

# Salmonella Abortusovis

*Paratyphoid Abortion*

Last Updated: Aug. 8, 2005



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## Importance

*Salmonella* Abortusovis primarily infects sheep. Infections can cause abortion storms when the organism is newly introduced into a flock; where this organism is endemic, sporadic abortions occur in young and newly introduced animals. Economic losses result mainly from abortions, stillbirths, and illness in lambs infected at birth. Occasionally, ewes develop metritis and septicemia.

## Etiology

This disease is caused by *Salmonella enterica* subspecies *enterica* serovar (serotype) Abortusovis. *Salmonella* Abortusovis, a member of the Enterobacteriaceae, is a short, aerobic, Gram-negative rod.

## Species affected

*Salmonella* Abortusovis is adapted to sheep and considered to be host specific; however, it has occasionally been isolated from other animals, including goats and rabbits. Mice and rabbits can be experimentally infected. Antibodies have been found in red deer.

## Geographic distribution

*Salmonella* Abortusovis infections can be found worldwide, but are particularly common in Europe and Western Asia. Infections have been reported in France, Spain, Germany, Cyprus, Italy, Switzerland, Russia, and Bulgaria. This disease was once very common in southwest England and Wales, but it is now rare in the United Kingdom.

## Transmission

*Salmonella* Abortusovis is almost always introduced into a flock by an infected sheep; unlike other *Salmonella* species, spread by feed, water, other mammals, or birds is negligible. Sheep may become infected by the oral, conjunctival, or respiratory routes. Venereal spread appears to be possible, but of minor importance. Sheep can be asymptomatic carriers.

Infectious organisms are mainly found in vaginal discharges, the placenta, aborted fetuses, and infected newborns. Vaginal discharges are highly infectious during the first week after an abortion; in some cases, they may be infectious up to a month. The feces may contain organisms in animals with septicemia, and a few sheep excrete the bacteria in the colostrum or milk. It is possible that the respiratory secretions are infectious in young lambs.

## Incubation period

Animals infected at one month of gestation may abort after a 2-month incubation period. If the ewes are infected during the third month of gestation, abortions occur after approximately 20 days. Animals infected one month before mating do not abort.

## Clinical signs

The major clinical sign is abortion, primarily during the second half or last third of gestation. Lambs may also be stillborn or die within a few hours of birth from septicemia. Occasionally, lambs appear to be healthy but die within 3 weeks; some have diarrhea or symptoms of pulmonary infections.

Most ewes appear to be otherwise healthy, although some animals have a transient fever. A vaginal discharge may be apparent for a few days before and after the abortion. Diarrhea is rare. Occasional ewes may develop post-parturient metritis and peritonitis from secondary bacterial invaders.

## Post mortem lesions

The aborted fetus and the placenta may be grossly normal or autolyzed. Sometimes, signs of septicemia are apparent in the placenta; they can include edema and hemorrhages in the chorioallantois and necrosis or swelling of the cotyledons. Multifocal sup-

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purative inflammation, necrosis, edema, or hemorrhages may be seen in the fetal tissues. The liver and spleen may be swollen and contain pale foci.

In young lambs or ewes with diarrhea, there may be enteritis and abomasitis, with swelling of the regional lymph nodes. Ewes that die with septicemia generally have acute metritis; the uterus is usually swollen and contains necrotic tissue, serous exudate, and a retained placenta.

## Morbidity and Mortality

During an outbreak in a naïve flock, *Salmonella* Abortusovis usually affects large numbers of animals. As many as 60% of all ewes may abort and mortality in ewes and newborn lambs may be significant. If the disease becomes endemic in a flock, abortions are usually sporadic; only young animals and new sheep introduced into the flock tend to be affected. Most ewes develop good immunity after infection but some may become carriers.

Antibiotics appear to stop the abortions during an outbreak. Vaccines may be available in some areas.

## Diagnosis

### Clinical

*Salmonella* Abortusovis infections should be suspected in sheep that abort or give birth to stillborn lambs. Usually, there are few signs of disease in the ewe, unless the placenta is retained and metritis develops.

### Differential diagnosis

The differential diagnosis includes chlamydiosis, brucellosis, campylobacteriosis, listeriosis, Q fever, and toxoplasmosis. Other *Salmonella* species must also be ruled out.

### Laboratory tests

A diagnosis of *Salmonella* Abortusovis infection is supported by finding short, Gram-negative rods in direct smears, but isolation of the organism is necessary for a definitive diagnosis. *Salmonella* Abortusovis will grow on MacConkey, desoxycholate citrate (DCA), or *Salmonella*-*Shigella* agar. Colonies on nonselective media are grayish, smooth, moist, and translucent to opaque. *Salmonella* Abortusovis grows relatively slowly in culture; colonies can be usually be found in 36–48 hours at 35–37° C, but occasionally reach a significant size only after 72 hours of incubation. Pure cultures are identified by biochemical tests, which must be read after 36–48 hours. Some authors feel that conventional identification systems for Gram-negative bacteria, such as the AP120E system, are unreliable.

Serology can be helpful for diagnosis. Serologic tests include a serum agglutination test (SAT), hemagglutination inhibition, complement fixation, indirect immunofluorescence, gel immunodiffusion, and enzyme-linked immuno-

sorbent assay (ELISA). Antibodies may become undetectable in some animals 2–3 months after abortion. An allergic skin test has also been reported; this test may detect infections longer than other assays.

## Samples to collect

Direct smears may be made from the vaginal discharge, placenta, and the stomach contents of the aborted fetus. Isolation of *Salmonella* Abortusovis can be attempted from the vaginal discharge of aborted ewes, the placenta, and fetal tissues. Vaginal swabs are most likely to be diagnostic if they are collected during the first week after the abortion. Fetal tissues for bacterial isolation should include the liver and contents of the gastrointestinal tract.

## Recommended actions if *Salmonella* Abortusovis infection is suspected

### Notification of authorities

*Salmonella* Abortusovis is a reportable infection in many states. State authorities should be consulted for specific details. Federal: Area Veterinarians in Charge (AVICs) [http://www.aphis.usda.gov/vs/area\\_offices.htm](http://www.aphis.usda.gov/vs/area_offices.htm)

State vets: <http://www.aphis.usda.gov/vs/sregs/official.html>

## Quarantine and Disinfection

*Salmonella* Abortusovis is a contagious disease; to prevent its spread, sheep must be quarantined, aborted animals must be isolated, and the abortion products must be destroyed. Affected farms, with all potential fomites, should be disinfected with an agent effective against *Salmonella*. Effective disinfectants include 1% sodium hypochlorite, 70% ethanol, 2% glutaraldehyde, iodine compounds, phenolics, and formaldehyde, as well as other agents. *Salmonellae* are also susceptible to moist heat (121° C for 15 min or longer) and dry heat (160–170° C for 1 hour or longer).

## Public health

Unlike other *Salmonella* species, *Salmonella* Abortusovis does not appear to be a significant threat to human health. Human infections with this species appear to be very rare.

## For More Information

World Organization for Animal Health (OIE)

<http://www.oie.int>

OIE International Animal Health Code

[http://www.oie.int/eng/normes/mcode/A\\_summry.htm](http://www.oie.int/eng/normes/mcode/A_summry.htm)

Animal Health Australia. The National

Animal Health Information System (NAHIS)

<http://www.aahc.com.au/nahis/disease/dislist.asp>

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