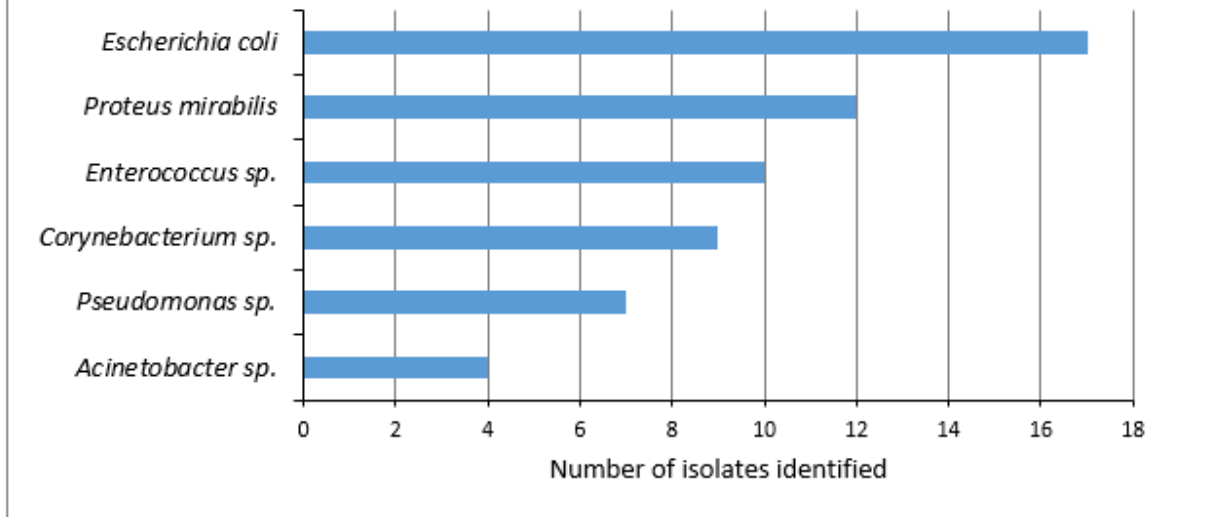
- In 2017, 98 animals (97 dogs and 1 cat) in LA County were reported to have methicillin-resistant staphylococcal infections. VPH received 101 reports, with three being recheck cultures from animals for which an infection had been reported earlier in the year. Some animals were concurrently infected with multiple staphylococcal species or had methicillin-resistant infections cultured from multiple sources, resulting in a total of 115 methicillin-resistant staphylococcal isolates reported.
- For the remainder of this section, we considered only those cases reported in 2017 by a single veterinary dermatology practice in LA County, totaling 95 cases. In four cases, methicillin-resistant staphylococcal infections were cultured from both skin infections (dermatitis) and ear infections (otitis). In two cases, two different species of methicillin-resistant *Staphylococci* were cultured from the same source. *S. schlieferi* was cultured twice from one animal for two separate episodes of otitis; this was reported as two individual isolates, bringing the total number of staphylococcal isolates reported from this dermatology practice was 108.
 - The most common resistant species found continue to be *S. pseudintermedius* and *S. schleiferi*, with 70 isolates and 31 isolates reported respectively, representing approximately 93% of the total isolates reported (Table 7A).
 - Resistant *Staphylococcal* infections were most commonly cultured from the skin of animals (Table 7A).

Table 7A: Reported methicillin-resistant Staphylococci isolates and lesion type (n=108) From a single veterinary dermatology clinic in Los Angeles County, 2017			
Species of <i>Staphylococcus</i>	Number of isolates	Dermatitis	Otitis
<i>S. pseudintermedius</i>	69	57	12
<i>S. schleiferi</i>	31	19	12
<i>S. aureus</i>	3	1	2
<i>S. epidermis</i>	3	1	1
<i>S. auricularis</i>	1	1	0
<i>S. simulansis</i>	1	1	0
Total	108	81	27

Co-infections with other bacteria

- Associated with the 95 cases of methicillin-resistant staphylococcal infections reported from this dermatology practice, the most commonly identified bacterial co-infections were: *Escherichia coli* (17 isolates), *Proteus mirabilis* (12 isolates), *Enterococcus* spp. (10 isolates), *Corynebacterium* spp. (9 isolates), *Pseudomonas* spp. (7 isolates), and *Acinetobacter* spp. (4 isolates) (Figure 7A). These six genera of bacteria comprised 76% of co-infections and were also the six most common co-infections in 2016. There were also six co-infections with several staphylococcal species that were not methicillin-resistant.

Figure 7A: Bacteria causing co-infections along with methicillin-resistant *Staphylococcus*, reported from a single veterinary dermatology clinic in Los Angeles County, 2017

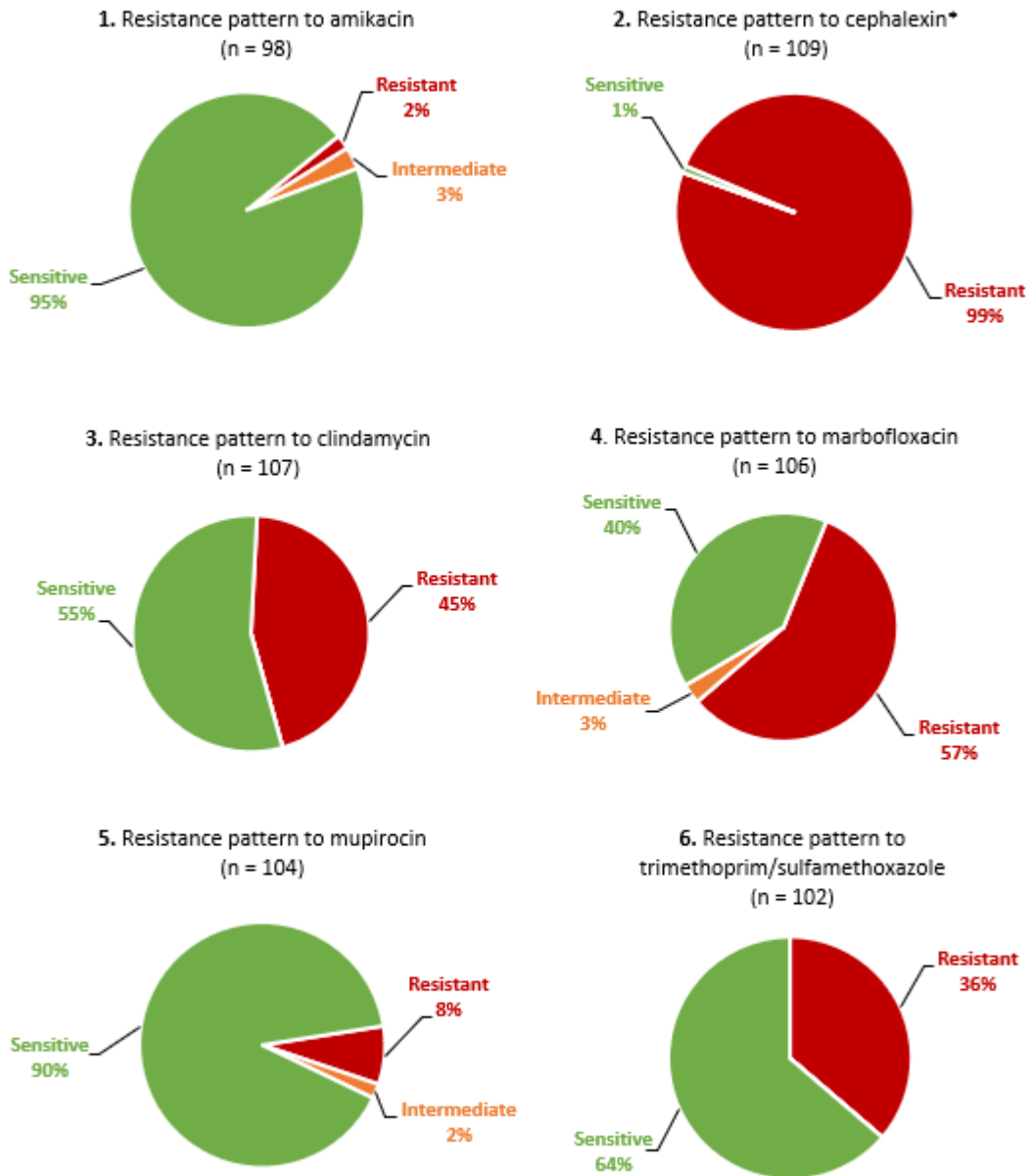


Antibiotic resistance patterns

- The resistance of methicillin-resistant *Staphylococcus* bacteria to other antibiotics tested in laboratory culture and sensitivity panels were variable, although several trends can be noted (Figure 7B).
 - Methicillin-resistant *Staphylococci* from our sample demonstrate 99% resistance to some of the most commonly utilized antibiotics from the cephalosporin and beta-lactam classes (Figure 7B-2). This is an increase from data collected in 2016, which showed resistance to cephalosporins and beta-lactams at 93%.
 - Resistance patterns to topical antibiotics remains minimal; for example, methicillin-resistant bacteria show 90% sensitivity to mupirocin (Figure 7B-5).
- Although methicillin-resistance was not routinely evaluated for the bacterial co-infections, resistance patterns to other antibiotics exist.
 - Approximately 22% of the co-infections, regardless of bacterial species, were resistant to at least one cephalosporin or beta-lactam antibiotic.
 - More than half of the *E. coli* co-infections were resistant to all tested cephalosporin and beta-lactam antibiotics.

