

Key Findings and Public Health Messages

- The California Department of Public Health (CDPH) received reports of 876 animal rabies cases from 2009 through 2012. Reported animal cases increased in California by 11.5 percent from 226 in 2009 to 252 in 2012.
- Among animal rabies cases, the most frequently reported species were bats (723, 82.5 percent), skunks (95, 10.8 percent), and foxes (51, 5.8 percent).
- The annual number of rabid bats reported to CDPH increased by 61.0 percent from 141 in 2009 to 227 in 2012. Rabid bats were most frequently reported from the South Coast (31.4 percent of 723), Bay Area (14.2 percent), and Far North (12.0 percent) regions.
- The annual number of rabid skunks reported to CDPH decreased by 63.6 percent from 44 in 2009 to 16 in 2012. Rabid skunks were most frequently reported from the Central Coast (42.1 percent of 95), Sacramento Metro (30.5 percent), and Sierra (10.5 percent) regions.
- During 2009-2012, 2 human cases of rabies were reported to CDPH. One case-patient had an unknown exposure in Humboldt County and the other had contact with a bat in Contra Costa County.
- Appropriate domestic and wild animal management, animal vaccination programs, identification and medical management of persons exposed to potentially rabid animals, public education about strategies to avoid animal bites, and avoiding wild animal

contact provide the best opportunities for reducing rabies in humans and animals.

Background

Human rabies is an uncommon but important viral zoonotic disease in the United States (US); between 1 and 8 cases are reported annually¹. In the US, rabies is identified more frequently in certain wild animal species than in domestic animals.

Distinct strain variants of rabies virus are maintained in populations of bats and skunks in California. Contact with the saliva of a rabid animal by direct bite is the most typical means of transmission of rabies virus. Rarely, rabies can be transmitted through contact of infectious saliva with open wounds or mucous membranes, and via transplant of organs and tissues from an undiagnosed donor.

Incubation of rabies in humans is variable and sometimes prolonged (7 days to 6 years). After an initial prodromal phase (headache, fever, malaise, anxiety, and non-specific neuropathies), patients rapidly progress to severe encephalomyelitis. Rabies is almost invariably fatal; no treatment protocol has proved reliably effective once clinical signs appear. Guidance on public health investigation and management of potentially exposed humans, and on surveillance and management of animals subject to rabies in California, are available elsewhere^{1,2}.

We describe here the epidemiology of animal and human rabies in California from 2009 through 2012. The epidemiological description of animal and human rabies for the 2001-2008 period can be found in the Epidemiologic Summary of Animal and Human Rabies in California, 2001-2008³. For a complete discussion of the definitions, methods, and limitations associated with this report, please refer to Technical Notes⁴.

California reporting requirements and surveillance case definitions

California Code of Regulations, Title 17, requires health care providers to report cases of suspected human or animal rabies to the local health officer (LHO) immediately by telephone. Laboratories must also notify the LHO when testing yields evidence suggestive of rabies; written notification must occur within one working day after the health care provider has been notified. Additionally, regulations require that all persons must notify the LHO if they have knowledge of persons or animals bitten by a potentially rabid animal, persons bitten by any mammal, or the whereabouts of an animal suspected to have rabies. In areas declared by CDPH to be rabies areas, the LHO must also be notified of any person who is bitten by an animal of a species subject to rabies, whether or not the animal is suspected of having rabies². During the surveillance period, all counties in California were declared rabies areas.

California regulations require LHOs to report to CDPH cases of human and animal rabies. For the surveillance period, CDPH officially counted cases that satisfied the surveillance case definition published by the U.S. Centers for Disease Control and Prevention (CDC). CDC defined a case of animal rabies as one with a positive direct fluorescent antibody test (preferably performed on central nervous system tissue) or isolation of rabies virus in cell culture or in a laboratory animal. A human rabies case was defined as a patient for whom Lyssavirus was detected by direct fluorescent antibody in a clinical specimen (preferably the brain or the nerves surrounding hair follicles in the nape of the neck), or Lyssavirus was isolated in cell culture or in a laboratory animal from saliva or central nervous system tissue, or Lyssavirus specific antibody was detected in the cerebrospinal fluid (CSF) or serum by indirect fluorescent antibody (IFA) test or an antibody titer greater than or equal to 5 (complete neutralization), or Lyssavirus RNA

was detected in saliva, CSF, or tissue using reverse transcriptase-polymerase chain reaction (RT-PCR).

