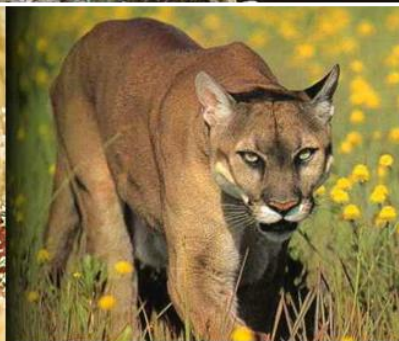




2011

Rabies in Maricopa County



Department of Public Health
Office of Epidemiology
June 2012

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Introduction

In 2006, the Maricopa County Department of Public Health (MCDPH) developed and initiated a comprehensive surveillance system that tracks the number of rabies risk assessments conducted, types of exposures, risk factors, and number of individuals that received post-exposure prophylaxis. This report describes trends in rabid animals, as well as the trends in human exposures to animals reported to MCDPH for rabies risk assessments in 2011.

**To report a suspected rabies case or to
receive a rabies risk assessment call MCDPH (24 hours a day):**

Members of the public: 602-747-7500

Medical providers: 602-747-7111

Rabies History

Rabies is a preventable viral disease of mammals that infects the central nervous system causing encephalopathy (brain dysfunction) and ultimately death in infected animals and humans. It can be transmitted from the bite of an infected animal or by contact with saliva, central nervous system (CNS) tissue, or cerebral spinal fluid from an infected animal in an open wound or a mucous membrane. The rabies virus is excreted through the saliva during the late stage of the disease, after rabies has affected the brain; sometimes before symptoms have begun to show. During this period, an animal can transmit rabies to another animal or human. The incubation period (time from exposure to the virus to the development of clinical signs or symptoms) in humans is usually several weeks to months, but ranges from days to years.

Early symptoms of rabies in humans are nonspecific consisting of fever, headache, and general malaise. As the disease progresses in humans, neurological symptoms appear, which may include insomnia, anxiety, confusion, slight or partial paralysis, excitation, hallucinations, agitation, hyper-salivation, difficulty swallowing, and hydrophobia (fear of water). Death usually occurs within days of the onset of symptoms. There is currently no cure for rabies. Once a victim begins showing symptoms of infection medical professionals can only provide supportive care. However, modern day post-exposure prophylaxis regimens, including the timely administration of Human Rabies Immune Globulin (HRIG) and rabies vaccine, have proven to be highly effective. In the United States human fatalities from rabies are very rare, but have occurred in people who failed to seek medical assistance, usually because they were unaware of their exposure.

Over the last 110 years rabies in the United States has changed dramatically. The number of rabies-related human deaths in the United States has declined from more than 100 annually in 1900 to one or two per year in the 1990's. More than 90% of the rabid animals reported annually to the Centers for Disease Control and Prevention (CDC) were wild animals like raccoons, skunks, bats, and foxes as opposed to before 1960 when most were domestic cats and dogs. The last documented human case of rabies in Arizona was in 1981 – this case was bitten by a rabid dog in Mexico. Currently in Arizona, the

principal rabies hosts are bats, skunks, and foxes. Recent epidemiologic data suggest that transmission of rabies virus can occur from minor, seemingly unimportant, or unrecognized bites from bats. This makes bats the most concerning source of possible rabies infection in Arizona. In 2009, Arizona had the highest number of rabid animals recorded since surveillance started in 1999 with 280 animals testing positive for rabies (**Table 1**). The only way to confirm that an animal has rabies is to test the (dead) animal in an approved laboratory. In most cases, domestic cats and dogs may be quarantined and observed at home for 10 days in order to watch for symptoms of rabies if warranted by MCDPH and Maricopa County Animal Care and Control (MCAC&C).

Table 1. Confirmed rabies positive animals in Arizona by year, 2000-2011*

	Bat	Skunk	Fox	Bobcat	Coyote	Cat	Dog	Other ^Δ	Total
2000	65	17	15	1	1	0	1	1	101
2001	55	59	6	4	4	0	0	1	129
2002	56	44	33	3	2	0	1	4	143
2003	44	8	18	4	1	0	0	0	75
2004	75	24	17	2	2	0	0	0	120
2005	84	67	12	2	1	2	0	1	169
2006	96	16	22	3	1	1	0	1	140
2007	115	13	24	6	1	0	0	0	159
2008	89	51	21	7	4	0	1	3	176
2009	69	144	51	8	2	1	0	5	280
2010	34	58	4	4	0	0	0	3	103
2011	47	13	7	1	0	0	0	2	70
Total	829	514	230	45	19	4	3	21	1,665