Figure 7B. Antibiotic-resistance in methicillin-resistant Staphylococcal infections to select antibiotics from a single veterinary dermatology practice in LA County, 2016.

(n = number of times antibiotic was tested)



Case Examples

- Methicillin-resistant *S. pseudintermedius* (MRSP) was cultured from the ear canal of a dog with chronic otitis associated with a malignant myoepithelioma with ductular ceruminous carcinoma (a type of cancer). This isolate was also found to be resistant to almost all of the antibiotics tested in the susceptibility panel, only sensitive to amikacin, mupirocin, rifampin, and trimethoprim/sulfamethoxazole.
- MRSP was also cultured from skin lesions on a dog with a one-year history of dermatitis. The dog had a concurrent diagnosis of mycosis fungoides (a type of skin cancer), for which it was undergoing chemotherapy. This MRSP infection was sensitive to only three antibiotics on a sensitivity panel: amikacin, mupirocin, and rifampin.
- Methicillin-resistant *S. aureus* (MRSA) was cultured from the ear canal of a cat with ongoing otitis externa. Several months later, MRSA was also cultured from skin lesions on the same cat, along with a co-infection of *Staphylococcus felis* which did not exhibit any antibiotic-resistance. Both MRSA isolates were sensitive only to amikacin, gentamicin, mupirocin, chloramphenicol, and trimethoprim/sulfamethoxazole.

Limitations

The data presented are derived only from the limited number of reports received by VPH from a single veterinary dermatology practice and may not accurately represent the total number or distribution of antibiotic resistant infections in LA County. Considering only reports from a dermatologist possibly over-represents cases of resistant bacterial dermatitis and otitis. Veterinarians may not have the ability to submit all suspect cases for bacterial culture and antibiotic sensitivity testing, and they also may not be reporting all cases of antibiotic-resistant staphylococcal infections. The antibiotic panels used by the veterinary laboratories when performing antibiotic sensitivity tests are not consistent; the number of times each antibiotic was assessed varied among the cases (see sample sizes in Figure 7B). Some isolates may reflect environmental flora rather than a true disease-causing organism.

Implications

- Antibiotic-resistant infections are detected in LA County veterinary practices. Based on the data collected, the most common methicillin-resistant isolate in small animals continues to be *S. pseudintermedius* (MRSP), and it is most commonly cultured from the skin and ears. MRSA infections continue to be uncommonly reported in pets.
- Empirical antibiotic selection for suspected bacterial infection may not lead to effective treatment, as methicillin-resistant *Staphylococci* often demonstrate resistance to many of the commonly used antibiotics.
 - Ineffective treatment is most likely with empirical selection of a cephalosporin or beta-lactam antibiotic to treat chronic, recurrent, or severe cases of suspected bacterial dermatitis, as the susceptibility of methicillin-resistant *Staphylococci* to these classes of antibiotics is extremely low.
 - The antibiotic options for treatment of methicillin-resistant bacterial infections may continue to decrease as antibiotic-resistance develops.
- The relationship between animal and human health remains unclear regarding antibiotic-resistant infections. Although MRSP rarely causes disease in humans, zoonotic transmission of MRSP from

animals to humans is possible.⁴⁸ Antibiotic-resistant organisms can opportunistically cause severe infections in both animals and humans who are immunosuppressed, or if the bacteria are inoculated into a wound.

Recommendations

- Pet owner education about antibiotic-resistance in bacteria should be included in discussions with veterinary staff if their pet has a suspected bacterial infection, and prior to dispensing antibiotics for the pet.
 - It is possible for a person to become colonized by MRSA during visits to human healthcare facilities. Pet owners could then transfer the MRSA to their pets, causing temporary colonization or active infection.
 - Pet owners with a history of recent surgery, open wounds, or immunosuppressive conditions should exercise appropriate personal hygiene around their pets to minimize the risk of opportunistic infections (e.g. frequent handwashing and avoiding licks to the face, hands or wounds).
- Veterinarians should strive to consistently submit samples for bacterial culture and antibiotic sensitivity testing prior to prescribing antibiotics for pets.
 - Empirical antibiotic use without first performing culture and sensitivity testing may promote more antibiotic-resistant bacteria in the environment and may not result in effective treatment.
 - Several guidelines are available regarding judicious uses of antimicrobials^{49,50} and antimicrobial use for treatment of urinary tract infections (UTIs) in dogs and cats.⁵¹
- We strongly encourage veterinarians to report cases of methicillin-resistant bacterial infection to VPH so that we may track developing trends in antibiotic resistance.

For More Information: publichealth.lacounty.gov/vet/AMR.htm.

8. Imported Pets and Public Health

Background and Significance

Over the last two decades, the importation of dogs for the commercial pet trade has increased both locally and internationally. Between 2002 and 2005, the number of puppies being imported into the United States tripled. Specifically in California, the majority of puppy imports occurred in Los Angeles County, with Los Angeles International Airport (LAX) serving as a major port of entry.⁷ In addition to animals being imported for the commercial pet trade, VPH has also witnessed an increase in the number



of dogs imported by southern California-based dog rescue organizations in recent years. Without proper oversight, dogs imported for either the commercial pet trade or through international animal rescue groups pose a significant public health and disease risk to southern California residents and their pets.

The Commercial Pet Trade and Public Health

Numerous animal welfare and public health issues have been documented for dogs imported through the commercial pet trade during live animal inspections performed at LAX by VPH staff. Dogs have arrived into LAX from abroad in unsanitary conditions, underage with falsified paperwork, without having received proper immunizations, and placed in improperly-sized shipping crates without food or water.⁵² Multiple cases of imported sick or dead dogs have also been documented. Two notable examples of imported rabies include a rabid cat imported from Mexico into LA County in 1987, and a rabid dog imported into LA County from Thailand in 2004 (see page 11).⁷ Both animals were visibly sick but still allowed entrance into LA County. Other diseases imported into the United States for the commercial pet trade include monkey pox, leishmaniasis, screwworm, canine distemper, canine heartworm, and canine parvovirus.^{7, 53, 54}

Animal Rescue Organizations and Public Health

A number of rescue organizations are active in southern California. In addition to working locally, some of these groups also rescue dogs internationally and import them into LA County through LAX. Recent surveys conducted by VPH at LAX showed an increase in rescued dogs, especially from countries in both South America and Asia. Because dogs that are rescued tend to be stray, abandoned, or street dogs, this potentially poses an even higher risk for the importation of diseases. For example, the last known rabid dog to pass through LAX in 2004 as mentioned above, was a stray dog rescued from Thailand by an individual (see page 11). In 2011, a street dog was rescued and imported from Turkey, and diagnosed with leishmaniasis. More recently, evidence suggests that the 2015-16 outbreak of H3N2 canine influenza in the Midwest was related to a single introduction of the virus from South Korea.⁵⁵ Furthermore, in 2017, multiple dogs in LA County were quarantined for Canine Influenza H3N2, after an international rescue group imported a dog into LA County that was sick with Canine Influenza H3N2.

Agencies that Oversee Animal Importation

The Centers for Disease Control and Prevention (CDC) is the federal agency which regulates the importation of dogs and cats.⁷ The current CDC regulations state that imported dogs from countries listed as “non-rabies free” are required to be vaccinated for rabies as early as 3 months of age, and can legally enter the United States one month after the rabies vaccination was administered. This means that the minimum age at which a dog can legally enter the United States from a country where rabies is present is 4 months of age.⁵⁶ Under very limited and specific circumstances, dogs that arrive from rabies endemic countries without being vaccinated against rabies may be issued a confinement agreement by the CDC, which requires the dog to be confined at the importer’s address until one month after the rabies vaccine is given.⁵⁶

Dogs from countries considered to be “rabies-free” by the CDC may be imported without proof of rabies vaccine if the dog lived in that country for at least 6 months prior to importation. However, the CDC may deny any dog entry into the United States if it does not meet all requirements. In addition, all states require that dogs be vaccinated for rabies by an approved vaccine. Therefore, imported dogs without proof of rabies vaccination can be subject to quarantines by local authorities.⁵⁶

For pet cats, neither a general health certificate nor rabies vaccination is required by the CDC for entry into the United States, although some airlines or states may have different requirements. However, cats may still be subject to inspection. If a cat appears to be ill, further examination by a licensed veterinarian at the owner's expense may be required at the port of entry.⁵⁷

For more information visit: <https://www.cdc.gov/importation/bringing-an-animal-into-the-united-states/>. Note that federal pet importation regulations may change over time. Updated recommendations may be available on websites of the CDC and United States Department of Agriculture Animal and Plant Health Inspection Service (USDA APHIS). For more information visit: <https://www.aphis.usda.gov/aphis/pet-travel/>.