Epidemiology of rabies in California

Animal cases

During the surveillance period, CDPH received reports of 876 animal rabies cases. Animal cases occurred in bats (723, 82.5 percent), skunks (95, 10.8 percent), foxes (51, 5.8 percent), dogs (3, 0.3 percent), cats (1, 0.1 percent), raccoons (1, 0.1 percent), coyote (1, 0.1 percent), and cattle (1, 0.1 percent).

The annual number of rabid animals reported to CDPH increased by 11.5 percent from 226 in 2009 to 252 in 2012 [Figure 1]. The annual number of rabid bats increased by 61.0 percent from 141 in 2009 to 227 in 2012 [Figure 2]. The annual number of rabid skunks decreased by 63.6 percent from 44 in 2009 to 16 in 2012, and the annual number of rabid foxes decreased by 85.4 percent from 41 in 2009 to 6 in 2012.

Rabid bats were most frequently reported from the South Coast (31.4 percent of 723), Bay Area (14.2 percent), and Far North (12.0 percent) regions. The regions with the greatest number of bat cases reported remained constant from the combined years of 2001 through 2008 to the combined years of 2009 through 2012; however, the highest proportion of reported cases shifted from the Bay Area to the South Coast region [Figure 3]. Rabid skunks were most frequently reported from the Central Coast (42.1 percent of 95), Sacramento Metro (30.5 percent), and Sierra (10.5 percent) regions. From the combined years of 2001 through 2008 to the combined years of 2009 through 2012, the Central Coast region persisted in having the highest proportion of reported rabid skunk cases [Figure 3].

Human cases

During the surveillance period, 2 human cases

of rabies were reported in California, one of which was fatal. The first case-patient, in 2011, was a female child from Humboldt County who survived. Diagnosis was by serology, and no rabies virus was recovered for strain typing. The circumstances of exposure were unknown. The second case-patient, in 2012, was an

adult male who had contact with a bat in Contra Costa County and was diagnosed after onset, hospitalization, and death outside of the United States. The rabies virus recovered from this patient was identified as a Mexican free-tailed bat variant.

