

RABIES

(Hydrophobia, Lyssa)

REPORTING INFORMATION

Human:

- **Class A: Report immediately via telephone** the case or suspected case and/or a positive laboratory result to the local public health department where the patient resides. If patient residence is unknown, report immediately via telephone to the local public health department in which the reporting health care provider or laboratory is located. Local public health departments should report immediately via telephone the case or suspected case and/or a positive laboratory result to the Ohio Department of Health (ODH).
- Reporting Form(s) and/or Mechanism:
 - *Immediately via telephone.*
 - The local health department should enter the case into the Ohio Disease Reporting System within 24 hours after the telephone report.
 - The Centers for Disease Control and Prevention (CDC) [Possible Human Rabies - Patient Information Form](#) is required.
 - Information collected from the form should be entered into ODRS **and** faxed to ODH at 614-564-2456. The mailing address for this form is: ODH, Outbreak Response and Bioterrorism Investigation Team (ORBIT), 246 N. High St., Columbus, OH 43215.
- Key fields for ODRS reporting include: import status (whether the infection was travel-associated or Ohio-acquired), date of illness onset, and all the fields in the Epidemiology module.

Animal:

- Complete [Rabies Test Submission Form \(HEA 2539, rev 10/12\)](#). Report is submitted with animal specimen to ODHL. ODHL reports positive animal rabies cases to the local health department and to the Zoonotic Disease Program.

AGENT

Rabies virus, a rhabdovirus of the genus *Lyssavirus*.

RABIES, HUMAN CASE DEFINITION

Clinical Description

Rabies is an acute encephalomyelitis that almost always progresses to coma or death within 10 days after the first symptom.

Laboratory Criteria for Diagnosis

- Detection of Lyssavirus antigens in a clinical specimen (preferably the brain or the nerves surrounding hair follicles in the nape of the neck) by direct fluorescent antibody test, *or*
- Isolation (in cell culture or in a laboratory animal) of a Lyssavirus from saliva or central nervous system tissue, *or*
- Identification of Lyssavirus specific antibody (i.e. by indirect fluorescent antibody (IFA) test or complete rabies virus neutralization at 1:5 dilution) in the cerebrospinal fluid (CSF), *or*
- Identification of Lyssavirus specific antibody (i.e. by indirect fluorescent antibody (IFA) test or complete rabies virus neutralization at 1:5 dilution) in the serum of an unvaccinated person, *or*
- Detection of Lyssavirus viral RNA (using reverse transcriptase-polymerase chain reaction [RT-PCR] in saliva, CSF or tissue.

Case Classification

Confirmed: A clinically compatible case that is laboratory confirmed by testing at a state or federal public health laboratory.

Comment

Laboratory confirmation by all of the above methods is strongly recommended. Several tests are necessary to diagnose rabies ante-mortem (before death) in humans; no single test is sufficient. Tests are performed on samples of saliva, serum, spinal fluid, and skin biopsies of hair follicles at the nape of the neck. Saliva can be tested by virus isolation or reverse transcription followed by polymerase chain reaction (RT-PCR). Serum and spinal fluid are tested for antibodies to rabies virus. Skin biopsy specimens are examined for rabies antigen in the cutaneous nerves at the base of hair follicles.

RABIES, ANIMAL CASE DEFINITION

Clinical Description

Rabies virus causes an acute encephalitis in all warm-blooded hosts and the outcome is always fatal. The first symptoms of rabies may be nonspecific and include lethargy, fever, vomiting, and anorexia. Signs progress within days to cerebral dysfunction, cranial nerve dysfunction, ataxia, weakness, paralysis, seizures, difficulty breathing, difficulty swallowing, excessive salivation, abnormal behavior, aggression, and/or self-mutilation.

Laboratory Criteria for Diagnosis

- A positive direct fluorescent antibody test (preferably performed on brain tissue) or other confirmatory test performed by CDC.
- Isolation of rabies virus (in cell culture or in a laboratory animal).

Case Classification

Confirmed: a case that is laboratory confirmed.

