Alberta Public Health Disease Management Guidelines

Rabies

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Health and Wellness Promotion Branch

Public Health and Compliance Branch

Alberta Health

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Case Definition

Confirmed Case

Clinical illness[A] with laboratory confirmation of infection:

- Detection of rabies virus antigen in an appropriate clinical specimen, including conjunctival swabs, saliva, cerebrospinal fluid (CSF) and nuchal skin biopsy by immunofluorescence (i.e., direct fluorescent antibody)

OR

- Detection of rabies virus RNA in an appropriate clinical specimen by RT-PCR

OR

- Isolation of rabies virus from saliva or CSF using cell culture or laboratory animal

OR

- Findings at autopsy including detection of rabies virus in central nervous system (CNS) tissue by immunofluorescence or RT-PCR and visualization of Negri bodies by histopathology

Probable Case

Clinical illness[A] with laboratory evidence:

- Detection of rabies-neutralizing antibody in the serum or CSF of an unimmunized[B] person who did not receive rabies immunoglobulin

Suspect Case

- Clinical illness[A] without laboratory evidence

[A] Rabies is an acute encephalomyelitis dominated by forms of hyperactivity (furious rabies) or paralytic syndromes (dumb rabies) that almost always progresses to coma or death within 10 days after the first symptom.

[B] Serology is very insensitive for rabies diagnosis and is best used in immunized persons to confirm immunity post immunization.[5]

Reporting Requirements

Physicians/Health Practitioners and Others

Physicians, health practitioners and others shall notify the Medical Officer of Health (MOH) (or designate) of the zone, of all confirmed, probable and suspect cases by the Fastest Means Possible (FMP).

Laboratories

All laboratories shall report all positive laboratory results:

- by FMP to the MOH (or designate) of the zone, and
- by mail, fax or electronic transfer within 48 hours (two business days) to the Chief Medical Officer of Health (CMOH) (or designate).

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- The MOH (or designate) of the zone where the case currently resides shall notify the CMOH (or designate) by FMP of all confirmed, probable, and suspect cases.
- The MOH (or designate) of the zone where the case currently resides shall forward the initial Notifiable Disease Report (NDR) of all confirmed cases to the CMOH (or designate) within one week of notification and the final NDR (amendment) within two weeks of notification.
- For out-of-province and out-of-country reports, the following information should be forwarded to the CMOH (or designate) by FMP:
  - name,
  - date of birth,
  - out-of-province health care number,
  - out-of-province address and phone number,
  - positive laboratory report, and
  - other relevant clinical/epidemiological information.

Epidemiology

Etiology

Rabies virus is a member of the *Rhabdoviridae* family, *Lyssavirus* genus.[1]

Clinical Presentation

Rabies is almost invariably fatal. Initial symptoms, lasting four to 10 days, include headache, fever, malaise, flu-like illness, paresthesia at the site of the animal bite and a sense of apprehension.[2,3] Two forms of rabies are known to occur: furious and paralytic. Furious rabies accounts for approximately 80% of cases. Progressively worsening CNS manifestations occur, such as anxiety, hyperactivity, excited behaviour, dysesthesia (abnormal sense of touch), pruritus (itching), radicular pain, intense thirst but fear of water (hydrophobia), and dysautonomia (autonomic nervous system does not work properly).[1,2] After a few days, death occurs by cardio-respiratory arrest.

Paralytic (dumb) rabies does not have the same CNS manifestations that furious rabies has.[2] Rather, paralysis insidiously ascends and the person becomes increasingly confused until coma occurs, then death. The paralytic forms are often misdiagnosed, which is believed to contribute to underreporting of the disease.[4]

Diagnosis

The diagnosis of rabies in humans typically requires more than one test ante-mortem and is typically made via detection of viral antigen by direct immunofluorescence from clinical specimens or detection of rabies virus RNA in an appropriate clinical specimen.

The prospect for detecting infectious rabies virus, rabies virus antigen and/or specific immune response increases as clinical symptoms progress. Serology cannot distinguish between antibodies resulting from current infection or previous immunization. Negative serological results do not rule out a rabies infection, because antibodies may not develop during infection and seroconversion usually occurs very late or not at all. The majority of patients with rabies infection die without having seroconverted.[5]

Treatment

Once symptoms have developed there is no specific treatment. Intensive supportive medical care is usually undertaken, but in most situations rabies is fatal.