*Source: Arizona Department of Health Services (ADHS) data

^ΔOther includes 4 horses, 5 javelinas, 3 llamas, 2 mountain lions, 1 cow, 2 badgers, 2 coati, 1 ringtail, and 1 raccoon

In 2011, Maricopa County recorded the lowest number of rabies positive animals since 2000 (**Table 2**). Statewide, Arizona had a total of 70 animals test positive for rabies, with Pima County reporting the greatest number of rabies positive animals in 2011. Changes in the numbers of rabies positive animals each year can be attributed to natural fluctuations in the disease transmission process, differences in the surveillance process, and the impact of rabies management programs.

The United States Department of Agriculture’s (USDA) Wildlife Services program along with the Centers for Disease Control and Prevention (CDC), the Arizona Department of Health Services, and Coconino County Public Health Services District have facilitated and completed annual bait drop programs in the Flagstaff area of Arizona since 2009. This was as a response to a significant increase in rabies positive animals recorded in Coconino County in 2009. In 2011, the USDA Wildlife Services distributed 133,650 oral rabies vaccine baits over 1,584 square miles in the Flagstaff area in early August, targeting the gray fox species. The vaccination program continues to be successful as Coconino County saw the number of rabies positive animals drop from 35 in 2009 to three in 2011. However, rabid animals are likely to continue to be found in all of Arizona’s counties and interactions with wild animals places a person at much higher risk for rabies.

Adults and children alike should be discouraged from approaching, feeding, or touching dead or living wild animals. It is best to avoid all unknown animals, wild and domestic alike, to avoid attacks.

Table 2. Confirmed rabies positive animals in Arizona by year and county, 2000-2011*

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Apache	0	0	0	0	0	0	0	0	0	0	0	0	0
Cochise	12	10	23	18	9	13	5	7	12	39	17	5	170
Coconino	3	26	9	7	9	4	4	7	7	35	2	3	116
Gila	21	4	7	2	6	2	13	21	11	7	2	0	96
Graham	1	0	4	3	1	2	0	1	1	0	0	1	14
Greenlee	0	0	0	0	0	2	5	8	12	3	0	1	31
La Paz	0	0	1	0	1	1	0	0	0	1	0	0	4
Maricopa	13	14	10	11	12	12	9	17	23	13	9	5	148
Mohave	0	1	1	2	0	0	0	2	0	0	2	0	8
Navajo	0	0	0	1	0	0	2	1	0	0	3	1	8
Pima	34	42	34	22	64	107	81	79	65	86	27	33	674
Pinal	4	3	4	4	7	7	9	7	16	11	7	9	88
Santa Cruz	5	17	32	1	6	12	7	3	16	70	29	7	205
Yavapai	6	11	14	3	3	7	4	6	11	15	4	4	88
Yuma	2	1	4	1	2	0	1	0	2	0	1	1	15
Total	101	129	143	75	120	169	140	159	176	280	103	70	1665

*Source: Arizona Department of Health Services (ADHS) data

In the U.S., although there is always risk of attack by an unknown domestic cat or dog, the risk of contracting rabies from such an attack is low. The last documented case of rabies in a dog in Maricopa County was in 1977 and was vaccine-associated – that is, the disease was caused by the rabies vaccine given to the dog. The last non-vaccine-associated infection in a dog in Maricopa County was in 1973. The last documented case of rabies in a cat in Maricopa County was in 1982 and was also a vaccine-associated infection. Vaccine-associated infections no longer occur in the United States because the vaccine has been changed from a live attenuated vaccine to a killed virus vaccine. Because of the rarity of rabies in domestic animals in Maricopa County, exposures to cats and dogs are considered very low risk for rabies transmission. However, it is still important to contact a healthcare provider or public health department after an interaction with any animal that may possibly transmit rabies so that the individual situation can be assessed and appropriate measures can be taken. Individuals bitten by an animal are encouraged to seek medical care for their wound and for the potential need for an updated tetanus shot.

In Maricopa County, the majority of animals that test positive for rabies are bats (**Table 3**). Since bat bites can be relatively minor or even unrecognized, it is especially important that all human interactions with bats be assessed for the need to start rabies post-exposure prophylaxis. Other non-domestic animals, including skunks, foxes, horses, coyotes, and bobcats have tested positive for rabies in Maricopa County since 2000. Human interaction with ANY wild animal should be assessed for the risk of

rabies by the local health department, as they present a medium to high risk for rabies. Rodent bites, while a wild mammal, are considered to be low-risk for transmitting rabies.