SIGNS AND SYMPTOMS

Humans

Humans infected with the rabies virus have an initial, asymptomatic incubation period. The incubation period can vary from about 10 days to rarely over a year. The average incubation period is 31 to 90 days. Shorter incubation periods are associated with exposure sites closer to the central nervous system, such as wounds of the head and neck, wounds in highly innervated areas and in younger persons.

The prodromal period in human rabies usually lasts 2-10 days. Pain and paresthesia are common at the wound site. Non-specific complaints such as general malaise, chills, fever, headache, sore throat and fever are commonly reported, as are behavioral changes such as apprehension, anxiety, agitation, irritability, insomnia and depression.

The acute neurologic period in humans can last 2-21 days. Rabies presents as encephalitis which is difficult to distinguish from other causes of encephalitis. An excitation or furious phase includes hyperesthesia and extreme sensitivity to light and sound, dilation of pupils and increase in salivation. Ascending or asymmetric paralysis can occur. Swallowing dysfunction due to muscle spasms is seen in most patients. Some experience laryngopharyngeal contractions when just looking at liquid and stop swallowing their own saliva. This excitation phase can persist until death or change to a generalized paralysis. In some cases paralytic symptoms predominate in the disease

course. Patients with furious rabies usually die within a week, while those with paralytic rabies (often seen with bat-strain rabies) may survive up to 30 days.

Animals

Initial symptoms in animals include behavior changes, agitation and reflex excitability. With the furious form, animals become dangerously aggressive, biting objects, other animals and humans. Salivation may be profuse and there may be voice changes due to paralysis of the throat muscles. In the dumb form, the excitatory phase is short or absent and paralysis is the dominant sign. There can be paralysis of a limb beginning at the site of exposure.

Dogs show either the furious or dumb form of rabies, with the symptoms described above. Cats generally show the furious type, followed by paralysis 2-4 days later. Cattle primarily show paralysis and incoordination. Cattle have difficulty swallowing and show abnormal abdominal contractions.

DIAGNOSIS

Human

CDC can perform antemortem testing for human rabies but requires that all four of the following samples be submitted: saliva, neck biopsy, serum and CSF. Providers need to complete the CDC Patient Information Form and contact the ODH Zoonotic Disease Program at 888-RABIES1 (888-722-0544) to arrange for testing pre-approval. Specific information for sample collection and the Patient Information Form can be found at the following website: http://www.cdc.gov/rabies/specific_groups/doctors/index.html.

Animal

The ODH Laboratory performs testing of animals for rabies. Contact the ODH Laboratory at 1-888-ODH-LABS (888-634-5227) (Monday – Friday; 8 AM – 5 PM) for specimen submission criteria. Include a completed Rabies Test Submission Form (HEA 2539, rev 10/12) with each specimen submitted.

EPIDEMIOLOGY

Source

Virus-laden saliva, or brain and spinal cord fluids of rabid animals.

Occurrence

Rabies occurs worldwide, and although primarily a disease of animals, numerous human cases occur in developing countries. In the United States there are about three human and 7,000 animal cases diagnoses annually. The last human case in Ohio occurred in 1970. About 60 animals are confirmed rabid in Ohio every year. Most cases are in wildlife such as bats, skunks and raccoons. Since 2000, Ohio has also had rabies confirmed in horses, fox, cat, cow, coyote, groundhog, and opossum. There continues to be an on-going focus of rabies associated with raccoons in Northeast Ohio which is where most of the non-bat rabies has occurred.

Mode of Transmission

Primarily by the bite of a rabid animal, or where saliva or other potentially infectious material is introduced into an open wound or mucous membrane.

Period of Communicability

In dogs, cats and ferrets, virus can appear in the saliva 3-5 days before the onset of symptoms and continue until death. The length of viral shedding in bats and other wildlife has not been determined, therefore no quarantine is recommended.

Incubation Period

In humans, usually 31-90 days, with a range from 9 days to as long as a year or more.

PUBLIC HEALTH MANAGEMENT

Case (Human)

Investigation

In suspected human cases, determine possible exposures to known rabid animals.

