

Brucellosis in Cattle

Brucella abortus is the organism that causes brucellosis in cattle. *B. abortus* is probably not native to North America, but was introduced with the importation of European breeds of domestic cattle. This disease is of economic importance in developing countries that have not had a national brucellosis eradication program. The prevalence of infection varies considerably among herds, regions, and countries. Many countries have greatly reduced, or even eradicated the disease through comprehensive government programs. However, in other countries brucellosis is still a serious problem facing cattle producers, and also a significant human health issue. For example, in Argentina, more than 10% of beef farms are seropositive to *Brucella*.

In 1934, a cooperative State Federal Brucellosis Eradication program was implemented on a nationwide scale in the United States. In 1934 and 1935, the reactor rate in adult cattle tested was 11.5%. The plan provided for blood tests, slaughter of seropositive cattle and federal indemnities. In 1941, Strain 19 vaccine was introduced and used in most states. Vaccinated cattle were required to be properly identified. In 1954, the United States Congress appropriated funds for a comprehensive national effort to eradicate brucellosis. This program was a cooperative effort between the federal government, the states, and livestock producers. During the year 1957, shortly after the inception of the program, there were almost 124,000 infected herds. Currently (as of May 2015) all 50 States are classified as Class Free for bovine brucellosis. For the most recent USDA APHIS report on Brucellosis and Tuberculosis, click [here](#).

The bacterium *B. abortus* is shed in large numbers in the contents of the pregnant uterus, fetus and the fetal membranes near the time of abortion or parturition (calving). When a susceptible animal ingests the organism, it invades the oral mucosa and regional lymph nodes, where it localizes and incubates. The organism does not multiply in the environment, but merely persists, and the viability of the organism outside the host is influenced by the existing environmental conditions. Grazing on infected pasture or contact with aborted fetuses and infected newborn calves are the most common methods of spread.

Brucella abortus is taken up by macrophages and neutrophils in an effort to eliminate the organism. However, the organism is able to survive and replicate inside the phagocyte. Eventually, *Brucella* infection causes cell lysis and some of the bacteria enter the bloodstream and a bacteremia occurs, which disseminates the pathogen throughout the body, and eventually localizes in the uterus, placenta, udder, and regional lymph nodes. The most common clinical sign of brucellosis in cattle is abortion, but the infected cow often shows no signs. The only external clinical signs might be slight swelling of lymph nodes that drain the site of infection. She is generally not infectious to other animals until calving or abortion, when a large number of organisms are present in products of parturition. Within about 30 days, she loses the ability to infect other animals until her next parturition.

Infection occurs in cattle of all ages but is most common in sexually mature animals. Abortions occur most commonly after the fifth month of pregnancy. Infected udders are clinically normal but they are important as a source of reinfection of the uterus, and as a source of infection for calves or humans drinking the milk.

Bulls are affected with orchitis, epididymitis, and seminal vesiculitis. Affected bulls are usually sterile when the orchitis is acute but may regain normal fertility if one testicle is undamaged. Such bulls are potential spreaders of the disease if they are used for artificial insemination. Congenital infection (infection while in the uterus) can occur in newborn calves and the infection may persist in a small proportion of calves, which may also be serologically negative until after their first parturition or abortion.

Few infected cows ever recover from infection completely and should be considered as permanent carriers whether or not abortion occurs. Excretion of the organism in the milk is usually intermittent and can persist for several years. Treatment is unsuccessful because of the intracellular location of the bacteria in lymph nodes, mammary gland, and reproductive organs, and the inability of drugs to penetrate the cell membrane barrier.

Vaccination has been an important part of the brucellosis eradication program in the United States. *Brucella abortus* strain 19 vaccine was used to prevent bovine brucellosis for many decades. While shown to be reasonably effective at preventing abortion when used appropriately, strain 19 does not completely prevent infection, especially infection of the udder, and it can induce antibody titers that cannot be distinguished from those of field strain infected animals. Therefore, a positive test result could be due to either the vaccine or a field strain, making it inappropriate for continued use in a test and slaughter program. Additionally, strain 19 can cause abortions in cows vaccinated late in pregnancy, and can cause undulant fever in humans. For these reasons, strain RB51 was developed and conditionally approved for use in cattle in 1996. This vaccine has the advantage of producing protection similar to strain 19 without inducing titers that can cause confusion in diagnosis.

References

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