Bovine Brucellosis

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Infection of cattle by *Brucella abortus*, the organism associated with bovine brucellosis has been recognized as an important health concern in the United States for decades. Regulatory programs to control or eradicate brucellosis in cattle were first initiated in the United States in 1934 as part of a recovery program to reduce cattle populations during severe drought conditions. In 1954, Congress appropriated funds to change the brucellosis control programs to an eradication programs as a joint effort between federal and state governments and cattle producers.

The United States Department of Agriculture, Animal and Plant Health Inspection Service – Veterinary Services (USDA/APHIS/VS) is responsible for managing national eradication or control programs that target livestock diseases of economic or zoonotic importance. Because the brucellosis eradication program has been ongoing for decades, a significant investment has been made in an effort to eliminate brucellosis. A milestone was achieved in the U.S. in 2008 when all states were simultaneously declared free of cattle brucellosis however eleven months later brucellosis was identified in cattle herds in Montana and subsequently infected herds have been identified in Idaho and Wyoming.

Brucellosis in cattle is most commonly associated with reproductive loss resulting from abortion, birth of weak offspring, or infertility, in particular third trimester abortions of dead or weak nonviable calves. The organism associated with brucellosis frequently localizes in the mammary gland and genital tract and may not be associated with gross lesions or clinical symptoms of mastitis. Other clinical signs associated with brucellosis are rare. Transmission of the organism is primarily through direct or aerosolized mucosal contact with fluids or tissues associated with the birth or abortions of infected fetuses. Calves born to an infected cow have a >20% chance of being infected. Bulls are considered dead ends hosts for the organism as venereal transmission is not considered significant for *B abortus*. The organism does not survive well in the environment and environmental persistence is generally accepted to be of no epidemiological importance as direct or close contact with aborted material or infected animals is required for transmission. Therefore maintenance of *B abortus* in cattle requires continual infection of susceptible hosts.

The U.S. has at least two wildlife species that function as maintenance hosts for *B abortus*, elk and bison. Currently, the infected wildlife reservoirs are located in the Greater Yellowstone Area (GYA) and these populations are the primary target of wildlife surveillance and mitigation. Feral swine are most commonly infected with *B suis*, and recent work has suggested that they may also serve as maintenance hosts for *B abortus*. Field transmission of *B abortus* from feral swine to cattle has not been documented at present. States in the southeast have reported numerous cases of seropositive cattle which are shown by bacterial culture to be infected with *B suis*. Cattle infected with *B suis* have positive responses on brucellosis serologic tests, which cannot be differentiated from responses after *B abortus* infections. Differentiating *B suis* from *B abortus* requires bacterial isolation which is not always successful.

Although reproductive losses caused by *B abortus* can be expensive to cattle producers, the primary impetus for regulatory programs to control brucellosis in cattle is to prevent zoonotic infections in humans. Multiple studies have demonstrated that addressing brucellosis in animal reservoirs is the most cost effective mechanism for controlling human brucellosis. All Brucella species have the capability of causing disease in humans. In the United States, the major concerns have been *B. suis* and *B. abortus*; however, there is an increasing recent concern regarding *B. melitensis* due to the illegal importation of non-pasteurized dairy products from goats. Human infection with *B abortus* can occur from direct contact with infected animals or tissues or fluids associated with abortion. However

consumption of nonpasteurized dairy products from Brucella infected animals is the most frequent route of human infection. Human infection with *B abortus* can cause Undulant Fever, a chronic and debilitating illness characterized by recurring periods of fever, enlarged spleen, liver, and or localized infections in joints, brain and heart muscle.

Vaccination of cattle is a critical tool to control or eradicate brucellosis. It primarily prevents clinical effects of the disease that lead to transmission. In the U.S. brucellosis vaccination is administered to young heifers, 4-12 months of age utilizing *Brucella abortus* strain RB51 vaccine. Vaccine programs do not include males because they are considered as not having a significant role in disease transmission. At this time, there are no vaccines available that provides good efficacy in the wildlife reservoir species.

Most effective regulatory programs combine vaccination and serologic testing. Vaccination programs are effective in reducing clinical effects and disease, but vaccination alone has never been effective in eradicating brucellosis. With the low prevalence of brucellosis, elimination of vaccination with reliance on test and removal programs can be associated with a resurgence of human and livestock brucellosis. Continued vaccination of replacement heifers against brucellosis is highly recommended.

In September 2009, USDA/APHIS/VS released a "Concept Paper for the New Direction for the Bovine Brucellosis Program. Although the new direction is in part related to the low prevalence of bovine brucellosis in the U.S., it largely is reflective of the reduced federal support for disease eradication programs and the complex nature of combating diseases that have a wildlife reservoir. The new direction will change the surveillance strategy and will focus more heavily on wildlife mitigation and risk management in zones rather than the state statuses currently used. Eradicating brucellosis from the wildlife population will be difficult, and it is unlikely that the United States can be considered totally free of brucellosis in cattle without resolution of the disease in free ranging wildlife reservoirs. Much work is being done to identify means by which the disease prevalence in wildlife and the risk of transmission to domestic animals can be reduced. The Concept Paper can be found at: http://www.regulations.gov/search/Regs/home.html#docketDetail?R=APHIS-2009-0006 under supporting & related materials. The document ID is: APHIS-2009-0006-0002.

Reference

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