Treatment

Intensive supportive care and rabies immune globulin (RIG) are the only therapies available. There is an experimental treatment protocol that has resulted in one recent human rabies recovery.

Isolation and Follow-up Specimens

Strict isolation of the case is required. Use standard precautions. Serum neutralizing antibody is usually not present until 8-10 days after onset of symptoms. If the initial specimen was drawn earlier than 10 days from onset of symptoms, a second serum specimen should be submitted. Antibody to rabies virus in the CSF strongly suggests a rabies virus infection.

Contacts

Contact the ODH Zoonotic Disease Program for questions concerning the handling of an animal bite, a case of rabies or human immunization at 888-RABIES1 (888-722-4371). Information on rabies is accessible through the ODH Zoonotic Disease Program website at: <http://www.odh.ohio.gov/odhprograms/dis/zdp/rabies/rabies.aspx>.

Follow the CDC and ACIP recommendations for treatment of bite wounds inflicted by a human rabies case, known animal rabies case or potentially rabid animal. Human contacts should also be evaluated for whether or not to treat with rabies post-exposure vaccination series. If post-exposure immunization is appropriate, previously non-immunized immunocompetent contacts should receive Rabies Immune Globulin (RIG) and four doses of Human Diploid Cell Vaccine or Purified Chick Embryo Cell Culture Vaccine. Please review the current Advisory Committee on Immunization Practices (ACIP) recommendations in the CDC's *Morbidity Mortality Weekly Report (MMWR)* March 19, 2010; 59(RR02); 1-9: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5902a1.htm>.

Animals which have bitten a person or caused a non-bite exposure should be appropriately quarantined or sacrificed and tested for rabies. Cases should be handled according to state regulations including Ohio Revised Code (ORC) 955.26 and Ohio Administrative Code (OAC) 3701-3-28 and 3701-3-29.

Animal quarantine recommendations and recommendation for pets exposed to potentially rabid animals should be handled according to the Compendium of Animal Rabies Prevention and Control. 2011 which can be found at: <http://www.nasphv.org/documentsCompendia.html>.

Prevention and Control

Follow-up Specimens

Surveillance for an area will depend upon how exposure occurred, species of animal, previous history of animal rabies in the area and other factors. Preventive measures include stray animal control and rabies vaccination of pets. The public, especially children, should be taught how to prevent being bitten by animals and to avoid handling wild animals.

If livestock are involved in exposure to a known rabid animal, contact the Ohio Department of Agriculture (ODA), Division of Animal Health, 8995 East Main Street, Reynoldsburg, Ohio 43068, 614-728-6220 or 800-300-9755.

Vaccination

For those individuals at increased risk of being exposed to rabies, such as veterinarians, animal control or wildlife workers, pre-exposure immunization is recommended. See the current ACIP recommendations at the CDC rabies website:

<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5902a1.htm>.

REFERENCES

General rabies information: <http://www.cdc.gov/rabies>

Veterinarians: http://www.cdc.gov/rabies/specific_groups/veterinarians/index.html

Healthcare Professionals: http://www.cdc.gov/rabies/specific_groups/doctors/index.html

Healthy Pets Healthy People: <http://www.cdc.gov/healthypets>

What is rabies?

Rabies is a rare but deadly disease, caused by a virus that attacks the nervous system. Rabies still exists throughout the world and at least 60,000 people die from it each year. Rabies can be prevented, but once symptoms appear it is invariably fatal.

Vaccination and animal control programs have successfully decreased the frequency of cases in the United States. On average, 3 people and 7,000 animals are known to die from rabies in the U.S. each year. In Ohio, approximately 60 animals are confirmed positive for rabies annually. The last human case in Ohio occurred in 1970.

Who can get rabies?

In the United States, Rabies is most often found among wild mammals such as raccoons, bats, skunks, coyote and foxes. Cats, dogs, horses and livestock can also get rabies, if they are not vaccinated

Some animals rarely get rabies. These include rabbits, squirrels, chipmunks, rats, mice, guinea pigs, gerbils and hamsters. They can get rabies, but it *almost* never happens.