Role of VPH:

Over the past decade, VPH has assisted the CDC with inspections of selected shipments of dogs at Los Angeles International Airport (LAX) to verify the health status and age of imported dogs. VPH compares the physical age of the animal with the age stated on the accompanying paperwork and also enforces local dog importation quarantines within LA County. Not every shipment can be inspected, so larger shipments, and shipments from repeat shippers are prioritized.

Data Sources

In 2011, VPH and CDC worked with airlines at LAX to create an Advance Notification System for dog imports. Airlines at LAX are requested to notify both agencies in advance of when a dog is imported. VPH performs live inspections of selected dog shipments, and maintains a database that contains relevant data, including:

- Advance Notifications received from airlines
- Live animal inspections performed by VPH staff
- Information on animals under federal importation quarantines in LA County

Findings

Findings

Totals - Advanced Notifications and Inspections on imported dogs in 2017:

- 776 Advanced Notifications for dogs were received from 18 airlines. In 2016, VPH received 428 advanced notifications from 17 airlines (Figure 1).
 - Of the 776 Advanced Notifications received in 2017, 283 (36%) of these shipments were inspected. The other 64% of shipments were not inspected because they arrived after regular work hours on weekdays, on the weekends, were identified as low risk, or due to competing priorities at VPH, which did not allow for staff to be at LAX.
 - The 283 shipments of dogs that were inspected were imported from 34 different countries. This is decreased from 2016 data, which showed inspected shipments had come from 43 countries.
 - Of the 34 countries where dogs were imported in from (23 countries (68%) are considered rabies endemic by the CDC (Figure 8B). The most common rabies-endemic regions of origin were eastern Asia, eastern Europe, and South America.
 - 86% of the 283 inspected shipments had a California based address for the consignee (importer)
 - A total of 3 dogs were issued health orders 2017.
 - The range of diseases that VPH issued health orders for were respiratory disease (coughing, sneezing, nasal discharge), skin disorders, and an eye ulcer.
 - 18 dogs (5 separate shipments) were shipped back by the CDC to their country of origin after VPH found that they were underage and had fraudulent paperwork.
 - French Bulldogs continued to be one of the most popular imported breeds for the commercial pet trade, followed by Pomeranians.

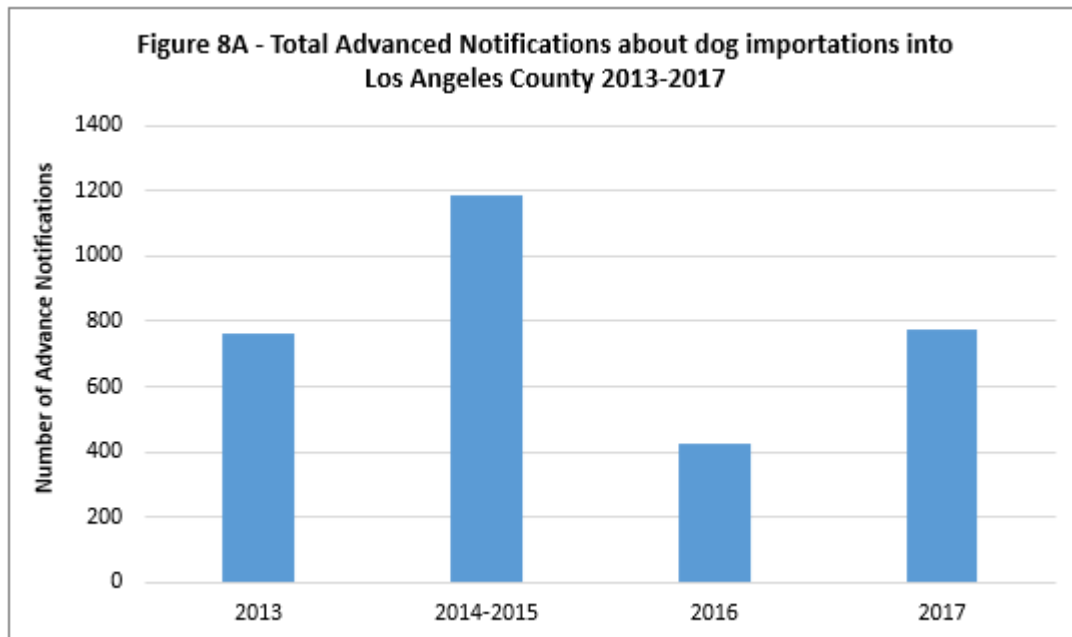
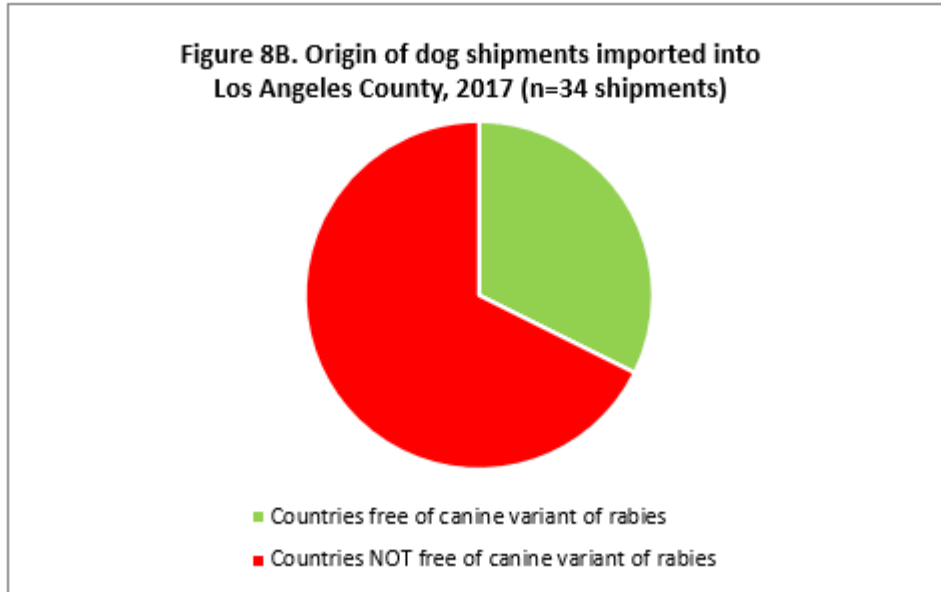


Figure 8B. Origin of dog shipments imported into Los Angeles County, 2017 (n=34 shipments)



Limitations

The Advance Notification System relies on airlines reporting upcoming dog importation shipments to VPH and the CDC. However, airlines may not report all dog imports for multiple reasons. This includes staff training on the Advanced Notification System to staff turn over. The most likely reason the number of advanced notifications increased in 2017 is because VPH and CDC did additional outreach to airlines after noticing the decreasing trend of advanced notices being reported from 2014-2016.

VPH does not have access to a master list of all dog shipments; therefore, the total number of dogs imported through LAX is not known.

VPH only collects importation data on dogs coming from other countries through LAX airline cargo. Dogs traveling in-cabin or imported through other international airports and then later arriving in Los Angeles are not tracked.

For cases where additional information about the dog’s origin is not available, the country where the dog boarded the flight is assumed to be the country of origin. Prior to the flight, dogs may have travelled from another country that may or may not be considered “rabies-free” by the CDC.

Targeting larger, multiple-dog shipments for inspection may lead to underrepresentation of health issues related to shipments of single animals.

Diagnostic workups are not required for imported animals that are ill. Many diseases that require additional tests for diagnosis may be missed by a brief physical exam.

Implications

- Inspections are helpful in determining if imported pets are sick or old enough to be imported.
- Collaborative outreach to airlines at LAX by VPH and the CDC has helped to maintain the number of Advance Notifications received by both agencies.
- Many of the dogs that are imported into LA County come from rabies-endemic countries.
- Some importers for the commercial pet trade have websites that advertise their puppies as being bred domestically. As a result, new owners purchasing these dogs may not know that their new puppy is from abroad.
- VPH is beginning to see a trend in local rescue groups importing adult dogs into LA County from rabies endemic countries in South America and Asia. Because the consignee (importer) name may be the name of an individual instead of that of a rescue group, the importation activity of rescue groups may be difficult for VPH to track. Internationally rescued dogs may represent an even higher risk for importation of diseases than those part of the commercial pet trade. Dogs that are rescued tend to be stray or street dogs, which have an increased likelihood of exposure to infectious diseases. In addition, due to financial constraints, not all rescue groups are able to cover additional infectious disease testing and veterinary care.

