



Pathogen Safety Data Sheet: Infectious Substances – *Rickettsia akari*

SECTION I - INFECTIOUS AGENT

NAME: *Rickettsia akari*

SYNONYM OR CROSS REFERENCE: Rickettsialpox, vesicular rickettsiosis.

CHARACTERISTICS: *R. akari* is a member of the family Rickettsiaceae. It is an obligate intracellular gram-negative coccobacillus and has a pleomorphic life cycle¹. The bacterium is approximately 0.3 – 0.5 µm by 9 µm, has a transverse septum between two bacilli, and reproduces by binary fission^{2,3}.

SECTION II - HAZARD IDENTIFICATION

PATHOGENICITY/TOXICITY: *R. akari* is the agent of rickettsialpox, which is a mild self-limited zoonotic febrile illness of the spotted fever group⁴. Infection is characterized by, in 80% of cases, the appearance of a 0.5 – 1.5 cm eschar or painful lymph nodes associated with lymphadenopathy at the site of the infectious mite bite^{5,6}. About 3-7 days after the skin lesion develops, the patient develops fever, headache and other systemic symptoms. Approximately 2-3 days later, a papulovesicular rash erupts on the trunk and extremities, which may be confused with chickenpox. Symptoms may later develop into organ-specific afflictions such as nausea, vomiting, and abdominal pain⁷. No deaths have been reported from *R. akari* infections⁸.

EPIDEMIOLOGY: Worldwide distribution – the bacteria have been found most commonly in urban areas of eastern United States, Turkey, Croatia, Ukraine, Russia, Mexico, Africa, and areas of Europe and Asia^{5,9,10}. The first and only large epidemic occurred in 1946 in the Queens borough of New York City, and a causal agent was delineated shortly thereafter⁹. In total, approximately 800 cases of rickettsialpox have been reported; most of them having occurred between 1940–1950, and none has resulted in death⁸. Very few cases have been reported in the past 30 years.

HOST RANGE: Humans, house-mice, domestic rats and Ukraine *Rattus norvegicus*, dogs, Korean reed voles, and other rodents^{4,5,9,10}.

INFECTIOUS DOSE: Unknown.

MODE OF TRANSMISSION: *R. akari* can be transmitted via the bite of the house-mouse mite, or sometimes by transovarial transmission between insects^{1,5}.

INCUBATION PERIOD: The typical incubation period is 12-15 days, but can be up to 28 days¹.



COMMUNICABILITY: Cannot be directly transmitted between humans.

SECTION III - DISSEMINATION

RESERVOIR: *R. akari* is maintained in nature by mites carried by the house-mouse (*Mus musculus*) and domestic rats. Humans and other mammals can be accidental reservoirs ⁴.

ZOONOSIS: Yes. The bacteria can be transferred from animals to humans by mites ⁵.

VECTORS: Rodent mites (*Liponyssoides sanguineus*) and possibly ticks as an accidental vector (*Rhiphicephalus sanguineus*), and has been confirmed in arthropods ^{4,5}.

SECTION IV - STABILITY AND VIABILITY

DRUG SUSCEPTIBILITY: Susceptible to tetracycline, and oral doxycycline for mild cases. Chloramphenicol can also be used as an alternative ¹.

DRUG RESISTANCE: *R. akari* has not been found to be drug-resistant ¹¹. The most effective antibiotic used to treat rickettsial infections is doxycycline.

SUSCEPTIBILITY TO DISINFECTANTS: Susceptible to 1% sodium hypochlorite, formaldehyde, ethanol, 2% glutaraldehyde ¹².

PHYSICAL INACTIVATION: *R. akari* cells can be quickly inactivated at 56°C ¹³.

SURVIVAL OUTSIDE HOST: *Rickettsia* species can only grow in living host cells (cell cultures or embryonated eggs) and do not survive well in the environment. The bacteria are unstable outside of the host and quickly lose their infectivity, as the bacteria are metabolically inactive outside of a host cell ².

SECTION V – FIRST AID / MEDICAL

SURVEILLANCE: Monitor for characteristic symptoms of infection, and for formation of an eschar at site of bite. Serological techniques such as indirect immunofluorescence antibody test (IFA) and enzyme-linked immunosorbent assays (ELISAs), and polymerase chain reaction techniques can also be used to diagnose *R. akari* infection ^{1,8,9}.

Note: All diagnostic methods are not necessarily available in all countries.

FIRST AID/TREATMENT: Administer appropriate antibiotic treatment. Doxycycline is the treatment of choice for all rickettsial infections ¹⁴. Supportive therapy for the patient is important, with attention to fluid and electrolyte balance and maintenance of proper renal function.

IMMUNIZATION: No vaccines are currently available for *R. akari* (or any rickettsial species) ¹.

PROPHYLAXIS: None. Measures in commercial rodent-control can be effective ⁸.



SECTION VI - LABORATORY HAZARDS

LABORATORY-ACQUIRED INFECTIONS: 4 cases of rickettsialpox occurred in laboratory workers shortly after an outbreak in 1946¹⁵. Other cases include infections in a rickettsiologist who worked with the pathogen, and in a technician who was believed to have been exposed through the respiratory or conjunctival mucous membranes during work with chicken yolk sacs infected with *R. akari*¹⁰.

SOURCES/SPECIMENS: Blood and serum samples of infected mammals⁴.

PRIMARY HAZARDS: Accidental parenteral inoculation, exposure to infective mites, inhalation of aerosols^{5,7,8}.

SPECIAL HAZARDS: None.

SECTION VII – EXPOSURE CONTROLS / PERSONAL PROTECTION

RISK GROUP CLASSIFICATION: Risk Group 2¹⁶.

CONTAINMENT REQUIREMENTS: Containment Level 2 facilities, equipment, and operational practices for work involving infectious or potentially infectious materials, animals, or cultures¹⁷.

PROTECTIVE CLOTHING: Lab coat. Gloves when direct skin contact with infected materials or animals is unavoidable¹⁷. Eye protection must be used where there is a known or potential risk of exposure to splashes.

OTHER PRECAUTIONS: All procedures that may produce aerosols, or involve high concentrations or large volumes should be conducted in a biological safety cabinet (BSC)¹⁷. The use of needles, syringes, and other sharp objects should be strictly limited. Additional precautions should be considered with work involving animals or large scale activities.

SECTION VIII – HANDLING AND STORAGE

SPILLS: Allow aerosols to settle and, wearing protective clothing, gently cover spill with paper towels and apply an appropriate disinfectant, starting at the perimeter and working towards the centre. Allow sufficient contact time before clean up.

DISPOSAL: Decontaminate all wastes that contain or have come in contact with the infectious organism before disposing by autoclave, chemical disinfection, gamma irradiation, or incineration.

STORAGE: The infectious agent should be stored in leak-proof containers that are appropriately labelled. *R. akari* cells are best preserved by rapid freezing and storage below -50°C ¹³.



SECTION IX - REGULATORY AND OTHER INFORMATION

REGULATORY INFORMATION: The import, transport, and use of pathogens in Canada is regulated under many regulatory bodies, including the Public Health Agency of Canada, Health Canada, Canadian Food Inspection Agency, Environment Canada, and Transport Canada. Users are responsible for ensuring they are compliant with all relevant acts, regulations, guidelines, and standards.

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PREPARED BY: Centre for Biosecurity, Public Health Agency of Canada.

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