

Ovine Epididymitis:

Brucella ovis

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Importance

Brucella ovis is an economically important cause of epididymitis, orchitis and impaired fertility in rams. Similar symptoms have been reported in male red deer in New Zealand. *B. ovis* is occasionally associated with abortion in ewes, and can cause increased perinatal mortality in lambs.

Etiology

Ovine epididymitis is caused by *Brucella ovis*, a Gram-negative coccobacillus or short rod. This organism is a facultative intracellular pathogen. Genetic and immunological evidence suggests that all members of the genus *Brucella* are closely related, and some microbiologists have proposed that this genus be reclassified into a single species (*B. melitensis*), which contains many biovars. This proposal is controversial, and both taxonomic systems are currently in use. The multiple species nomenclature is used in this factsheet.

Species Affected

B. ovis infects sheep, as well as farmed red deer (*Odocoileus virginianus*) in New Zealand. Experimental infections have been reported in goats and cattle, but there is no evidence that these species are infected in nature. An attempt to infect mouflon (*Ovis musimon*) by intraconjunctival injection failed; however, transient bacteremia and seroconversion may occur in this species.

Geographic Distribution

B. ovis has been reported from Australia, New Zealand, North and South America, South Africa, and many countries in Europe. It probably occurs in most sheep-raising regions of the world.

Transmission

B. ovis is often transmitted from ram to ram by passive venereal transmission via ewes. Ewes can carry this organism in the vagina for at least two months and act as mechanical vectors. Some ewes become infected, and shed *B. ovis* in vaginal discharges and milk. Rams often become persistently infected, and many of these animals shed *B. ovis* intermittently in the semen for 2 to 4 years or longer. *B. ovis* can also be transmitted by direct non-venereal contact between rams. Ram-to-ram transmission is poorly understood and may occur by a variety of routes, including oral transmission. Shedding has been demonstrated in the urine as well as in semen and genital secretions.

Red deer can be infected by venereal transmission, direct contact between infected stags, and experimentally by the intravenous, conjunctival, nasal and rectal routes. Similarly to rams, infected stags shed *B. ovis* in semen; however, most stags eliminate the infection within a year and do not seem to transmit the organism long-term. *B. ovis* has been found in the urinary bladder and kidneys of infected stags.

Contamination of pastures does not seem to be an important method of transmission for *B. ovis*.

Incubation Period

In experimentally infected rams, clinically detectable lesions become apparent from 3 weeks to 8 weeks after inoculation.

Clinical Signs

B. ovis can cause epididymitis, orchitis and impaired fertility in rams. Initially, only poor quality semen may be seen; sperm motility and concentration may be decreased, and individual sperm are often abnormal. Later, palpable lesions may occur in the epididymis and scrotum. Epididymitis may be unilateral or, occasionally, bilateral. The testes may atrophy. Palpable lesions are often permanent, although they are transient in a few cases. Some rams shed *B. ovis* for long periods without clinically apparent lesions. *B. ovis* can also cause abortions and placentitis in ewes, but this appears to be uncommon. Infected ewes may give birth to weak lambs that die soon after birth. Systemic signs are rare in adult ewes and rams. *B. ovis* can cause poor semen quality in red deer stags, but abortions have not been reported in hinds.

Post Mortem Lesions [Click to view images](#)

Lesions are mainly found in the epididymis, tunica vaginalis and testis in rams. The lesions vary from a slight enlargement of the epididymis to large indurations. Epididymal enlargement can be unilateral or bilateral, and the tail is affected more often than the head or body. Spermatoceles containing partially inspissated spermatic fluid may be found in the epididymis. Fibrous atrophy can occur in the testis. The tunica vaginalis is often thickened and fibrous, and can have extensive adhesions. Placentitis may be observed in ewes.

Morbidity and Mortality

Approximately 30-50% of all infected rams have palpable lesions of the epididymis. *B. ovis* has little effect on sperm quality in some individual animals, but causes severe decreases in sperm motility, concentration and morphology in others.

Estimates of the abortion rate in ewes and perinatal mortality vary. Some sources report rates of 1% to 2%, while others suggest that these outcomes are rare. Limited experimental studies have reported abortion rates from 0% to 8%. Abortions and increased perinatal mortality have not been reported in red deer hinds.

Diagnosis

Clinical

B. ovis infections should be considered when rams develop epididymitis and testicular atrophy, or poor semen quality is seen. Some but not all rams have palpable lesions.

Differential diagnosis

Other bacteria that cause epididymitis and orchitis should be considered. Commonly isolated organisms include *Actinobacillus seminis*, *A. actinomycetemcomitans*, *Histophilus ovis*, *Haemophilus* spp., *Corynebacterium pseudotuberculosis ovis*, *Chlamydophila abortus* and *B. melitensis*, but many other organisms can also cause these conditions. Sterile, trauma-induced spermatic granulomas should also be ruled out.

Laboratory tests

Microscopic examination of semen or smears stained with the Stamp's modification of the Ziehl-Neelsen method can be useful for a presumptive diagnosis. *Brucella* species are not truly acid-fast, but they are resistant to decolorization by weak acids, and stain red against a blue background. Brucellae are coccobacilli or short rods, usually arranged singly but sometimes in pairs or small groups. This test is not definitive. Other organisms such as *Chlamydophila abortus* and *Coxiella burnetii* can resemble *Brucella* in this test. *Brucella melitensis* can also be confused with *B. ovis*. Immunostaining is sometimes used to identify *B. ovis* in semen.