Recommendations

- Pet owners and veterinarians should inquire about the origin of puppies. If the owner of a new puppy did not see the dog's parents, it could be imported.
- Veterinarians should ask pet owners for copies of any paperwork associated a new pet and inquire about its origin. Veterinarians should check the teeth to verify the age of puppies, and match the description of a dog to any available paperwork. If the paperwork seems questionable, veterinarians should consider giving vaccine boosters.
- If a dog is sick, veterinarians should consider foreign animal diseases, including rabies. Suspected rabies or any other infectious disease in an imported animal must be reported to VPH immediately.
- Dog owners should pick up and discard feces immediately, not let the puppy mingle with other animals until it is confirmed to be healthy and fully vaccinated, and always wash their hands after handling their puppy or any other animal.
- Veterinarians who work with rescue organizations should strongly encourage veterinary examinations of newly arrived dogs and recommend a minimum of a 30-day observation period prior to adoption.

For More Information: publichealth.lacounty.gov/vet/PetImport.htm

9. Canine Influenza H3N2



Background and Significance

Canine influenza is a highly contagious respiratory infection in dogs caused by an influenza virus. There are two known strains: H3N8 and H3N2. Both strains cause fever, coughing, sneezing, nasal discharge, and occasionally pneumonia and death. To date, neither strain has been known to be transmissible to humans.

Infected dogs transmit the virus through coughing and sneezing. Other dogs become infected by breathing in aerosolized droplets from the infected dog, through direct contact, or through contact with contaminated surfaces. Neither strain is known to make people sick. There are vaccines available to help protect dogs from getting sick with both strains of the virus.⁵⁸

Canine influenza is a relatively new virus. Prior to 2004, no influenza viruses were known to be capable of causing outbreaks in dogs. Both strains of canine influenza originated in other species before evolving the ability to infect dogs. Although neither strain is known to be able to infect people, the emergence of these viruses serve as a significant reminder that new influenza viruses can emerge to infect animal and human populations. The most effective way to protect the community from outbreaks is to isolate dogs infected with canine influenza until they are no longer contagious.

Canine Influenza H3N8

This virus was first reported in Florida in 2004. It jumped species from horses to dogs.⁵⁹ It has caused a few outbreaks in Los Angeles County. Infected dogs can shed the virus for 2-5 days before the start of symptoms, and for 2-4 days after. Infected dogs are typically isolated for 7 days.^{60, 61}

Canine Influenza H3N2

This virus was first reported in South Korea in 2006, and likely emerged in Asia sometime around 2002-2004.⁶² The virus caused a large outbreak in the Chicago area in 2015. It likely jumped species from birds to dogs in Asia.⁵⁵ It is able to infect cats, although this appears to be rare.⁵⁹ Infected dogs shed the virus for 2 days before the start of clinical signs, and may shed it intermittently for 21 days or more afterward.⁶³ As a result, the 7-day isolation period used to stop outbreaks of the H3N8 virus in dogs is not long enough for stopping the outbreaks from the H3N2 virus. Dogs infected with the H3N2 virus should be isolated for 30 days to prevent spread.⁵⁹

The first case reported in southern California was in a German Shepherd in south Orange County in March 2015 (Online posting – southern California Veterinary Medical Association, 2015, no longer available). This virus was first detected in Los Angeles County in July 2015. In 2017, it caused two outbreaks in dogs and three single reports of sick dogs in Los Angeles County.

New research has shown that the H3N2 canine influenza virus has been introduced multiple times in dogs imported from Asia into the USA, triggering outbreaks, each of which subsequently fade out.⁶⁴ The virus also may still be going through the process of genetically adapting to dogs.⁶²

Data Sources

In LA County, cases of influenza in dogs and cats are reportable to VPH by local veterinarians. This report only addresses the canine cases. Most dogs are tested for canine influenza through either polymerase chain reaction (PCR) testing for the presence of the virus in nasal and pharyngeal swabs, or testing for antibodies against the virus in the bloodstream.⁵⁸

Confirmed cases were dogs that had clinical signs compatible with canine influenza, and that had either a positive PCR test, or a positive antibody titer in an unvaccinated dog. Suspected cases were those that had compatible clinical signs and an epidemiologic link to a confirmed case.

Cases of canine influenza H3N8 and H3N2 during 2015 and earlier were previously reported in the 2015 Animal Disease Surveillance report (<http://publichealth.lacounty.gov/vet/reports/2015LACountyAnDisSurvReport.pdf>) and are summarized here only briefly. There have been no cases of canine influenza H3N8 reported in Los Angeles County since 2011, therefore this report focuses on just canine influenza H3N2.

Findings

Totals - Dogs with canine influenza H3N2

- In 2017, a total of 65 cases of canine influenza H3N2 were reported.
 - 10 cases were confirmed, and 55 cases were suspected
 - There were no deaths.
 - Cases were spread across 2 outbreaks, and 3 single cases with no associated outbreaks.
 - **Outbreak in March.** A small group of coughing dogs were imported from Asia, triggering an outbreak. A total of 35 dogs became ill. Six cases were confirmed by PCR testing (including one of the originally imported dogs), and the other 29 cases were suspected based on epidemiologic links to the confirmed cases. To control the outbreak, a total of 62 dogs were placed under isolation or quarantine in 17 locations. Sick dogs were isolated for at least 3 weeks at their homes and then re-tested to make sure they were negative for the virus. Healthy dogs that had been exposed to sick dogs were quarantined at home for 7 days.
 - **Single confirmed case in March.** A dog developed coughing and pneumonia in San Bernardino County and was taken to Los Angeles County for testing and treatment. The dog recovered, and was isolated a veterinary hospital for 2 weeks before being placed with a group of 90 other dogs. Since dogs with canine influenza H3N2 can be contagious for more than 2 weeks, an extensive investigation was performed, which determined that the virus had not spread further.

- **Single confirmed case in May.** This case was not reported until August 2017. A single dog imported from Asia was found to have fever and pneumonia soon after arrival. The dog was taken to two veterinary practices in the San Gabriel Valley area of Los Angeles County. It was kept at home until it appeared healthy, but was not isolated for a full 30 days. Fortunately, there were no reports of any other dogs directly catching influenza from this dog.
 - **Outbreak in July.** A dog in the San Gabriel Valley area developed a cough after returning from a boarding facility. The dog was found to be PCR-positive for canine influenza H3N2. At least 26 other dogs developed coughing during this outbreak, but none of the other dogs were tested for influenza. Around this time, verbal reports were received from researchers that some dogs might test positive for more than 30 days after onset of illness. This outbreak was successfully contained by isolating sick dogs at home for 40 days, and quarantining exposed dogs for 14 days.
 - **Single confirmed case in November.** A veterinarian in the San Fernando Valley area reported that a dog with moderate coughing had tested positive for canine influenza H3N2 by PCR. The dog had been at a grooming facility during the week before illness, but had no other reported contact with dogs. The dog was placed in home isolation for 40 days, and an investigation was performed. As of November 9, 2017, there was no evidence of an outbreak.
- Before 2017, only one other case of canine influenza H3N2 had been reported in LA County. In July 2015, an adult Labrador mix in the southern half of the county had stayed in a kennel for about a week, and began coughing the day after it arrived home. It was not imported. It had not visited any other dog parks or other facilities. The dog was isolated at home for 3 weeks after becoming ill. Three other dogs developed coughing or sneezing after visiting the facility around the same time period, but all three tested negative for canine influenza viruses by PCR testing.

Limitations

Cases may have been underreported. The clinical signs of canine influenza H3N2 can look very similar to other causes of respiratory disease in dogs. Veterinarians may not test dogs for canine influenza if the dog is only moderately ill, and if the owner declines to pay for testing. Surveillance for this disease relies upon veterinarians remembering to report cases – it is possible some veterinarians did not report cases.

Implications

- Importation of dogs infected with canine influenza H3N2 has been the primary cause of outbreaks in the USA in recent years,⁶⁴ and was the cause of at least one outbreak in LA County in 2017
- Outbreaks are more likely to occur in areas where dogs are housed indoors together (such as boarding facilities), and when dogs are transported around the county or country.

Recommendations

- **Veterinarians/Animal Shelters**
 - **Vaccination.** Dogs that frequently interact with other dogs (e.g. dog park, groomer, daycare) should be vaccinated against canine influenza H3N2 to promote herd immunity, to protect the Los Angeles County dog population.
 - **Infection Control.** Do not allow coughing dogs into your lobby. Move them immediately into an exam room, or have the owner wait in the car with their coughing dog if it not too hot outside.

Hospitalize any coughing dog in an isolation area. Thoroughly clean and disinfect all surfaces that have been in contact with a coughing dog or its owner. Most common disinfectants kill the influenza virus when used properly. Advise pet owners to keep any coughing or sneezing pet at home, away from other animals.