Reservoir

Rabies virus is maintained in nature within various types of wild and domestic carnivores (e.g., foxes, dogs, coyotes, wolves, ferrets, skunks, raccoons, cats) and bats.[3] In developing countries, dogs remain the principal reservoir. Rabbits, hamsters, guinea pigs, gerbils, squirrels, chipmunks, rats, birds and mice are rarely infected. Although rodents and other small mammals are very susceptible to the virus, these small animals rarely survive the encounter with a larger rabid animal.[6] In Alberta, rabies is mainly found in bats.[7]

Transmission

Rabies is transmitted via a bite, scratch or lick that introduces saliva of an infected animal (refer to Reservoir for highest risk animals) into a fresh break in the skin or contact with intact mucous membranes including the eyes, nose and mouth.[1–3] Aerosol transmission, although rare, has been reported in caves and laboratory settings.[2,3]

Although the virus has been isolated from the saliva of infected cases, making person-to-person transmission from a human bite theoretically possible, such transmission has not been confirmed.[3,8] Activities that could potentially pose a risk to others include bites, kisses, direct contact between saliva and mucous membranes or broken skin, sexual activity, and sharing utensils or cigarettes.[9]

Transmission has been reported following corneal transplants and other organs taken from persons who have died of undiagnosed rabies.[10,11] Mother-to-child transmission is possible, although rare.[12]

Ingestion of raw meats or other tissues from animals infected with rabies is not a source of human infection but is not advised.[8] There have been documented cases in which people have contracted rabies from cuts or sprays while handling rabid animal carcasses.[13,14]

The virus is inactivated rapidly in sunlight (1.5 hours at 30°C) and does not survive for long periods outside of the host (minutes to hours, depending on environmental conditions).[15] Ultraviolet light, detergent, ethyl alcohol, or a 1:10 dilution of bleach can destroy the virus.[2]

Incubation Period

The incubation period varies from a few days to more than 19 years; however, the majority of cases become ill within 90 days of exposure.[2,3,8,16] The incubation period is dependent on a number of factors, including the severity of the wound, site of the wound in relation to the richness of the nerve supply, distance from the brain, the amount and strain of virus introduced, and whether protective clothing was worn.[3]

Period of Communicability

Generally, a person is considered infectious beginning 14 days prior to the onset of symptoms.[3] Refer to the *Rabies Prevention and Control Manual: Guidance for Public Health and Veterinary Professionals* for further information on suspected animal rabies.

Host Susceptibility

Persons most at risk are those whose occupation or activities result in exposure to animals, such as veterinarians, animal control staff, cave spelunkers, laboratory personnel and long-term travellers to endemic areas.[3,17] Host-specific risk factors include younger age and immune status of the host (e.g., no history of pre-exposure immunization). Refer to the *Canadian Immunization Guide* for efficacy of rabies pre-exposure immunization.

Incidence

Rabies has been notifiable in Canada since 1927[18] and in Alberta since 1985.[19] The first case of rabies reported since then occurred in 2007.[19] The individual became infected following a bat exposure, did not seek medical intervention, and subsequently died within six to seven months of the exposure.

Africa and Asia account for the highest number of human rabies deaths.[8] Of the people bitten by suspect rabid animals worldwide, 40% are under the age of 15.

Refer to the Interactive Health Data Application (IHDA) for more information.

Public Health Management

Key Investigation

A single case (confirmed, probable or suspect) of rabies should be managed as an urgent issue requiring immediate public health action.[20] Because of the near 100% case fatality rate of rabies disease, public health investigation of source and identification of all persons exposed to the same source or that came into contact with infected body fluids of the case should begin immediately if rabies infection is suspected.

- Confirm that the client meets the case definition (confirmed, probable or suspect).
- Obtain a history of illness including the date of onset, and signs and symptoms.
- Determine the possible source of infection for all cases, taking into consideration the incubation period, reservoir and mode of transmission. Assessment may include determining, obtaining or identifying:
  - travel/immigration history,
  - animal involved,
  - type of exposure (bite, scratch, other and provoked vs. unprovoked),
  - geographic location of exposure, and
  - immunization status of animal, if possible.
- Determine the immunization status of the case.
- Identify other persons and animals that may have been exposed to the source animal.
- Determine contacts, which includes those:
  - potentially exposed to the infected body fluids of the case, and/or
  - exposed to the same source (e.g., animal).