A definitive diagnosis can be made if *B. ovis* is cultured from an animal. *Brucella* spp. can be isolated on a variety of plain media, or selective media such as

Farrell's medium or Thayer-Martin's modified medium. Enrichment techniques can also be used. *B. ovis* colonies usually become visible after three to four days. The colonies are round, shiny and convex, and approximately 0.5-2.5 mm in diameter. *B. ovis* is a rough (R) form of *Brucella*; this can be observed by examining the colony by oblique illumination. *B. ovis* can often be identified to the species level by its cultural, biochemical and serological characteristics, although phage typing can be used for definitive identification. Pulse-field gel electrophoresis or specific polymerase chain reaction restriction fragment length polymorphism (PCR RFLP) can also distinguish *B. ovis* from other *Brucella* species. Serological tests used to detect *B. ovis* include enzyme-linked immunosorbent assay (ELISA), agar gel immunodiffusion (AGID) and complement fixation. Other tests including hemagglutination inhibition and indirect agglutination have also been described, but are less commonly used. *Dichelobacter nodosus*, which causes foot rot, is reported to cross-react with *B. ovis* in serological assays, but the practical significance is unknown.

B. ovis can also be detected by PCR.

Samples to Collect

B. ovis is not zoonotic; however, in areas where *B. melitensis* co-exists with *B. ovis*, special care is necessary when handling and shipping samples, as *B. melitensis* is highly pathogenic for humans. Semen, vaginal swabs, milk and smears of suspect tissues can be stained and examined microscopically. *B. ovis* can be isolated from semen samples in live rams, and vaginal swabs and milk from live ewes. Repeated sampling of semen may be necessary, as *B. ovis* can be shed intermittently. At necropsy, the preferred tissues to collect in rams are the epididymis, seminal vesicles, ampullae and inguinal lymph nodes. The uterus, iliac and supra-mammary lymph nodes can be sampled in ewes. In aborted or stillborn lambs, the best sites to culture are the stomach (abomasal) contents and lung. Samples for culture should be refrigerated and submitted as soon as possible.

Recommended actions if brucellosis is suspected

Notification of authorities

B. ovis occurs in the U.S. State authorities should be consulted for reporting requirements in each state.

Federal: Area Veterinarian in Charge (AVIC):

www.aphis.usda.gov/animal_health/area_offices.htm

State Veterinarians:

www.aphis.usda.gov/vs/sregs/official.html

Control

B. ovis is generally introduced into a flock by infected animals or semen. The prevalence of infection can be reduced by examining rams before the breeding season and

culling rams with palpable abnormalities. However, palpable lesions are not found in all infected rams, and laboratory testing of rams should also be considered. In some areas, *B. ovis*-free accredited flocks and rams may be available. A commercial killed *B. ovis* vaccine is used in New Zealand. In other countries, weaner rams may be vaccinated with the *B. melitensis* Rev-1 vaccine. Vaccination is not practiced in the U.S. Antibiotic treatment has been used successfully in some valuable rams, but it is usually not economically feasible for most animals. Fertility may remain low even if the organism is eliminated. Infections in ewes are generally prevented by controlling infections in rams.

B. ovis has been eradicated from sheep flocks in the Falkland Islands, as well as some individual flocks in New Zealand by test and removal methods directed at rams.

Brucella species are readily killed by most commonly available disinfectants including hypochlorite solutions, 70% ethanol, isopropanol, iodophores, phenolic disinfectants, formaldehyde, glutaraldehyde and xylene; however, organic matter and low temperatures decrease the efficacy of disinfectants. Disinfectants reported to destroy *Brucella* on contaminated surfaces include 2.5% sodium hypochlorite, 2-3% caustic soda, 20% freshly slaked lime suspension, or 2% formaldehyde solution (all tested for one hour). Ethanol, isopropanol, iodophores, substituted phenols or diluted hypochlorite solutions can be used on contaminated skin. Alkyl quaternary ammonium compounds are not recommended for this purpose. Autoclaving [moist heat of 121°C (250°F) for at least 15 minutes] can be used to destroy *Brucella* species on contaminated equipment. These organisms can also be inactivated by dry heat [160-170°C (320-338°F) for at least 1 hour]. Boiling for 10 minutes is usually effective for liquids. Xylene (1ml/liter) and calcium cyanamide (20 kg/m³) are reported to decontaminate liquid manure after 2 to 4 weeks. *Brucella* species can also be inactivated by gamma irradiation (e.g. in colostrum) and pasteurization. Their persistence in unpasteurized cheese is influenced by the type of fermentation and ripening time. The fermentation time necessary to ensure safety in ripened, fermented cheeses is unknown, but is estimated to be approximately three months. *Brucella* survives for very short periods in meat, unless it is frozen; in frozen meat, survival times of years have been reported.

Public Health

Unlike most other species of *Brucella*, *B. ovis* is not known to infect humans.

Internet Resources

Food and Agriculture Organization of the United Nations. Manual for the Recognition of Exotic Diseases of Livestock, A Reference Guide for Animal Health Staff. <http://www.spc.int/rahs/>

Public Health Agency of Canada. Material Safety Data Sheets
<http://www.phac-aspc.gc.ca/msds-ftss/index.html>

The Merck Manual
<http://www.merck.com/pubs/mmanual/>

The Merck Veterinary Manual
<http://www.merckvetmanual.com/mvm/index.jsp>

World Organization for Animal Health (OIE)
<http://www.oie.int>

OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals
http://www.oie.int/eng/normes/mmanual/a_summry.htm

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