

An Update on the Incidence of Rabies in Pennsylvania in 2009

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The Pennsylvania Veterinary Laboratory (PVL) has maintained records of rabies diagnostic testing in Pennsylvania from 1900 to the present. There have been animals reported positive for rabies in the Commonwealth every year during this period, ranging from lows of only 11 positives in 1964 and 1968, to a high of 902 positives in 1944. A total of 388 animals were reported positive for rabies in 2009 in Pennsylvania including both wildlife and domestic animals.

Wildlife

Positive wildlife in Pennsylvania in 2009 included 199 raccoons, 54 skunks, 44 bats (of five different species), 24 foxes (both red and grey), 5 groundhogs, and one whitetail deer. 36% of the raccoons, 36% of the skunks, and 19% of the foxes submitted to PVL for testing were positive for rabies in 2009. Raccoons were not a major rabies vector in Pennsylvania until the late 1970's when infected raccoons were translocated into West Virginia from a southeastern U.S. focus of rabies in Florida. The variant of rabies virus from the translocated animals first appeared in Pennsylvania raccoon populations in 1982 and by 1989 a high of 488 rabid raccoons were reported in the Commonwealth. Raccoons have continued to have the highest incidence of rabies in Pennsylvania since that time. In 2009, at PVL, a total of 371 raccoons were tested with 135 testing positive for rabies. This epizootic involving the raccoon strain of rabies virus now involves all northeastern and mid-Atlantic states.

Rabies vector species are those at greater risk for contracting the disease. In Pennsylvania these species are: raccoons, skunks, foxes, bats, groundhogs and coyotes. The first confirmed case of rabies in a coyote in Pennsylvania was in 2006, a second coyote was reported in that year also. No coyotes were reported positive for rabies in the Commonwealth in 2007 or 2008. One Coyote was reported positive for rabies in 2009.

Any unvaccinated wild or domestic mammal can potentially contract rabies, but it is very rare in small rodents (rats, squirrels, chipmunks) and lagomorphs (rabbits and hares). As prey species, most rodents flee at the first sign of danger or are killed during the initial attack by a predator. Rabies has never been recorded in mice, voles, chipmunks, or other small rodents in Pennsylvania with the exception of one rat (species unknown) reported positive in 1945. The first muskrat was also reported that year, and another was positive in 2004. Seven squirrels have been positive in Pennsylvania from 1961 to the present, the latest in 1991.

Large rodents (beavers, woodchucks/groundhogs) have been confirmed with rabies in some areas of the United States. Five groundhogs were positive in Pennsylvania in 2009, and rabid groundhogs have been reported every year in the state since 1982. Three beavers, Pennsylvania's largest rodent, have also been reported positive for rabies, the latest in 2001.

The first bat documented with rabies in Pennsylvania was reported in 1953, and since then seven of the nine species of bats found in the state have been reported positive for rabies. Only the small-footed and the Indiana bats have never been positive in PA. Both of these bats are either threatened or endangered so not many are encountered and tested for rabies. In 2009, 44 bats were positive for rabies. Most were big brown bats (*E. fuscus*), but other positives included four

little brown bats (*M. lucifugus*), three northern long-eared bats (*M. septentrionalis*), and two hoary bat. Bat rabies and terrestrial rabies cycles are generally independent of one another. 379 bats were submitted to PVL in 2009 and 6% were positive. This figure does not represent a random population survey and the actual incidence of rabies in bats is undoubtedly much lower than this figure would indicate. Nevertheless, rabid bats have been encountered in Pennsylvania every year since 1961. Both big brown and little brown bats routinely enter human dwellings, and these bats are the primary reason that indoor cats and dogs should be vaccinated against rabies. Typically, about three quarters of all bats submitted to PVL since 1975 have been big brown bats, of which 5.3% have been reported positive, while only 2.0% of the little brown bats have been diagnosed with rabies in Pennsylvania.

One Pennsylvania whitetail deer tested positive for rabies in 2008 bringing the statewide total to 30 since 1951. Two otters and nine bobcats have been reported positive in the Commonwealth. The first confirmed case of rabies in a black bear occurred in 2004 in Centre County.

Only five opossums have ever been confirmed positive, all from 1983 to 1985, and rabies has never been diagnosed in Pennsylvania's wild rabbits or other small terrestrial mammals such as shrews and moles.