Management of a Case

- Individuals should avoid contact with the saliva and tears of a rabies case.[3]
- Routine precautions are recommended at all times during patient care, and the number of health care staff involved in care should be limited.
  - Personal protective equipment is recommended (e.g., gown, goggles, face shield and gloves), especially during intubation, suctioning and autopsy because of potential aerosolization of the virus.[3,21,22]
  - Concurrent disinfection (by detergent and/or 1:10 diluted bleach) of articles soiled with saliva or tears should be done as soon as possible; alternatively these items may be discarded as biohazardous waste.
  - The use of needles or other sharp objects around the case should be limited so as not to risk accidental percutaneous exposure.[2]

Management of Contacts

- Individuals who have been bitten by or who have an open wound/mucous membrane exposure to a rabies case or the same animal source should receive post-exposure prophylaxis (PEP) urgently.[3]
- For PEP recommendations refer to the *Alberta Immunization Policy (AIP)*.

Bite Exposure

- Refer to the *Rabies Prevention and Control Manual: Guidance for Public Health and Veterinary Professionals*.

Immediate care for bite or direct contact with suspected rabies-infected fluids (animal or human)

- When a bite and/or direct contact with saliva exposure occurs, in addition to the following, individuals should be immediately reported to public health for assessment and reporting:[3]
  - Wash the wound immediately with soap or detergent and water.
  - Then wash the wound with 70% ethanol, an iodine-containing solution or Dakins solution (3 tablespoons of bleach plus ½ teaspoon baking soda in 1 litre of boiled water).
  - Do not suture the wound (or suture loosely) to allow free bleeding and drainage.
- Infiltration of the wound with rabies immune globulin (RIG) should be considered.

Preventive Measures

- Provincially funded pre-exposure rabies immunization may be considered for certain risk groups (e.g., veterinarians, wildlife and park personnel). Refer to the *AIP*.
- Educate the public and those individuals with the greatest risk of animal exposure to avoid close contact with unfamiliar animals on the following.[3,21,23–26]
  - Have all domestic pets immunized by a licensed veterinarian.
  - Avoid close contact with unfamiliar animals, wild or domestic, even if they appear friendly.
  - Do not keep wild animals as pets. Avoid handling, feeding or unintentionally attracting wild animals.
  - Report any animal(s) behaving strangely to local public health or animal control departments.
  - Do not attempt to nurse a wild animal back to health. Seek assistance from animal control.
  - Cover up potential entrances, such as uncapped chimneys and openings in attics, roofs, and decks to discourage wild animals, such as bats, from taking up residence in or around homes.
  - Travellers should receive a pre-travel immunization assessment for rabies vaccine (and other vaccines) depending on their travelling destination, the purpose of and duration of their trip.[27]
  - When travelling with pets:
    - ensure their rabies immunizations are up to date, and
    - keep them under control to avoid contact with other animals (wild and domestic).

Appendix 1: Revision History

Revision Date	Document Section	Description of Revision
November 2021	General	• Updated Template • Diagnosis and Treatment section moved to Epidemiology • Updated web links

References

1. American Academy of Pediatrics. Rabies. In: Pickering LK, Baker CJ, Kimberlin DW, Long SS, editors. Red Book: 2018-2021 Report of the Committee on Infectious Diseases. 31st ed. Elk Grove Village, IL: American Academy of Pediatrics; 2018. p. 673–82.

2. Government of Canada. Pathogen Safety Data Sheet - Rabies Virus [Internet]. 2011. Available from: https://www.canada.ca/en/public-health/services/laboratory-biosafety-biosecurity/pathogen-safety-data-sheets-risk-assessment/rabies-virus.html

3. Heymann D, editor. Control of Communicable Diseases Manual. 20th ed. Washington, D.C.: American Public Health Association; 2015.

4. World Health Organization (WHO). Rabies | Symptoms [Internet]. 2018. Available from: www.who.int/rabies/about/home_symptoms/en/

5. Kasempimolporn, S.; Hemachudha, T.; Khawplod, P.; Manatsathit S. Human immune response to rabies nucleocapsid and glycoprotein antigens. Clin Exp Immunol. 1991;84(2):195–9.

6. Childs E, Colby L, Smith JS, Krebs JW, Strine T, Rupprecht E. Surveillance and Spatiotemporal Associations of Rabies in Rodents and Lagomorphs in the United States, 1985-1994. J Wildl Dis. 1997;33(1):20–7.