Table 3. Confirmed rabies positive animals in Maricopa County by year and animal, 2000-2011*

	Bat	Skunk	Fox	Other	Total Positive
2000	13				13
2001	13			1 coyote (Arizona gray fox variant)	14
2002	10				10
2003	10		1		11
2004	9		2	1 bobcat (Arizona gray fox variant)	12
2005	11			1 bobcat (Arizona gray fox variant)	12
2006	9				9
2007	16			1 bobcat (variant typing not performed)	17
2008	21			1 coyote (Arizona gray fox variant) 1 horse (Big brown bat variant)	23
2009	11		1	1 horse (North central skunk variant)	13
2010	8			1 bobcat (variant typing not performed)	9
2011	3			1 javelina (Arizona gray fox variant?) 1 bobcat (variant typing not performed)	5

*Source: Arizona Department of Health Services (ADHS) data

Rabies Risk Assessments in Maricopa County

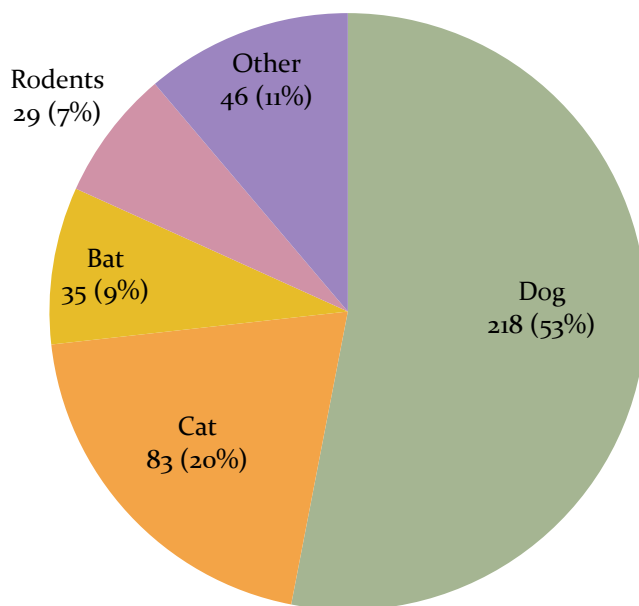
The Maricopa County Department of Public Health (MCDPH) conducts risk assessments for people who have had an interaction with an animal that poses a possible threat of transmitting rabies. MCDPH works in partnership with the Arizona Department of Health Services, Arizona Game and Fish Department, and all Maricopa County Animal Care and Control offices to make sure county residents and the animals involved are appropriately assessed after an exposure. Although suspicion of rabies is not an emergency, it is urgent and should be addressed without delay. MCDPH is available twenty-four hours per day, seven days per week to conduct immediate risk assessments and assist patients and medical providers with any questions they might have. Members of the public can reach MCDPH at **602-747-7500**. Medical providers can reach MCDPH at **602-747-7111**.

A risk assessment weighs the potential adverse consequences associated with administering post-exposure prophylaxis against the risk of the person acquiring rabies from their exposure. Risk assessments should be conducted in each situation involving a possible rabies exposure. Risk assessments consider the following factors: type of exposure, presence of animal rabies in the area where the contact occurred, species of animal, and circumstances of the exposure incident.

In 2011, MCDPH conducted 411 rabies risk assessments for persons that had a potential exposure to domestic or non-domestic animals. As seen in **Figure 1**, the majority of the risk assessments conducted were for exposures to domestic animals (dogs 53%, cats 20%), while exposures to bats constituted 9%

of risk assessments. **Figure 2** shows the number of risk assessments conducted for human interactions with domestic dogs or cats only. The majority of the cats were stray (67%), while only 27% of dogs were reported as stray. MCDPH conducted 110 rabies risk assessments for exposures to wild animals and livestock in 2011 (**Figure 3**). Of these 110 assessments, 35 (32%) were for human encounters with bats.

