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## **Fact Sheet: Rabies in Louisiana**

Although rabies remains endemic in wildlife in Louisiana, especially bats and skunks, the disease in pet species, particularly dogs, has been decreasing in occurrence since the early 1900s. This decrease is likely due to rabies vaccination programs and organized animal control activities. Human rabies has not been seen in Louisiana since 1953. Since 1996 an average of 7.9 cases of animal rabies has been discovered each year in the state. No positive dogs or cats have been identified since the year 2000.

The shift in the risk of rabies transmission from domestic dogs to wildlife has occurred throughout all areas of the United States. Due to increased surveillance for wildlife rabies, the number of reported cases has increased in the past few decades. Rabies is considered a disease of all warm-blooded animals, but the virus circulates in nature in only a few species, such as bats, raccoons, foxes, skunks, and coyotes. The only terrestrial rabies variant known to occur within Louisiana is a skunk variant, although discovery of raccoon variant rabies is also possible. Bat variants of the virus also are found in the state.

Although a limited number of species maintain the virus in nature, all warm blooded animals are susceptible to infection. Therefore public health concerns include human exposure to animals other than those responsible for maintenance of variants. For example, a terrestrial animal can be infected from the bite of a bat, although the particular variant might be maintained in nature exclusively by bats, the animal bitten by the bat can be infected with the bat strain and can transmit the virus through a bite to humans.

Rodents, squirrels, rabbits, hares and chinchillas are rarely found to be rabid and have not been known to cause human rabies in the United States. For these reasons, these species are not considered vectors of the disease except in certain unusual circumstances.

Because of the continued risk, however small, of rabies transmission to humans, surveillance for the disease cannot be taken lightly. Human deaths from rabies virus have occurred in all three adjoining states within the past five years. Since Louisiana employs a passive surveillance system, the relatively small number of wildlife cases reported each year is not an accurate indication of the state of rabies transmission in wildlife.

The following is a list of important facts about the disease:

What is rabies?

- An acute encephalitis in all warm-blooded hosts, including humans and the outcome is almost always fatal (only seven survivors, all but one had received either pre- or post-exposure prophylaxis).

- All species of mammals are susceptible to rabies, but only a few species are important reservoirs

#### Species affected:

- Most cases occur in wild animals such as raccoons, skunks, bats and foxes [2000: 7369 cases in animals in U.S., 40% in raccoons]
- Less than 10% of cases occur in domestic animals (prior to 1960, the majority of cases reported were in domestic animals)
  - Cats (twice as many as in dogs and cattle), cattle and dogs are the most commonly affected domestics

#### Species affected:

##### Rabies virus variants

- Terrestrial: distinct genetic variants in skunk, raccoon, coyote, fox
- Insectivorous bat rabies

#### Rabies in U.S., 2000

- 37.7 % in raccoons
- 30.1 % in skunks
- 16.8 % in bats
- 6.1 % in foxes
- 0.7 % in rodents and lagomorphs
- These percentages indicate an increase in skunks, foxes and bats from the year before.

#### Signs and symptoms

- Early signs (2 – 10 days)
  - Fever
  - Headache
  - General malaise
- Progressing to:
  - Neurological signs: insomnia, confusion, anxiety, paralysis, excitation, hallucinations, agitation, hypersalivation, difficult swallowing, hydrophobia
  - Death

#### What about rodents and lagomorphs (rabbits and hares)?

- Never have caused a human case of rabies in the United States
- Should not be considered a risk unless sick at the time of bite or if the area is known to be experiencing an increase in rabies transmission
- Woodchucks and ground hogs (*Marmota monax*) are the only exceptions

#### Annual incidence of rabies, U.S.

- In the late 1890's, about 100 human cases per year were recorded

- By the 1990's: 1 or 2 cases per year
  - Human fatalities usually result from a failure to seek medical assistance usually due to lack of awareness of exposure

#### Examples of human fatal cases

- A California man removes a bat from his house. He did not recall a bite.
- An immigrant recently arriving to New York dies. He had been bitten by an unvaccinated puppy in Ghana.
- A Georgia man dies after bats from his attic had “landed on him at night” while sleeping.
- A Minnesota man dies after being bit by a bat that lived among other bats in his house. He did not seek medical attention.
- A Wisconsin man dies after ridding his house of bats. He did not remember being bitten, but had asked a friend if one could get rabies from an “insect bite”.

#### U.S. cost to public health annually

- > \$300 million
  - Vaccination of companion animals
  - Animal control programs
  - Maintenance of rabies laboratories (3 in Louisiana)
  - Medical costs
    - Includes post-exposure prophylaxis (PEP)

#### Human rabies vaccines

- CDC estimates that 40,000 doses are given annually (most after bites by domestic animals)
- Five doses of vaccine given out over a four week period (days 0, 3, 7, 14, & 28)
- PEP cost > \$1000.00 (vaccine is currently c. \$125.00/each)
- There has NEVER been a vaccine failure in the U. S.