- **History-taking.** Ask about travel and origins of any coughing dog. Ask about the health of other dogs that have spent time near the coughing dog, to determine if there may be an outbreak.
- **Isolation & Quarantine Duration**
 - Isolate confirmed or suspected cases of canine influenza H3N2 for 40 days.
 - Quarantine pets (dogs and cats) exposed to confirmed or suspected cases for 14 days. Isolation is usually in the pet owner's home.
 - If a case is suspected, use proper isolation measures to prevent infection via direct contact or fomites.
- **Report** any suspected or confirmed case of influenza in dogs or cats in Los Angeles County to VPH at 213-288-7060 or vet@ph.lacounty.gov
- **Dog importers**
 - If possible, arrange for dogs to be vaccinated against canine influenza H3N2 before importation
 - Import only healthy dogs
 - Learn about the risk of canine influenza in the country from which you are importing dogs. In 2017, the countries associated with most cases came from China and South Korea.
 - Quarantine every imported dog in your facility after arrival, and monitor its health for 30 days after arrival before adopting it out.
 - Isolate any dog that shows signs of illness to prevent spread of disease
 - Have a veterinarian examine every imported dog, and test any dogs that have respiratory signs for canine influenza H3N2 and any other disease that may have been imported
- **Pet owners**
 - If you think your dog has influenza, keep it away from other animals and contact your veterinarian.
 - Dogs that frequently interact with other dogs (e.g. dog park, groomer, daycare) should be vaccinated against canine influenza H3N2.
 - To prevent spread of disease, do not let a sick pet share its food bowl, leash, toys or other supplies with other pets.
 - Wash your hands after touching your pet.

For More Information: <http://www.publichealth.lacounty.gov/vet/InfluenzaCanine.htm>

10. Other Diseases, Studies, and Investigations

2016-2017 Canine Hemorrhagic Gastroenteritis in Dogs



Hemorrhagic gastroenteritis (HGE) is an illness in dogs associated with a sudden onset of vomiting, abdominal pain, and diarrhea that is usually bloody. It is typically seen in adult, small breed dogs that otherwise healthy, are fully vaccinated, and that have not had a dietary indiscretion.⁶⁵ HGE is often associated with an increase in the red blood cell concentration on blood tests (i.e. increased packed cell volume or PCV). Treatment is mostly supportive. Since bacteria may be a cause of HGE, many veterinarians treat HGE cases with antibiotics. Some dogs are ill enough to require hospitalization and intravenous fluid support. The disease is thought to be more common in smaller breeds of dogs, possibly because of a greater sensitivity to toxins excreted by bacteria.⁶⁵ The disease is not considered to be contagious to humans, cats, or other dogs.⁶⁵

The cause of HGE is unknown, but it is thought to be associated with toxins that are sometimes excreted by bacteria called *Clostridium perfringes*.^{65,66} However, other pathogens have also been found to be associated with the same clinical signs in dogs. For example, an HGE outbreak in dogs in Virginia in 2015 may have been caused by a type of calicivirus called vesivirus 2117.⁶⁷

Since the exact cause of HGE is unknown, there is no standard test for veterinarians to perform to diagnose it. Most cases are diagnosed based on a combination of the clinical signs, size and breed of dog, plus the finding of an elevated PCV.⁶⁵ Most dogs are treated with fluid support and antibiotics.

Veterinarians in the western San Fernando Valley in Los Angeles County reported increases in cases of HGE during four out of the five winters between 2004-2009, and again in winter 2016-2017. A literature review revealed no other reports of outbreaks occurring repeatedly in the same geographic location and same time of year. Therefore, VPH sought to gather more details information about this outbreak.

The 2016-2017 outbreak

On December 19, 2016, VPH received an initial report of 10 dogs with HGE seen during one week at a general and emergency veterinary practice in the San Fernando Valley area. On December 22, 2016, VPH sent out an email-based Animal Health Alert to local veterinarians about the cluster of HGE cases, and asked them to report in all cases.

The practice that had reported the initial cluster soon stated they may have seen more than 60 cases. Active case finding was performed at their practice. Charts were initially screened to find cases involving dogs with acute onset vomiting and/or diarrhea with no definitive diagnosis. A supplemental questionnaire was also administered over the phone to dog owners to obtain more detailed exposure history.

Dogs were defined as **suspected cases** if they had watery diarrhea, bloody diarrhea or blood in their stool without a known cause. Any dogs for which underlying causes of illness were diagnosed (e.g. foreign body, canine parvovirus, giardiasis) were excluded.

A total of 180 reports were received from 9 clinics. 105 dogs of a variety of breeds fit the suspect case definition with presentation dates that ranged from November 2016 through May 2017 (Figure 10A). Cases were concentrated mainly in the San Fernando Valley area (Figure 10B). The median age of affected dogs was 5.3 years. With a range of 10 weeks to 15 years.

The cause of this outbreak is currently unknown, though *Clostridium perfringens* was isolated from 10 out of 12 fecal samples submitted. *C. perfringens* is often part of the normal flora in dogs. However, there is an association between HGE and these bacteria and the toxins they produce.⁶⁶ A few practicing veterinarians in the San Fernando Valley stated that cases seemed to appear when it rained. Cases were graphed alongside rainfall totals from a rain gauge belonging to the Los Angeles County Department of Public Works in Northridge. Although there may be a link between rainfall and HGE, no confirmed pattern has emerged from a brief analysis (Figure 10C).

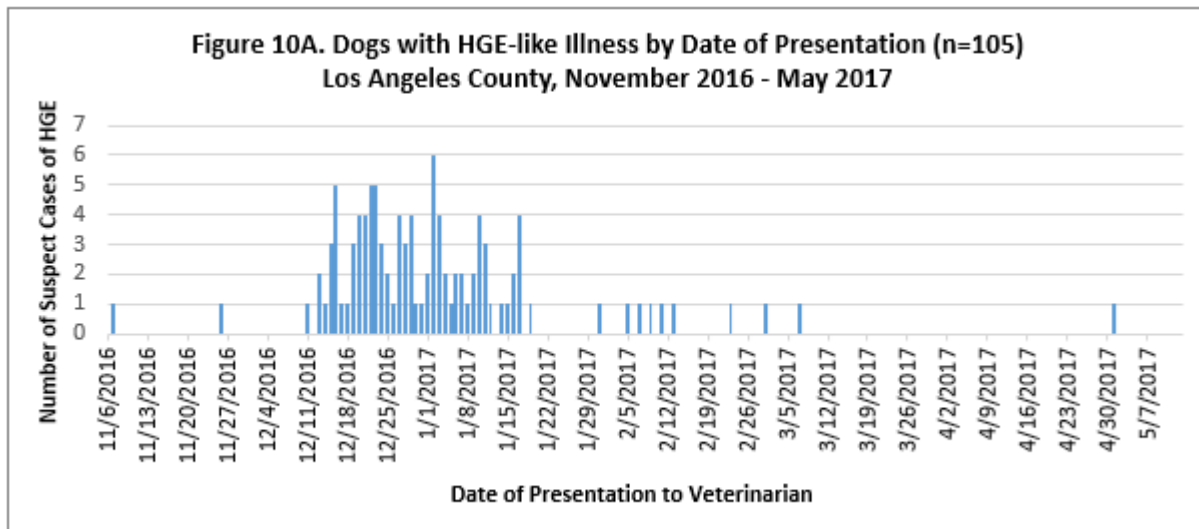


Figure 10B. Locations of Dogs with Hemorrhagic gastroenteritis-like illness (n=105), Los Angeles County, fall 2016-winter 2017