Figure 1. Human exposures* to all animals reported to the Maricopa County Department of Public Health for rabies risk assessments in 2011 (n = 411)

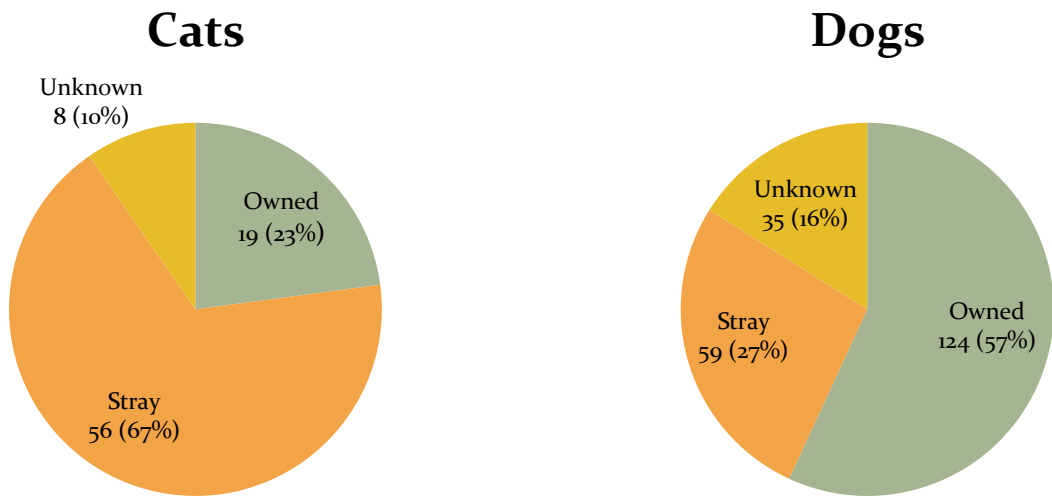


† Source: Maricopa County Department of Public Health (MCDPH) data

* Note: The numbers graphed here reflect the total number of assessments done, regardless of exposure risk.

** "Other" includes: Bear (1), Bobcat (13), Coyote (9), Donkey (1), Ferret (1), Fox (2), Horse (5), Javelina (5), Monkey (1), Mountain Lion (1), Rabbit (2), Skunk (1), Raccoon (2), and unknown (2). See Figure 3 for further details.

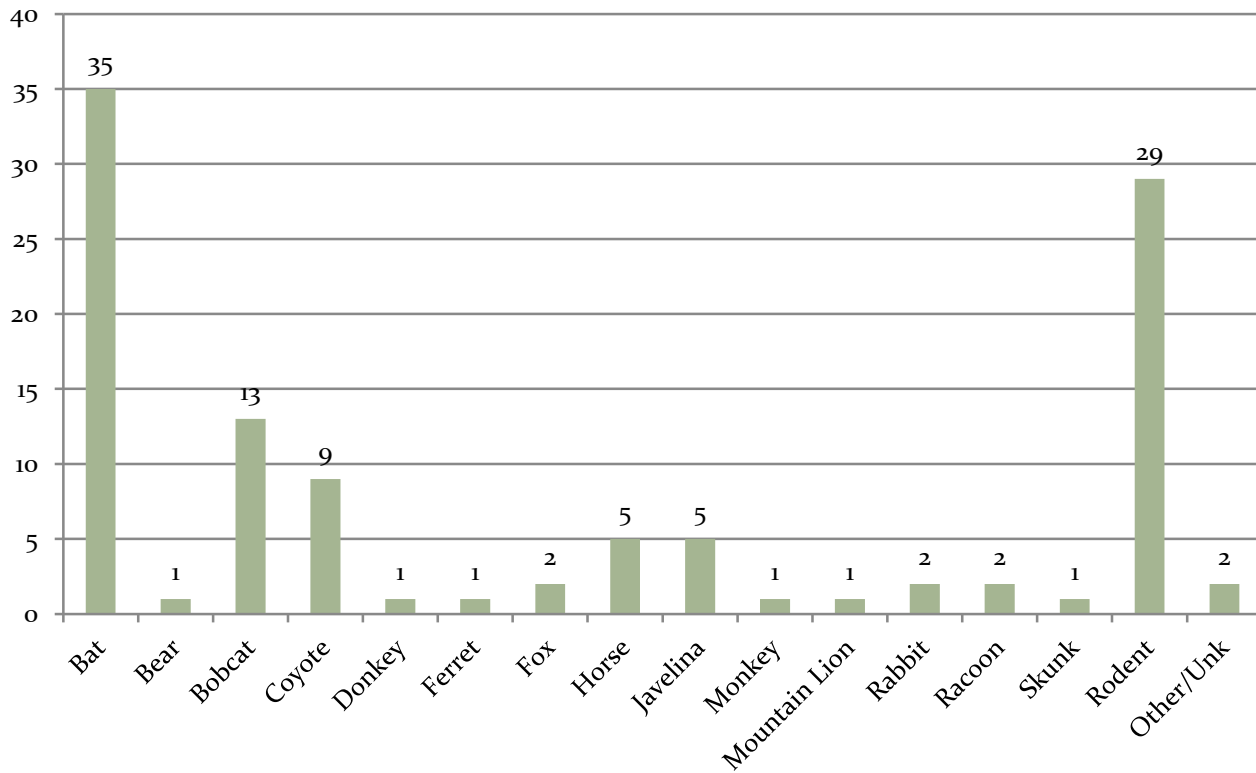
Figure 2. Human exposures* to domestic cats and dogs reported to the Maricopa County Department of Public Health for rabies risk assessments in 2011 (n = 301)†



† Source: Maricopa County Department of Public Health (MCDPH) data

* Note: The numbers graphed here reflect the total number of assessments done, regardless of exposure risk.