#### Rabies worldwide

- Exposure to rabid dogs is responsible for over 90% of human exposures worldwide and 99% of human deaths.
- Canine rabies control programs are often too expensive for developing nations
- The highest incidence of human rabies is often in countries with a poor public health infrastructure and therefore, inaccurate reporting of the disease

#### The virus

- A rhabdovirus (order: Rhabdoviridae) belonging to the Lyssavirus genus (“lyssa”, Greek for mad, vicious dog)
- Enveloped RNA virus with characteristic bullet shape
- Other Lyssaviruses: Lagos bat virus, Mokola virus, Duvenhage virus, European Bat virus 1 & 2 and Australian bat virus

Entry into the host

Mode of transmission

- Infected saliva of a host passed to an uninfected animal
- The virus most often enters through a bite
- However, various other portals of entry have been identified:
  - Transfer of saliva to eyes, nose, or mouth
  - Aerosol
  - Corneal transplant (8 deaths in 5 countries, 1 in U.S.)

Infectious path of rabies in the raccoon

- Raccoon bitten by rabid animal and virus enters through infected saliva
- Virus ascends the peripheral nerves to the spinal cord and brain (3-12 weeks)
- In the brain, the virus multiplies rapidly and is spread to the saliva. The raccoon appears ill at this point.
- The raccoon usually dies within seven days of onset of signs.

Incubation period in the human

- Varies
  - Site of bite
  - Replication in peripheral nerves or non-nervous tissue
- Typically 1 – 3 months (range few days to several years)

Pathology of rabies (most learned in late nineteenth century)

- Encephalitis and myelitis with perivascular infiltrates with lymphocytes, pmn's and plasma cells throughout the CNS
- Cytoplasmic inclusion bodies in neuronal cells (Negri bodies), especially pyramidal cells of the hippocampus or Purkinje cells of the cerebellum.

Negri bodies

- Dr. Adelchi Negri discovered in 1903
- Presence is variable. Only in 50% of samples from positive animals
- May appear like other types of inclusion bodies
- Do not use for diagnosis

Factors affecting the outcome of rabies exposure:

- Virus variant
- Dose of virus inoculum
- Route and location of exposure
- Individual host factors
  - Age
  - Immune status

## Diagnosis

- Direct fluorescent antibody test on animal brain tissue
- Humans
  - Saliva: virus isolation or reverse transcription/PCR
  - Serum and CSF: serology
  - Skin biopsy: rabies antigen examination in cutaneous nerves at the base of the hair follicle

## Direct fluorescent antibody test

- Detects viral proteins
- A fluorescent anti-rabies antibody is incubated with brain tissue
- A fluorescence microscope is used to visualize (apple-green fluorescence) areas where the antibody binds to the virus nucleoprotein

## Pre-exposure prophylaxis: three vaccinations given at 0, 7, and 21 or 28 days

- Recommended for persons in high risk groups
  - Veterinarians
  - Animal handlers
  - Certain laboratory workers
- Persons whose activities bring them in contact with bats, raccoons, skunks, dogs, etc.
- International travelers at risk in locations where biologicals are not consistently available.

## Purposes of pre-exposure prophylaxis

- Does not eliminate the need for post-exposure prophylaxis
  - Human rabies immune globulin not needed
  - Reduces the number of PEP injections
- Enhances immunity where PEP may be delayed
- Provides protection for people that may experience unapparent exposure

## What is the procedure to follow when a person is bitten?

- Recommend that the wound be cleaned thoroughly with soap and water, then seek medical attention immediately.
- Collect pertinent information:
  - Geographic location of the incident
  - Type of animal involved
  - How the exposure occurred (provoked or unprovoked)
  - Vaccination status of the animal
  - Possibility of the animal be captured and tested for rabies
- Consult public health authorities

What can pet owners do to prevent the spread of rabies?

- Keep vaccinations up to date for all dogs, cats and ferrets
- Keep pets away from wild animals
- Report the presence of stray animals
- Spay or neuter your pets (reduces the number of unwanted pets that may not be maintained on vaccinations)

What can everyone do to prevent the spread of rabies?

- Enjoy wildlife from afar
- Do not adopt wild animals as pets or tend to sick or abandoned wildlife
- Teach children never to handle unfamiliar animals, wild or domestic. “Love your own. Leave others alone.”
- Prevent bats from entering occupied spaces
- Be extremely careful of wildlife when traveling outside the U. S. (Estimated number of deaths from rabies annually worldwide: > 50,000)

Rabies is very common in:

- Asia
- Africa
- Latin America

A jogger is bitten by a cat or a dog that is not vaccinated. What should be done?

- If the animal is captured and appears healthy, a ten day period of quarantine should be observed.
- Evaluation of the vaccine status is essential.
- Should the animal show signs of rabies within the ten day period, it should be euthanatized and examined for rabies.

What if a wild animal bites my pet?

- If the wild animal is captured, it should be submitted for rabies testing immediately.
- If the wild animal is not captured and the pet is unvaccinated:
  - The wild animal is assumed to be rabid
  - The pet should be euthanatized immediately or kept in strict isolation for 6 months and vaccinated one month prior to release.
- If the pet is vaccinated, it should be kept under observation for 45 days.

Bats

How do we handle exposure to bats?

- The bat should be captured
- Some bat bites are undetected, so in the following situations a bite should be assumed:

- Awaken and see a bat in your room
- Find a bat in a room with an unattended child
- See a bat near a mentally impaired or intoxicated person
- Bats in unusual locations, bats not able to fly and bats active in daylight are more prone to be rabid

Map