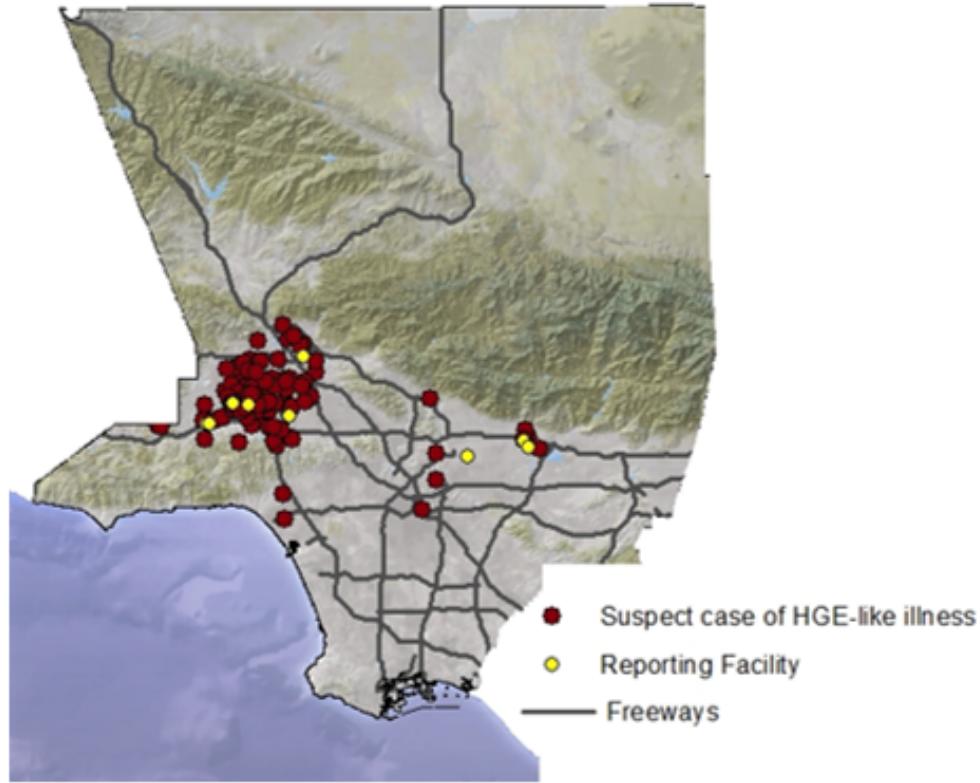
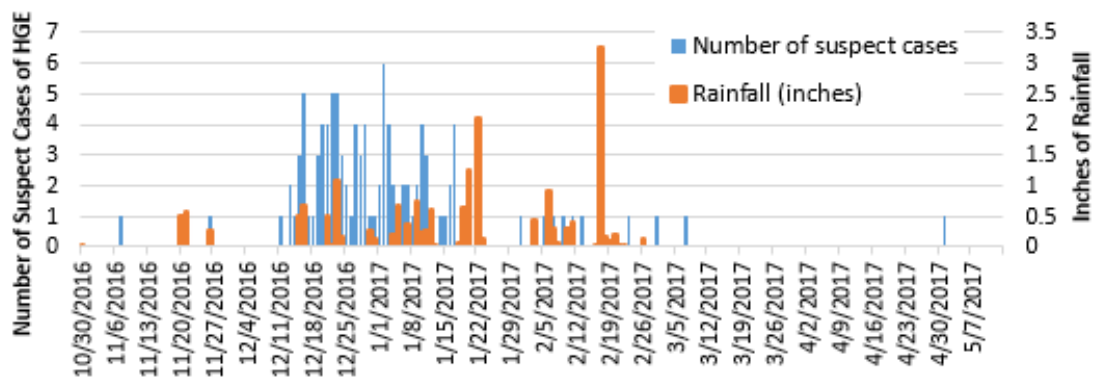


Figure 10C. Dogs with HGE-like Illness by Date of Presentation vs Rainfall in Northridge (in inches), Los Angeles County, November 2016 - May 2017



* Rainfall data are from Los Angeles County Department of Public Works (Northridge rain gauge)

Strangles (*Streptococcus equi* subspecies *equi*) infection in horses – 3 cases



Strangles is a highly contagious upper respiratory infection in horses caused by a bacteria called *Streptococcus equi* subspecies *equi*. The clinical signs of strangles include sudden-onset fever, followed by sore throat (pharyngitis), abscess formation and rupture of the lymph nodes under the jaw and behind the throat (submandibular and retropharyngeal areas). Uncommonly, abscesses can appear in other organs such as the lungs, liver, spleen, kidneys, or intestines; this is a condition termed “bastard strangles.” A few horses may develop purpura hemorrhagica, an immune-mediated inflammation of the blood vessels (vasculitis), in response to repeated exposure to the bacteria (such as re-infection or vaccination).^{68,69}

Some horses may become healthy-appearing carriers of the bacteria – this can occur when dried clumps of pus (chondroids) form inside a part of the horse’s anatomy called the guttural pouch. The guttural pouches are large outpouchings of the horse’s Eustachian tube and are located in the area of the throat. When chondroids containing the bacteria form in the guttural pouch, the horse’s immune system cannot completely clear away the bacteria. Bacteria occasionally leak out of the chondroids and out through the horse’s nasal discharge - therefore a carrier horse can remain contagious for a long time.⁶⁸

Definitive diagnosis of strangles remains difficult because horses may not shed the bacteria for the first 72 hours after the onset of fever, and healthy-appearing carriers may be present in a stable. Most testing involves efforts to look for the bacteria in the nasal passages and throat via culture or polymerase chain reaction (PCR) testing. PCR testing detects both live and dead bacteria. Therefore, PCR-positive results can result from environmental contamination from other strangles-infected horses that may be nearby. PCR test results must be interpreted in conjunction with clinical signs.⁶⁸ When a veterinarian collects a sample from a horse for testing by culture, specimens obtained via nasopharyngeal washes or guttural pouch scoping from deeper areas of the respiratory tract are more sensitive than simple nasal swabs. In other words, a negative culture from just a nasal swab or even a nasopharyngeal wash does not rule out strangles (i.e. can be a false negative test).⁷⁰ Diagnosis of healthy carriers may require scoping of the guttural pouch in the horse’s throat, to look for signs of inflammation and chondroids and to collect further samples.⁶⁸ Many horses with strangles do not require antibiotic treatment - the disease will eventually resolve if the horse is provided good food, water and shelter, and appropriate nursing care of any abscesses that may be forming or draining. However, in some cases a veterinarian may need to prescribe antibiotics. Horses that are carriers can be treated and usually cured by washing (lavage) of the guttural pouch under sedation.⁶⁸

Horses of all ages can be affected with strangles, with the most commonly infected being 6-10 years old. Strangles can spread quickly between horses and cause outbreaks in stables, but is associated with a low case mortality rate. The bacteria can be transmitted through direct contact with respiratory or abscess secretions from infected horses, through shared water troughs and other equipment and fomites and by flies. Strangles is considered a mildly zoonotic disease, with human cases occurring rarely, and usually only in people with other health problems. Nevertheless, people working with horses with strangles should take

steps to prevent direct human exposure to the discharges from the infected horse.⁶⁸ The bacteria that cause strangles can survive in water for several weeks, however they die after 1-3 days on fencing and soil and do not generally persist in the environment for prolonged periods.⁶⁸

Complete resolution of an outbreak is challenging because horses may be infectious for at least 6 weeks after the signs resolve, or they may become carriers. Prevention is also challenging and biosecurity is fundamental to controlling the spread of disease. Vaccines are available for strangles prevention but may not confer total immunity against infection. It is recommended that new horses be isolated for 3 weeks prior to introduction to the rest of the population. Handlers working with infected horses should not have contact with healthy horses, and should not use the same equipment (buckets, brushes, etc) on other horses. Quarantine of the stable should last for a minimum of 3 weeks after the resolution of the last case, and after all cases have been declared strangles negative by three consecutive negative cultures, collected one week apart.⁶⁸

Cases of strangles in horses are reportable to the VPH. Known cases of strangles are subject to quarantine, since actively infected and recovering horses are considered important sources of new infections.

Guidance on the diagnosis, management and control of strangles outbreaks are provided by the American College of Veterinary Internal Medicine⁶⁸ and by the American Association of Equine Practitioners.⁶⁹

As of 2019, a case definition for strangles in horses is still under development. For the purposes of this summary, the following case definition was used:

- **Confirmed** - Growth of the organism in culture from aspirate of abscessed lymph node (OR endoscopy confirmed guttural pouch disease + positive qPCR from guttural pouch swab OR 4-fold or greater increase in titer of paired serology samples taken 10 days apart) AND more than 1 compatible clinical signs (fever, lymphadenopathy +/- abscessation, mucopurulent nasal discharge, pharyngitis, dysphagia, upper airway stridor)
- **Probable** - More than one compatible clinical sign (see list above), AND a positive PCR test
- **Suspected** - Exposure to a confirmed infected horse OR at least 1 compatible clinical sign (see above), AND a positive titer in an unvaccinated horse OR the field veterinarian strongly suspects diagnosis of Strangles.

Strangles cases in Los Angeles County, 2017

In 2017, two confirmed cases and three suspected case in horses were reported in Los Angeles County. An additional suspected case that occurred in January 2018 is included in the case summaries below because it was connected to a 2017 case.

Western half of county - One confirmed case, two suspected cases

In June 2017, a group of 14 leased adult horses arrived at a summer recreation facility in the western half of the county. All 14 were examined on arrival by the manager of the facility, and 3 were found to have fevers and nasal discharge. These 3 were placed in an isolated area, separate from the other 11 horses and far away from 2 horses and 3 donkeys that resided at the location full time. The 3 ill horses were returned to their owner the next day. The owner of the facility monitored

the temperatures and health of the remaining animals for a week and did not note any signs of infection. There were no vaccine records available for the three horses.

The three ill horses were placed in an isolated paddock by their owner and were immediately treated by their veterinarian with five days of ceftiofur. All 3 horses improved clinically. Nasal swabs were then taken from all three horses by public health staff for culture, and one of the three horses cultured positive for *S. equi* subsp. *equi*. This horse continued to test positive for *S. equi* for a total of three consecutive cultures (each collected a week apart), despite appearing healthy, and was suspected of having become a carrier. Two horses were released from quarantine, and the suspected carrier remained under quarantine. The owner was advised to have the horse assessed for being a carrier by an endoscopic guttural pouch exam.