Figure 3. Human exposures* to wild animals and livestock reported to the Maricopa County Department of Public Health for rabies risk assessments in 2011 (n = 110)†



†Source: Maricopa County Department of Public Health (MCDPH) data

*Note: The numbers graphed here reflect the total number of assessments done, regardless of exposure risk

Partnerships for Risk Assessments

MCDPH experienced a 46% increase in cat and dog risk assessments, compared to 2010. This increase does not necessarily reflect an increase in the number of bites. Rather, the increase is likely due to improved communication between agencies and the establishment of animal testing protocols developed in conjunction with MCA&C, Arizona Department of Health Services, Arizona State Public Health Laboratory, and MCDPH. In addition, the newly created MCDPH rabies webpage (www.mcrabies.org) was launched in 2010, which may have contributed to this increase in risk assessments.

MCDPH epidemiology staff consider all pertinent information including human bite/exposure, circumstances of bite (provoked/unprovoked), animal vaccination status, location of animal (urban/rural), potential for wildlife contact, and signs and symptoms of animal (if applicable). When there is very low or no suspicion of rabies, or when there are no human exposures, it may be determined that the animal does not need to be submitted for rabies testing. No rabies specimens should reach the Arizona State Public Health Laboratory (ASPHL) without first being pre-approved by MCDPH Office of Epidemiology staff.

In 2011, MCDPH and ADHS made a significant effort to reduce the number of animals submitted for rabies testing at the ASPHL. This was done by better identifying which biting animals were most likely to be infected with rabies and by quarantining and observing biting animals rather than euthanizing them, whenever possible. (Rabies testing cannot be done on live animals, but live animals can be observed for onset of neurological symptoms.) According to ADHS, domestic cat and dog submissions decreased by 74% between 2009 and 2011. Wild animal submissions decreased by 61% in the same time period. In addition, the USDA Wildlife Services (USDA-WS) began wild animal testing by performing DRITs (Direct Rapid Immunohistochemical Test) on non-exposure animals. USDA-WS performed over 400 DRITs in Arizona in 2011, including 40 on wild animals in Maricopa County.

Exposure vs. Non-Exposure

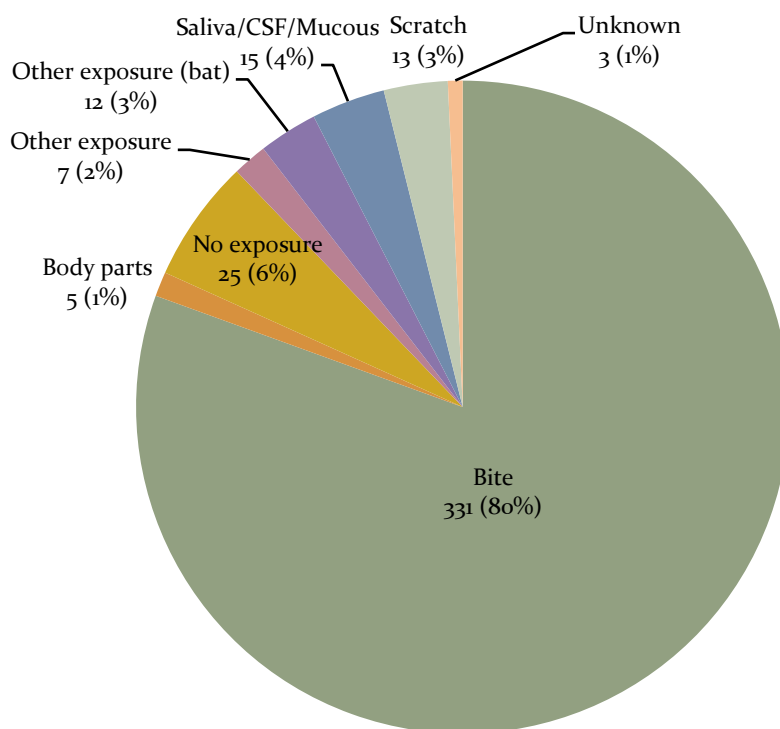
An exposure is any bite, scratch, or other situation where saliva, central nervous system (CNS) tissue, or cerebral spinal fluid of a potentially rabid mammal enters an open wound, non-intact skin, or comes in contact with a mucous membrane by entering the eye, mouth, nose, or mucous membranes of genitalia. **In order for transmission to occur, saliva or CNS tissue has to penetrate the skin or enter through mucous membranes.** Transmission through organ transplantation has also occurred in very rare circumstances.