Domestic Animals

Cats are the most common domestic animals diagnosed with rabies in the United States. Dogs are the most common domestic rabid animals worldwide. Domestic animals positive for rabies in Pennsylvania in 2009 included 55 domestic cats, four dogs, and one cow. In 2009 the number of rabid cats again exceeded the total number of foxes or bats reported positive during the same period.

Pennsylvania law requires dogs and cats over three months of age to be vaccinated against rabies, but unvaccinated, free-roaming cats continue to be one of the more problematic rabies vectors. Rabies in vaccinated animals is very rare.

Human Rabies

Human rabies is quite rare in the United States. Only 27 cases have been reported in people in the United States since 1990. The most recent reported case was in 2007 from a bat strain of the virus due to confirmed contact with a bat. Monoclonal antibody analysis and genetic sequencing indicate that one death occurred from a skunk strain of rabies, and one death occurred in Virginia in 2003 from the raccoon strain of the virus. The remaining deaths probably all resulted from bat variants of the rabies virus. In May, 2004 an organ donor in Arkansas died of bat-associated rabies and four persons who received organs and tissue from this donor subsequently became infected and died from rabies later that year. But in most of the remaining cases of rabies in humans in the U.S. no exposure to bats could be documented. It remains unclear why a disproportionate number of human deaths from rabies in the U.S. are associated with bat strains of the virus.

A total of 173 human deaths from rabies have been documented in Pennsylvania in the last century. All of these cases occurred prior to 1949, with the exception of a single human death in Lycoming County in 1984 from a bat variant of the rabies virus. This was the last diagnosed case of rabies in the Commonwealth to date.

Ascension of Wildlife Rabies

From 1900 to 1944, all rabies positive cases reported in Pennsylvania were domestic animals; with dogs by far the most commonly reported species. The first wild animal documented with rabies in the state was a fox reported in 1944; the first rabid raccoon was not reported until 1948, and the first positive skunk was not seen until 1951. By the mid 1970's about 85% of reported positives were wildlife; in 2009 wildlife accounted for 88.5% of Pennsylvania's confirmed rabies cases. This epizootiological transition occurred largely due to canine rabies control programs that include mandatory vaccination and aggressive removal of strays. These programs were, and continue to be effective. 792 dogs were positive for rabies in 1944 in Pennsylvania, while only four dogs were reported positive in 2009. Dogs continue to be the animal most commonly reported with rabies worldwide, and the vast majority of human deaths from rabies worldwide are a result of bites from rabid dogs.

Conclusion

In the first half of the twentieth century rabies was recognized primarily as a disease of domestic dogs. In the twenty first century, rabies in Pennsylvania (and the United States) is now primarily a disease of mammalian wildlife, with occasional spillovers into domestic animals. Raccoons, skunks, foxes, and bats continue to be major wildlife vectors of rabies, while cats continue to be the primary domestic vectors.

Vaccination and education continue to be the most effective weapons against this disease. Reliable diagnostic testing programs combined with available and affordable vaccines currently keep human deaths from rabies at a minimum in the United States and most developed countries. In developing countries, however, many tens of thousands of humans and countless animals succumb each year to this ancient and deadly disease.

Rabies diagnostic services are offered at no charge at the following laboratories:

1. **Philadelphia Department of Health Laboratory**, Division of Disease Control, 500 South Broad Street, Philadelphia, PA 19107; (215) 685-6740. This laboratory provides testing of animals from within Philadelphia city limits.
2. **Allegheny County Department of Laboratories**, 3441 Forbes Ave., Pittsburgh, PA 15213; (412) 578-8070. This laboratory provides testing for residents of Allegheny County.
3. **PA Department of Health, Bureau of Laboratories**, 110 Pickering Way, Exton, PA 19341; (610) 280-3464. This laboratory provides statewide testing of human exposure cases.
4. **PA Department of Agriculture, PA Veterinary Laboratory**, 2305 North Cameron Street, Harrisburg, PA 17110; (717) 787-8808, Fax (717) 772-3895. This laboratory provides statewide testing of all species at no charge.

For further information contact the rabies department at the Pennsylvania Veterinary Laboratory by telephone weekdays 8 to 4, or FAX or e-mail khorman@state.pa.us. Contact individual testing laboratories for current testing policies and submission instructions.