Southern half of county - Single confirmed case

In September 2017, an adult quarter horse gelding with an abscess near the left jaw joint and nasal discharge was presented to a veterinarian in the southern half of the county. The horse was recently brought in from Riverside County into a neighborhood that included approximately 20 horses on multiple adjacent properties. Its vaccination history was unknown. Culture of the abscess fluid confirmed *S. equi* subsp. *equi* infection. The Riverside County Veterinarian's office was notified, and the horse was returned to the seller in Riverside County where it was placed in isolation. Two horses that had had direct contact with the infected gelding were quarantined in an isolated area for 2 weeks in order to be monitored for illness. One of the two had been vaccinated against strangles, and the vaccine history on the other was not obtained. Neither horse developed signs of strangles, one of the horses had a negative PCR test for *S. equi*, and both horses were released from quarantine. During the quarantine period, a horse-based community event had been scheduled. The organizers of the event were notified that there had recently been a confirmed strangles case in the area and were advised to tell people to keep any sick horses at home. Horse owners in the neighborhood where the case occurred were advised not to participate in the community event, as a precaution.

Southern half of county - Two suspected cases with unusual signs

In December 2017, an adult quarter horse gelding was presented to a veterinarian for fever, lethargy, loss of appetite and diarrhea while at a boarding facility in the southern half of the county. The horse had a history of extensive travel to other states, however, it had not traveled for over a year. The horse had not been vaccinated against strangles. A nasal swab from this horse was PCR positive. No culture was performed. The owner's other horse had been diagnosed with strangles as a foal but had no evidence of the disease at this time and was not quarantined. The sick horse was housed in a barn with 23 other horses, in a facility that was at full capacity with almost 150 horses on site. A second horse (one that had been vaccinated against strangles) in the same barn developed similar clinical signs (fever, diarrhea), had a negative *S. equi* PCR result, was voluntarily quarantined, and released from quarantine in January.

Another horse, a gelding, in the same barn developed diarrhea and a fever early January 2018. It had arrived at the stables 4 months prior, and had not been vaccinated for strangles. This horse was

housed separately from the 2 ill horses but had been turned out with them just prior to their quarantine. This horse was treated just with an anti-inflammatory medication called flunixin meglumine (Banamine) and clinical signs resolved within 36 hours. A nasal swab from this horse was PCR positive for *S. equi*, and it was placed under quarantine. The owner's other horse had no clinical signs, was voluntarily tested for *S. equi*, and was PCR negative. The second horse was not placed under quarantine, but was instructed to limit access to shared spaces and avoid direct contact with other horses. Public health staff conducted weekly health checks at the stable.

None of the other horses in the barn developed clinical signs strangles and were not tested. Three consecutive negative nasal swab cultures were obtained from the original ill horse, and it was released from quarantine. Endoscopic guttural pouch examination was recommended to rule out carrier status.

It is a challenge to diagnose and manage cases of strangles. Strangles is only reportable in certain states and localities, and there is no standardized outbreak control protocol available. Improved biosecurity measures may be difficult to implement in boarding type facilities. Outbreak management and tests required to eliminate carrier status is costly and cumbersome for horse owners.

Veterinarians should continue to be vigilant when there is suspicion of strangles as to prevent outbreaks due to the contagious nature of the disease and that horses are stabled in close quarters with other horses and can travel often. It is recommended that states and localities work with equine health experts to establish consistent ordinances and protocols for controlling and preventing strangles.

Helpful Resources

Overview of Animal Disease Reporting in Los Angeles County

publichealth.lacounty.gov/vet/disintro.htm

Los Angeles County - Priority List of Reportable Animal Diseases

publichealth.lacounty.gov/vet/docs/2019LACountyAnimalReportableDiseaseList.pdf

Los Angeles County Animal Disease Reporting Forms

publichealth.lacounty.gov/vet/Forms.htm

Los Angeles County Animal Diseases, Conditions and Data

publichealth.lacounty.gov/vet/AnimalDiseaseList.htm

Consultation with a Los Angeles County Public Health Veterinarian

All professionals and the public are encouraged to call with questions or a request for a consultation. During working hours (8:00am-5:00pm Monday-Friday), the Veterinarian-On-Duty can be reached at 213-288-7060. Or email us at vet@ph.lacounty.gov.

Los Angeles County Animal Health Alert Network

The Animal Health Alert Network is an email system that keeps Veterinarians informed about local animal disease problems or outbreaks. Any animal health worker in Los Angeles County can join. Those interested in joining may contact: vet@ph.lacounty.gov.

Articles in *Pulse* Magazine - publication of the southern California Veterinary Medical Association

Past articles covered local cases of rabies, canine parvovirus trends, flea-borne typhus (a.k.a murine typhus) in humans, avian influenza, and much more. To learn more about the SCVMA, visit <http://www.scvma.org>.

World Health Organization (WHO): Veterinary Public Health

who.int/zoonoses/vph/en

Centers for Disease Control and Prevention (CDC): One Health

cdc.gov/onehealth

California Department of Public Health (CDPH): Veterinary Public Health Section

cdph.ca.gov/Programs/CID/DCDC/Pages/VPHS.aspx

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REPORTING ANIMAL DISEASES / CONDITIONS

Always report as soon as possible:

- Occurrence of any unusual disease
- Outbreak or cluster (3 or more cases) of animal disease/deaths of any cause
- Animal illness concurrent with human illness
- Disease not endemic to area
- Illness in animal recently imported from another country

Urgency Reporting Requirements

= Report **immediately** by telephone

= Report **within 1 working day** of identification

= Report within **7 calendar days** from time of identification

DISEASE PRIORITY LIST 2019

<ul style="list-style-type: none"> All Diseases on the Reportable Disease List of the California Department of Food and Agriculture (CDFA) Anaplasmosis Anthrax Babesiosis Blastomycosis Botulism Bovine Spongiform Encephalopathy Brucellosis (any type) <i>Burkholderia pseudomallei</i> Calicivirus, feline virulent Campylobacteriosis Chagas Disease Chronic Wasting Disease Coccidioidomycosis Cryptococcosis Distemper Domoic Acid Poisoning Ehrlichiosis Foot-and-Mouth Disease Glanders Heartworm 	<ul style="list-style-type: none"> Hemorrhagic gastroenteritis (HGE) of dogs Hemorrhagic Fevers, viral (Crimean-Congo, Ebola, Lassa, Marburg) Histoplasmosis Influenza (any type) Leptospirosis Listeriosis Lyme Disease Methicillin-resistant <i>Staphylococcus</i> spp Mycobacterium spp <i>Onchocerca lupi</i> Parvovirus Panleukopenia Plague Psittacosis Pseudorabies Q Fever Rabies Salmonellosis Salmon Poisoning Disease Screw worm myiasis Spotted Fever Rickettsioses <i>Streptococcus equi</i> (Strangles) Tetanus Tularemia 	<ul style="list-style-type: none"> Viral Encephalitis (EEE, WEE, VEE, Japanese Encephalitis) Viral Newcastle Disease (birds) West Nile Virus Yersiniosis Unusual disease Outbreak of any disease <p>Non-infectious conditions <u>Reporting requested but not legally required</u> Cannabis toxicosis <i>Haemaphysalis longicornis</i> (i.e. Longhorned Tick) Contamination of food product-suspected</p> <p>In Los Angeles County, report all diseases in this list and the list of the California Department of Food and Agriculture (CDFA) to the Los Angeles County Veterinary Public Health Program. We will forward reports to the CDFA as needed.</p>
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NOTE: Ringworm and roundworm are not reportable.

Reporting Forms: <http://www.publichealth.lacounty.gov/vet/Forms.htm>

Phone: (213) 288-7060 Email: vet@ph.lacounty.gov Fax: (213) 481-2375.



LIST OF REPORTABLE CONDITIONS FOR ANIMALS AND ANIMAL PRODUCTS*

*Pursuant to Section 9101 of the California Food and Agricultural Code, Title 3 California Code of Regulations § 797 and Title 9 Code of Federal Regulations Section 161.4(f)

WHO MUST REPORT: Any licensed veterinarian, any person operating a diagnostic laboratory, or any person who has been informed, recognizes or should recognize by virtue of education, experience, or occupation, that any animal or animal product is or may be affected by, or has been exposed to, or may be transmitting or carrying any of the following conditions, must report that information.

WHAT TO REPORT: Immediately report any animal disease not known to exist in the United States, any event with increased mortality and/or morbidity of unknown cause or source and any toxicology condition likely to contaminate animals or animal products (meat, milk or eggs).

CALL IF YOU SEE: Vesicles, unusual or unexplained illness, CNS signs, mucosal diseases, hemorrhagic septicemias, unusual larvae in wounds, uncommon ticks, high morbidity or mortality.

Report any emergency, regulatory, or monitored condition within the provided time frame. Some diseases are listed under the major species of concern; if you see compatible signs for such conditions in another species, please report!