The touching or handling of a potentially rabid animal or an inanimate object that had contact with a rabid animal does not constitute an exposure unless wet saliva or CNS material from the rabid animal entered a fresh wound, non-intact skin, or a mucous membrane. Contact with blood, urine, feces, or dried saliva on objects does not constitute an exposure. A bite from a rodent such as a squirrel, hamster, mouse, rat, rabbit, or hare does not constitute a potential rabies exposure, except in unusual circumstances. Unusual circumstances include: a wild rodent or rabbit that exhibits acute neurological signs per a veterinarian or a domesticated rodent or rabbit housed outside that survived an attack through the cage by a potentially rabid animal. These cases should be evaluated individually by a public health staff member to determine if an exposure has occurred.

Bite vs. Non-Bite

A bite is any penetration of the skin by the teeth of an animal. Any bite, regardless of its site or severity, could be a potential exposure. Bites to areas with a large number of nerves, such as the face, neck, and/or hands may be quicker to progress to the symptomatic phase of rabies. The site of the bite should not influence the decision whether or not to receive post-exposure prophylaxis. However, the site and severity of a wound should influence the decision whether to start treatment immediately or await quarantine and/or rabies test results. Recent epidemiologic data suggest that even the very minimal injury inflicted by a bat bite (compared to lesions caused by terrestrial carnivores) should prompt consideration of immediate post-exposure prophylaxis unless the bat is available for testing. Most human exposures to animals reported to MCDPH for assessment in 2011 were bite exposures (Figure 4).

Figure 4. Human exposures to all animals reported to the Maricopa County Department of Public Health for rabies risk assessments in 2011 by type of exposure (n = 411)[†]



[†]Source: Maricopa County Department of Public Health (MCDPH) data

The contamination of open wounds, abrasions, mucous membranes, or scratches with saliva or other potentially infectious material (such as neural tissue) from a rabid animal constitutes a non-bite exposure. In all instances of potential human exposures involving bats, if the bat is not available for testing, post-exposure prophylaxis might be appropriate even if a bite, scratch, or mucous membrane exposure is not apparent. However, in these circumstances there should be a reasonable probability that an exposure might have occurred.

Provoked vs. Unprovoked

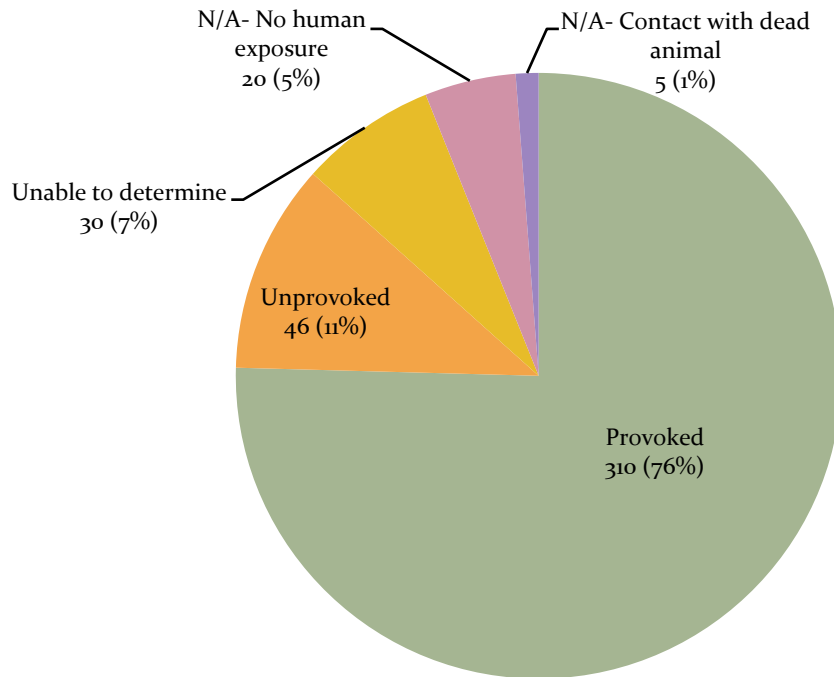
The mental state of an animal can give some indication of whether or not an animal is infected with rabies. Thus, part of a rabies risk assessment includes assessing the animal's behavior when it bit or scratched a human. If the bite was unprovoked, for example, the animal is more likely to be infected although this fact alone does not prove or disprove infection. There have been many aggressive animals that are not rabies-infected just as there have been placid animals that are infected.