Figure 1. Number of reported animal rabies cases in California by year

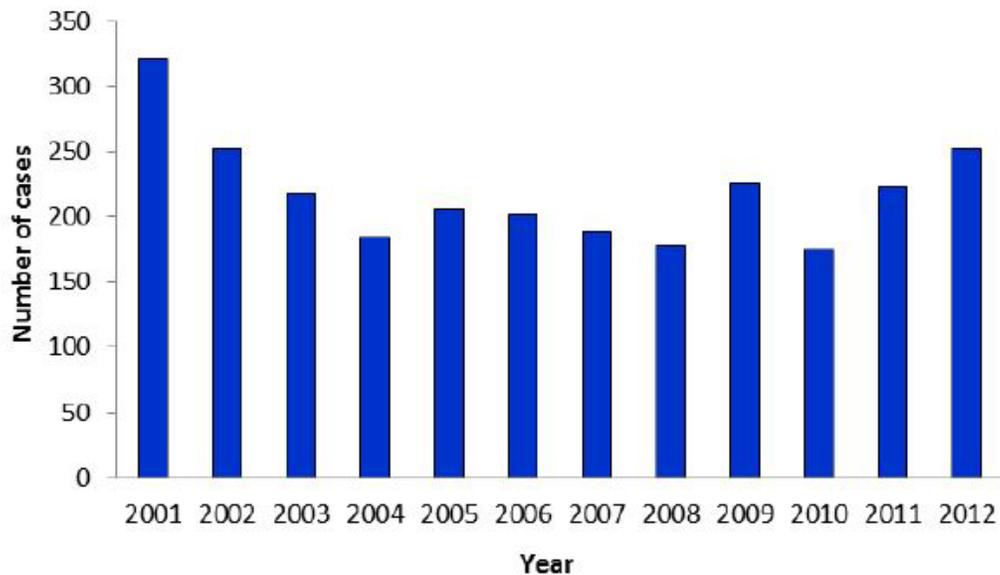


Figure 2. Reported animal cases of rabies in California by species and year

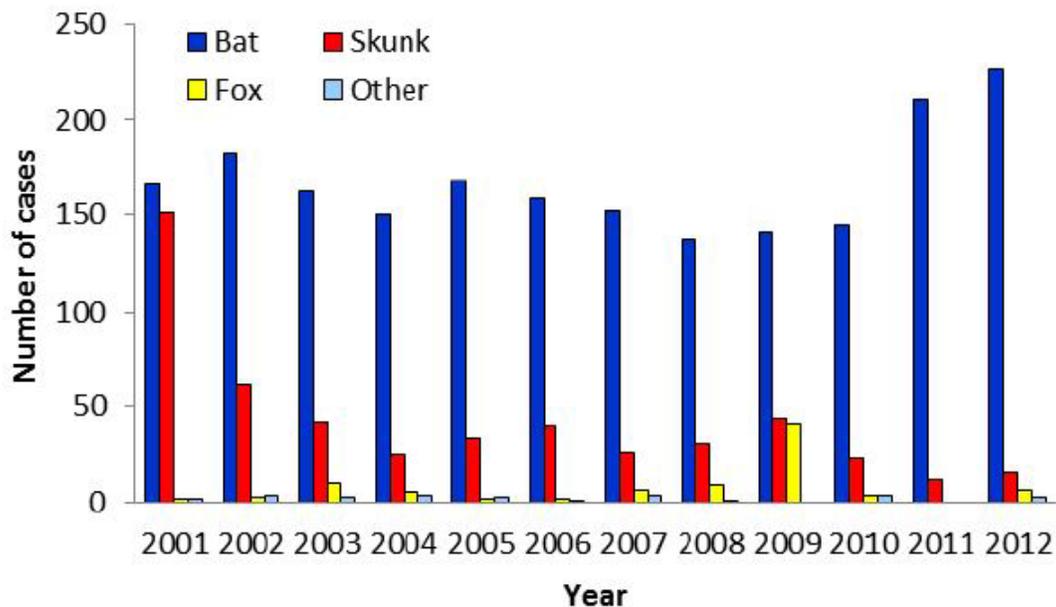
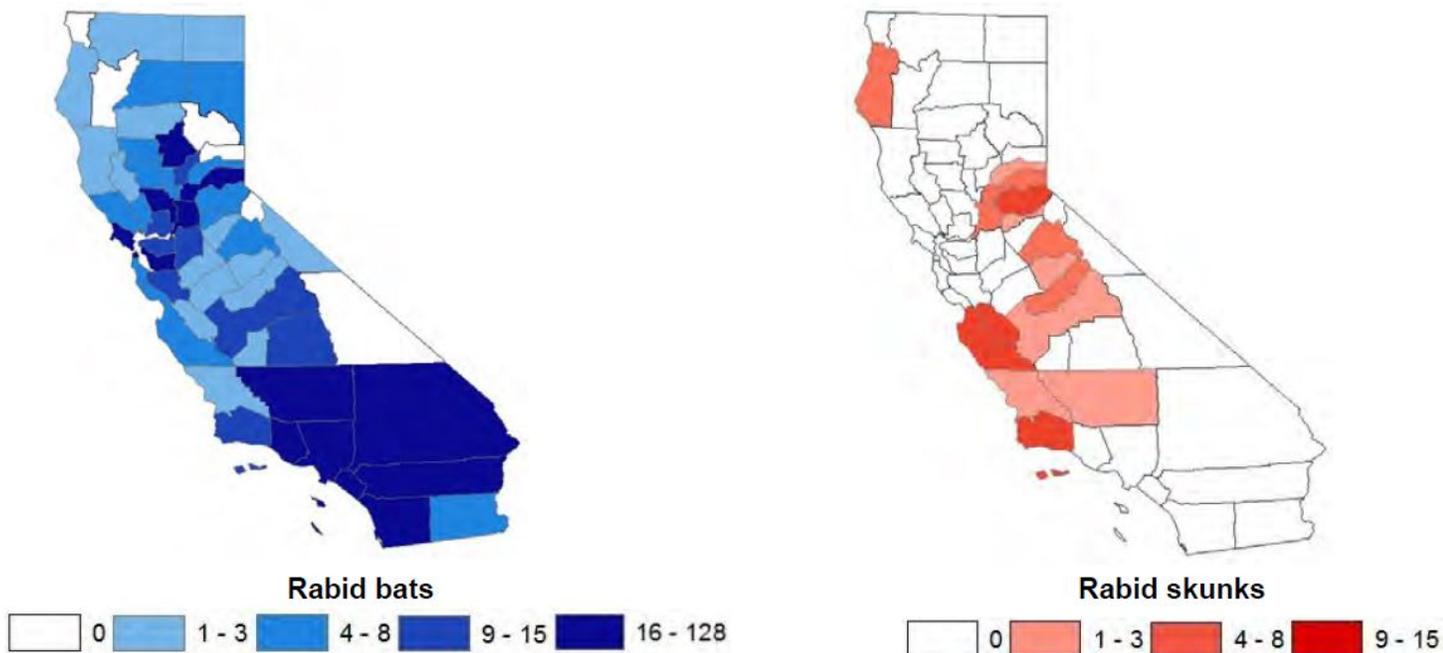