EMERGENCY CONDITIONS Report within 24 Hours of Discovery	REGULATORY CONDITIONS Report within Two Days of Discovery	MONITORED CONDITIONS Report within 30 Days of Discovery								
<p>MULTIPLE SPECIES</p> <p><u>General, non-specific conditions:</u> Unexplained high mortality or diseased animals; livestock exposed to toxic substances.</p> <ul style="list-style-type: none"> • Anthrax (<i>Bacillus anthracis</i>)¹ • Crimean Congo hemorrhagic fever¹ • Foot-and-mouth disease • Heartwater (<i>Ehrlichia ruminantium</i>) • Japanese encephalitis • Melioidosis (<i>Burkholderia pseudomallei</i>) • Rabies of livestock¹ • Rift Valley fever • Screwworm myiasis (<i>Cochliomyia hominivorax</i> or <i>Chrysomya bezziana</i>) • Surra (<i>Trypanosoma evansi</i>) • Vesicular stomatitis <p>BOVINE</p> <ul style="list-style-type: none"> • African trypanosomiasis (Tsetse fly diseases) • Bovine babesiosis (Cattle tick fever) • Bovine spongiform encephalopathy • Contagious bovine pleuropneumonia (<i>Mycoplasma mycoides mycoides</i> small colony) • Foot-and-mouth disease • Hemorrhagic septicemia (<i>Pasteurella multocida</i> B/Asian or E/African) • Lumpy skin disease • Malignant catarrhal fever (wildebeest-associated form) • Rinderpest • Schmallenberg virus/ Akabane • Theileriosis (<i>Theileria parva parva</i> or <i>T. annulata</i>) <p>CAPRINE/OVINE</p> <ul style="list-style-type: none"> • Contagious agalactia (<i>Mycoplasma agalactiae</i>) • Contagious caprine pleuropneumonia (<i>Mycoplasma capricolum capripneumoniae</i>) • Foot-and-mouth disease • Nairobi sheep disease • Peste des petits ruminants (Goat plague) • Schmallenberg virus/ Akabane • Sheep pox and goat pox <p>PORCINE</p> <ul style="list-style-type: none"> • African swine fever • Classical swine fever • Foot-and-mouth disease • Nipah virus • Swine vesicular disease • Vesicular exanthema of swine virus (VESV) <p>AVIAN SPECIES</p> <ul style="list-style-type: none"> • Avian influenza (HPAI and H5/H7 LPAI) • Turkey rhinotracheitis (Avian metapneumovirus) • Virulent Newcastle disease (Exotic Newcastle disease, velogenic viscerotropic Newcastle disease) <p>EQUINE</p> <ul style="list-style-type: none"> • African horse sickness • Dourine (<i>Trypanosoma equiperdum</i>) • Glanders (Farcy, <i>Burkholderia mallei</i>) • Hendra virus (Equine morbillivirus) • Venezuelan equine encephalomyelitis • Vesicular stomatitis <p>CERVIDS/LAGOMORPHS/CAMELIDS</p> <ul style="list-style-type: none"> • Rabbit hemorrhagic disease (Calicivirus) 	<p>MULTIPLE SPECIES</p> <ul style="list-style-type: none"> • Brucellosis (<i>B. melitensis</i>, <i>B. abortus</i>, <i>B. suis</i>)¹ • Pseudorabies (Aujeszky's disease) • Tuberculosis (<i>Mycobacterium bovis</i>)¹ • Tularemia¹ <p>BOVINE</p> <ul style="list-style-type: none"> • Bovine brucellosis (<i>Brucella abortus</i>)¹ • Bovine tuberculosis (<i>Mycobacterium bovis</i>)¹ • Trichomonosis (<i>Trichomonas foetus</i>) <p>CAPRINE/OVINE</p> <ul style="list-style-type: none"> • Caprine and ovine brucellosis¹ (excluding <i>Brucella ovis</i>) • Scrapie • Sheep scabies (Body mangel, <i>Psoroptes ovis</i>) <p>PORCINE</p> <ul style="list-style-type: none"> • Porcine brucellosis (<i>Brucella suis</i>)¹ • Pseudorabies (Aujeszky's disease) <p>AVIAN SPECIES</p> <ul style="list-style-type: none"> • Fowl typhoid (<i>Salmonella gallinarum</i>) • Ornithosis (Psittacosis, avian chlamydiosis, <i>Chlamydia psittaci</i>) • Pullorum disease (<i>Salmonella pullorum</i>) <p>EQUINE</p> <ul style="list-style-type: none"> • Contagious equine metritis (<i>Taylorella equigenitalis</i>) • Eastern equine encephalomyelitis • Epizootic lymphangitis • Equine herpesvirus myeloencephalopathy (EHM) • Equine infectious anemia • Equine piroplasmiasis (<i>Babesia caballi</i> or <i>Theileria equi</i>) • Western equine encephalomyelitis • West Nile virus <p>CERVIDS/LAGOMORPHS/CAMELIDS</p> <ul style="list-style-type: none"> • Chronic wasting disease in cervids 	<p>MULTIPLE SPECIES</p> <ul style="list-style-type: none"> • Bluetongue • Echinococcosis/hydatidosis (<i>Echinococcus</i> species) • Epizootic hemorrhagic disease • Johne's disease (Paratuberculosis; <i>Mycobacterium avium paratuberculosis</i>) • Leishmaniosis • Q Fever (<i>Coxiella burnetii</i>) <p>BOVINE</p> <ul style="list-style-type: none"> • Anaplasmosis (<i>Anaplasma marginale</i> or <i>A. centrale</i>) • Bovine cysticercosis (<i>Taenia saginata</i>) • Bovine genital campylobacteriosis (<i>Campylobacter fetus venerealis</i>) • Bovine viral diarrhea • Enzootic bovine leukosis (Bovine leukemia virus) • Infectious bovine rhinotracheitis (Bovine herpesvirus-1) • Malignant catarrhal fever (sheep-associated form) <p>CAPRINE/OVINE</p> <ul style="list-style-type: none"> • Ovine epididymitis (<i>Brucella ovis</i>) • Caprine arthritis/encephalitis • Enzootic abortion of ewes (Ovine chlamydiosis; <i>Chlamydia abortus</i>) • Maedi-visna (Ovine progressive pneumonia) • <i>Salmonella abortusovis</i> <p>PORCINE</p> <ul style="list-style-type: none"> • Porcine cysticercosis (<i>Taenia solium</i>) • Porcine reproductive and respiratory syndrome • Senecavirus A • Swine enteric coronavirus diseases, including transmissible gastroenteritis • Swine influenza • Trichinellosis (<i>Trichinella spiralis</i>) <p>AVIAN SPECIES</p> <ul style="list-style-type: none"> • Avian infectious bronchitis • Avian infectious laryngotracheitis • Duck viral hepatitis • Goose parvovirus • Infectious bursal disease (Gumboro disease) • Influenza A viruses (see Emergency Conditions for HPAI and H5/H7 LPAI) • Mycoplasmosis (<i>Mycoplasma synoviae</i> and <i>Mycoplasma gallisepticum</i>) <p>EQUINE</p> <ul style="list-style-type: none"> • Equine herpesvirus-1 and 4 (excluding EHM) • Equine influenza • Equine viral arteritis <p>CERVIDS/LAGOMORPHS/CAMELIDS</p> <ul style="list-style-type: none"> • Camel pox in camels • Myxomatosis in rabbits <p>FISH, AMPHIBIAN, CRUSTACEAN, BEE, AND MOLLUSK</p> <ul style="list-style-type: none"> • Compatible with the OIE list, http://www.oie.int/animal-health-in-the-world/oie-listed-diseases-2019/ 								
<p>WHERE TO REPORT:</p> <p>CA Department of Food and Agriculture Animal Health Branch (AHB) District Offices:</p> <table border="0"> <tr> <td>Redding</td> <td>530-225-2140</td> </tr> <tr> <td>Modesto</td> <td>209-491-9350</td> </tr> <tr> <td>Tulare</td> <td>559-685-3500</td> </tr> <tr> <td>Ontario</td> <td>909-947-4462</td> </tr> </table> <p>CDFA- Animal Health Branch Mailing Address: 1220 N Street Sacramento, CA 95814 Physical Address: 2800 Gateway Oaks Sacramento, CA 95833 Telephone 916-900-5002 OR</p> <p>US Department of Agriculture Animal and Plant Health Inspection Services Veterinary Services (VS) 10365 Old Placerville Road, Suite 210 Sacramento, CA 95827-2518 Toll free at 1-877-741-3690</p>			Redding	530-225-2140	Modesto	209-491-9350	Tulare	559-685-3500	Ontario	909-947-4462
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Tulare	559-685-3500									
Ontario	909-947-4462									

¹Diseases in green, seen in any species, are also reportable to the California Department of Public Health (CDPH); CDFA will report these designated zoonotic diseases to CDPH.

For additional information, contact CDFA (email: cavet@cdfa.ca.gov or visit our website at www.cdfa.ca.gov/ah) or USDA at http://www.aphis.usda.gov/animal_health



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Department of Public Health
Veterinary Public Health Program
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