An animal may be provoked by: yelling, chasing, running from, striking, taunting, frightening, or generally bothering an animal in such a way that induces the animal to become aggressive. Other situations which may provoke an animal include: entering a domestic dog or cat's yard or space, breaking up fighting animals, approaching an animal while it is eating or sleeping, approaching an animal with its young, approaching an animal that has impaired vision, hearing, or mobility, or handling an animal in such a way that could elicit a pain response - i.e. grabbing, hitting, poking, pulling, scratching, kicking, stepping on, or handling an injured animal. Approaching or petting a stray, feral, or wild mammal is also considered sufficient to provoke a bite, as a human is entering an animal's territory.

Situations that would be considered to be unprovoked include an attack by an animal that is aware of an individual's presence and the individual is not approaching or menacing the animal or an attack by an animal that is acting sick, exhibiting abnormal behavior, generally seems unhealthy, or a wild animal that has no fear of humans.

Most of the human exposures to animals reported to MCDPH in 2011 were considered to be a result of a provoked attack (**Figure 5**). In fact, provoked exposures occurred almost seven times more frequently than unprovoked exposures among those who receive risk assessments last year. As mentioned earlier, approaching a wild or an unfamiliar domestic animal always involves a risk and should be avoided, regardless of the animal's behavior.

Figure 5. Human exposures to all animals reported to the Maricopa County Department of Public Health for rabies risk assessments in 2011 by type of animal exposure (n = 411)[†]



[†]Source: Maricopa County Department of Public Health (MCDPH) data

Prophylaxis

Human Rabies Immunoglobulin (HRIG)

HRIG is given in conjunction with post-exposure vaccinations to individuals who have *not* been previously vaccinated. HRIG works by immediately boosting the body's immune system against rabies while the body builds a natural response to the vaccine. *HRIG alone is not adequate for post-exposure protection.* It can be given up to seven days after the first dose of vaccine. After this time, HRIG is not necessary and may actually inhibit the strength or rapidity of an expected immune response.

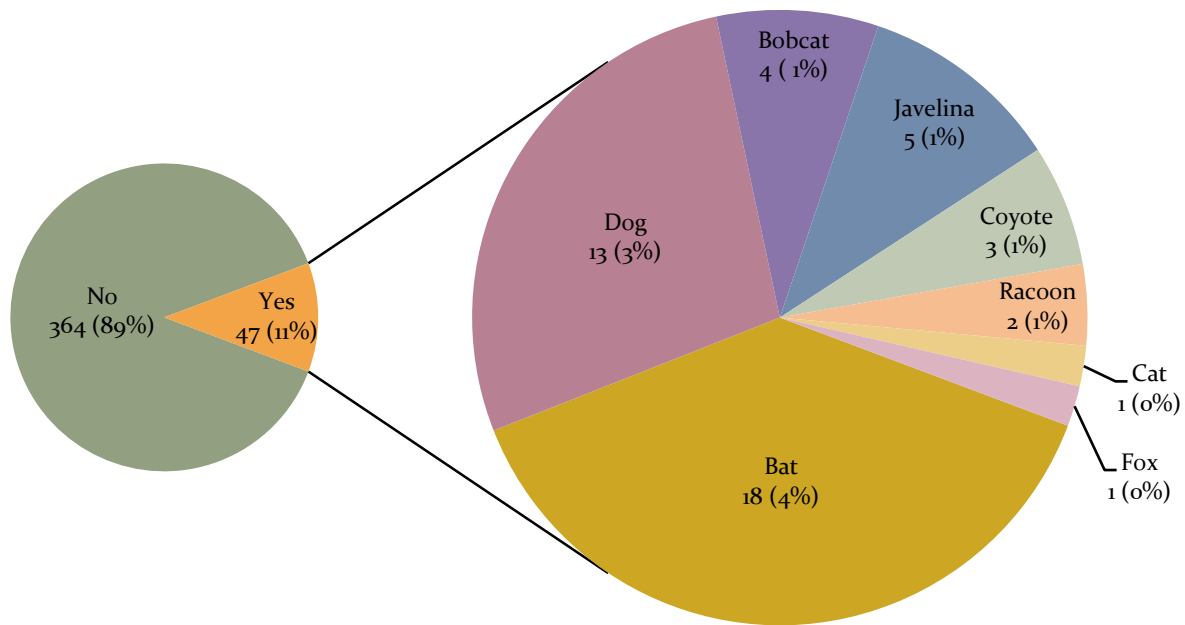
Post-Exposure Prophylaxis (PEP)