Other animals, such as birds, reptiles, fish, and insects *never* get rabies.

How is rabies spread?

Rabies is spread through contact with infected saliva. This usually happens during a bite, but may also occur if saliva contacts an open wound or mucous membranes such as eyes, nose or mouth. Contact with the brain or other nervous tissue of an infected animal may also spread the disease. Rare cases of human to human transmission have occurred through organ donations.

Other body fluids including urine, blood, feces and skunk spray do not contain enough virus to transmit the disease.

How long after exposure before symptoms appear?

It may take several weeks or even a few years for people to show symptoms after getting infected with rabies, but usually people start to show signs of the disease 1 to 3 months after exposure to the virus.

What are the symptoms of rabies in humans?

The early signs of rabies can be fever or headache, but this changes quickly to nervous system signs, such as confusion, sleepiness, or agitation. Once someone develops these symptoms they will likely die of the disease. This is why it is very important to talk to your doctor or health care provider right away if any animal bites you, especially a wild animal.

What are the signs of rabies in an animal?

The first sign of rabies is typically a change in the animal's behavior. It may become unusually aggressive or unusually tame. The animal may lose fear of people and natural enemies. It may become excited, irritable and snap at anything in its path. A wild animal may appear affectionate and friendly. Staggering, convulsions, spitting, choking, frothing at the mouth and paralysis are sometimes noted. Many animals have a marked change in voice. The animal usually dies within a few days after showing signs of rabies.

How is rabies diagnosed in humans?

Several tests are necessary to diagnose rabies ante-mortem (before death) in humans; no single test is sufficient. Tests are performed on samples of saliva, serum, spinal fluid, and skin biopsies of hair follicles at the nape of the neck.

How is rabies diagnosed in animals?

There are no reliable tests for animals that can be used while they are alive. Animals with clinical signs of rabies should be humanely euthanized so they can be sent to the Ohio Department of Health Laboratories for testing.

Can rabies be treated?

There are no standard treatments that are successful once signs are apparent.

Can rabies be prevented?

Yes, rabies is preventable. Licensed vaccines are available for dogs, cats, ferrets, and horses. These vaccines are important not only to keep your pets from getting rabies, but also to provide a barrier of protection for you, if your animal is bitten by a rabid wild animal.

Human pre-exposure vaccines are available for those at high risk of exposure such as wildlife officers, veterinarians, and animal care workers.

After an exposure occurs in humans, vaccines are still effective in preventing the disease. For most people, rabies post-exposure vaccinations consist of a dose of human rabies immune globulin and four doses of rabies vaccine given on the day of the exposure and then again on days 3, 7, and 14. This set of vaccinations is highly effective at preventing rabies if given as soon as possible following an exposure. If a person has previously received post-exposure vaccinations or received pre-exposure vaccinations, only two doses of vaccine (on the day of exposure and then 3 days later) are needed. The circumstances surrounding each exposure are different and you should discuss the treatment options with your physician. If the animal is available for testing or can be quarantined for a 10-day period, it is sometimes recommended to wait until the results are available before undergoing the treatment.

What should I do after a bite or possible exposure to rabies?

Wash the wound thoroughly with soap and water. The rabies virus is easily destroyed by common disinfectants such as soap, so washing is a critical step in preventing rabies. Contact your doctor and your local health department immediately. If it can be done safely, have someone try to capture the animal without damaging its head. Having the animal available for quarantine or testing may eliminate the need for costly rabies prevention treatments.

What if I think my pet has been exposed?

If your pet has been in a fight with another animal, wear gloves to handle it or isolate your pet for several hours to avoid exposure to saliva on the animal's fur. Call your veterinarian right away. Vaccinated pets will need a booster dose of rabies vaccine within five days of exposure and should be kept under observation for 45 days. Unvaccinated animals exposed to a known or suspected rabid animal must be confined for six months or humanely destroyed.

For more information, visit these websites:

World Health Organization (WHO) rabies fact sheet:
<http://www.who.int/mediacentre/factsheets/fs099/en/>

CDC rabies homepage: <http://www.cdc.gov/rabies/>