7. Canadian Food Inspection Agency. Rabies in Canada [Internet]. 2018. Available from: www.inspection.gc.ca/animals/terrestrial-animals/diseases/reportable/rabies/rabies-in-canada/eng/1356156989919/1356157139999

8. World Health Organization (WHO). Rabies: Key facts [Internet]. 2018. Available from: www.who.int/en/news-room/fact-sheets/detail/rabies

9. The Center for Food Security & Public Health. Rabies [Internet]. 2009 [cited 2018 Nov 19]. Available from: www.oie.int/fileadmin/Home/eng/Publications_%26_Documentation/docs/pdf/rabies.pdf

10. Srinivasan A, Burton EC, Kuehnert MJ, Rupprecht C, Sutker WL, Ksiazek TG, et al. Transmission of Rabies Virus from an Organ Donor to Four Transplant Recipients for the Rabies in Transplant Recipients Investigation Team*. N Engl J Med. 2005;35211:1103–11.

11. Centers for Disease Control and Prevention (CDC). Investigation of Rabies Infections in Organ Donor and Transplant Recipients --- Alabama, Arkansas, Oklahoma, and Texas, 2004. MMWR [Internet]. 2004 [cited 2017 Apr 25];53(26):586–9. Available from: www.cdc.gov/mmwr/preview/mmwrhtml/mm5326a6.htm

12. Aguèmon CT, Tarantola A, Zoumènou E, Goyet S, Assouto P, Ly S, et al. Rabies transmission risks during peripartum – Two cases and a review of the literature. Vaccine [Internet]. 2016 Apr 4 [cited 2018 Oct 17];34(15):1752–7. Available from: http://www.ncbi.nlm.nih.gov/pubmed/26947499

13. Tariq WU, Shafi MS, Jamal S, Ahmad M. Rabies in man handling infected calf. Lancet [Internet]. 1991 May 18;337(8751):1224. Available from: www.ncbi.nlm.nih.gov/pubmed/1673761

14. Wertheim HFL, Nguyen TQ, Nguyen KAT, de Jong MD, Taylor WRJ, Le T V, et al. Furious Rabies after an Atypical Exposure. PLoS Med [Internet]. Public Library of Science; 2009 Mar 17 [cited 2018 Oct 17];6(3):e1000044. Available from: https://dx.doi.org/10.1371/journal.pmed.1000044

15. Matouch O, Jaros J, Pohl P. [Survival of rabies virus under external conditions]. Vet Med (Praha) [Internet]. 1987 Nov [cited 2018 Nov 19];32(11):669–74. Available from: http://www.ncbi.nlm.nih.gov/pubmed/3125654

16. Singh K, Rupprecht C, Bleck T. Rabies (Rhabdoviruses). In: Mandell GL, Bennett JE, Blaser MJ, editors. Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases. 8th editio. Philadelphia, PA: Elsevier Saunders; 2015. p. 1984–94.

17. Centers for Disease Control and Prevention. Traveler's Health | Rabies [Internet]. 2016. Available from: wwwnc.cdc.gov/travel/diseases/rabies

18. Government of Canada. Notifiable disease charts - Notifiable diseases on-line [Internet]. 2018. Available from: diseases.canada.ca/notifiable/charts-list

19. Alberta Health. Communicable Disease Reporting System (CDRS). Edmonton, AB; 2019.

20. Ontario Ministry of Health and Long-term Care. Ontario Public Health Standards - Infectious Diseases Protocol, Appendix A: Rabies. 2009; Available from: http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/infdispro.aspx#r

21. Government of Canada. Canadian Immunization Guide [Internet]. 2018. Available from: www.canada.ca/en/public-health/services/canadian-immunization-guide.html

22. Washington State Department of Health. Human Rabies Reporting and Investigation Guideline [Internet]. 2016. Available from: www.doh.wa.gov/ForPublicHealthandHealthcareProviders/NotifiableConditions/ListofNotifiableConditions

23. Centers for Disease Control and Prevention. Human Rabies --- Alberta, Canada, 2007. MMWR Morb Mort Wk Rpt [Internet]. 2008;57(8):197–200. Available from: www.cdc.gov/mmwr/preview/mmwrhtml/mm5708a1.htm?s_cid=mm5708a1_e

24. Centers for Disease Control and Prevention (CDC). Yellow Book | Chapter 3 | Rabies [Internet]. 2017. Available from: wwwnc.cdc.gov/travel/yellowbook/2018/infectious-diseases-related-to-travel/rabies

25. Alberta Health. Alberta Immunization Policy [Internet]. Edmonton, AB; 2018. Available from: www.health.alberta.ca/professionals/immunization-policy.html

26. Ontario Ministry of NR. Provincial Efforts to Combat Wildlife Rabies. periodical. Queens Printer for Ontario; 2009.

27. Government of Canada. Canadian Immunization Guide: Rabies Vaccine [Internet]. 2016. Available from: www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-4-active-vaccines/page-18-rabies-vaccine.html