When an individual is assessed to be at high risk for rabies, the MCDPH recommends rabies post-exposure prophylaxis (PEP). In 2011, of the 411 rabies risk assessments conducted, MCDPH recommended starting PEP in 47 of these assessments (**Figure 6**).

All post-exposure management should begin with immediate thorough cleansing of all wounds with soap and water. If available, a virucidal agent should be used to irrigate the wounds to decrease the chances of infection. This may also aid in reducing the likelihood of rabies. Whenever possible, bite

injuries should not be sutured to avoid further and/or deeper contamination. Tetanus prophylaxis and antibiotics should be given as indicated. Public health officials should be notified immediately of such an incident to conduct a rabies risk assessment to determine if post-exposure prophylaxis is warranted. Post-exposure prophylaxis (for persons who have never been vaccinated for rabies) consists of HRIG and four vaccinations, given on days 0, 3, 7 and 14. HRIG is only provided one time, most often on day 0, but may be given up to seven days after the first dose of vaccine. (Day 0 is the first day that vaccine and HRIG are given.) If the person is immunosuppressed, they should be given an additional dose of rabies vaccine on day 28 and serum samples should be tested to ensure that an acceptable antibody response has developed after completing the series.

Figure 6. Human exposures to all animals reported to the Maricopa County Department of Public Health for rabies risk assessments in 2011 by MCDPH PEP recommendation (n = 411)†



†Source: Maricopa County Department of Public Health (MCDPH) data

Pre-Exposure Prophylaxis

Humans may receive rabies pre-exposure prophylaxis (vaccine and HRIG when there has been exposure or rabies vaccine in the absence of an exposure) for several reasons. In general, any persons that are at high risk for being exposed to rabies should consider rabies pre-exposure prophylaxis. In particular, rabies research laboratory workers and rabies biologic production workers should receive pre-exposure rabies vaccine. Rabies diagnostic laboratory workers, cavers, veterinarians and staff, animal control and wildlife workers in rabies enzootic areas, and all persons who frequently handle bats should strongly consider pre-exposure vaccination. The pre-exposure vaccination series consists of three vaccinations, given on days 0, 7, and 21 or 28. Receiving pre-exposure prophylaxis does not eliminate the need for rabies evaluation after a potential rabies exposure. However, if post-exposure prophylaxis is warranted, there is no use of HRIG and fewer doses of vaccine are needed following the exposure.

For further information about rabies, please see the following websites:

Maricopa County Department of Public Health (MCDPH)

MCDPH Rabies Website

Available at: <http://www.mcrabies.org>

Arizona Department of Health Services (ADHS)

Arizona Manual for Rabies Control and Bite Management

Available at: <http://www.azdhs.gov/phs/oids/vector/rabies/pdf/AZRabiesManual.pdf>

ADHS Rabies Website

Available at: <http://www.azdhs.gov/phs/oids/vector/rabies/>

Centers for Disease Control & Prevention (CDC)

Human Rabies Prevention – United States, 2008

Recommendations of the Advisory Committee on Immunization Practices (ACIP)
MMWR 2008; 57: (No. RR-3)

Available at: <http://www.cdc.gov/mmwr/PDF/rr/rr5703.pdf>

Use of a Reduced (4-Dose) Vaccine Schedule for Postexposure Prophylaxis to Prevent Human Rabies.

Recommendations of the Advisory Committee on Immunization Practices (ACIP).
MMWWR 2010; 59: (No. RR-2)

Available at: <http://www.cdc.gov/mmwr/pdf/rr/rr5902.pdf>

CDC Rabies Website

Available at: <http://www.cdc.gov/rabies>

MARICOPA COUNTY PROVIDES RISK ASSESSMENTS FOR ALL ANIMAL BITES.

Please call Maricopa County to report ALL suspected rabies cases and ALL animal bites!



**To report a suspected rabies case or
to receive a rabies risk assessment**

24 hours a day

602-747-7111

**To report an animal bite to
Maricopa County Animal Care and Control**

24 hours a day

602-506-7387



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