Figure 3. Reported rabid bats and skunks in California by location found, 2009-2012



Comment

Human rabies remained rare in California during the surveillance period. Rabies continues to be an almost invariably fatal disease; the recovery of the 2011 case-patient was exceptional and only the third known instance of an unvaccinated patient surviving rabies⁵. California's 2012 case-patient was the first California case with medical management and diagnosis abroad⁶. The number of rabid wild animals reported to CDPH increased during the surveillance period 2009-2012 (876) compared to the previous four-year surveillance period, 2005-2008 (773). The greatest increase occurred in foxes with a 168.4 percent increase; 80 percent of all 2009-2012 rabid foxes occurred in 2009 during an epidemic in Humboldt County. There was an 18 percent increase in reported rabid bats between the period 2005-2008 and 2009-2012, with the greatest increase in the South Coast region (139 percent).

Appropriate domestic and wild animal management, animal vaccination programs, assessment and medical management of persons exposed to potentially rabid animals, public education about strategies to avoid animal bites, and minimizing contact with wild animals provide the best strategies for reducing rabies in humans and animals.

References and resources

¹[Centers for Disease Control and Prevention. Human rabies prevention United States, 2008. MMWR 2008;57:1-26,28.](http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5703a1.htm)
<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5703a1.htm>

²[CDPH rabies information page:](http://www.cdph.ca.gov/HealthInfo/discond/Pages/rabies.aspx)
<http://www.cdph.ca.gov/HealthInfo/discond/Pages/rabies.aspx>

³[Epidemiological Summaries of Selected General Communicable Diseases in California, 2001-2008: Animal and Human Rabies](http://www.cdph.ca.gov/programs/sss/Documents/Epi-Summaries-CA-2001-2008-083111.pdf#page=51)
<http://www.cdph.ca.gov/programs/sss/Documents/Epi-Summaries-CA-2001-2008-083111.pdf#page=51>

⁴[Epidemiologic Summaries of Selected General Communicable Diseases in California, 2001-2008: Technical Notes](http://www.cdph.ca.gov/data/statistics/Documents/technicalnotes-episummary-aug2409.pdf)
<http://www.cdph.ca.gov/data/statistics/Documents/technicalnotes-episummary-aug2409.pdf>

⁵[Centers for Disease Control and Prevention. Recovery of a patient from clinical rabies—California, 2011. MMWR 2012;61 \(4\):61-5.](http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6104a1.htm)
<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6104a1.htm>

⁶[Centers for Disease Control and Prevention. U.S.-acquired human rabies with symptom onset and diagnosis abroad, 2012. MMWR 2012;61\(39\):777-81.](http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6139a1.htm)
<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6139a1.htm>

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