Monitoring, Treating Brucellosis in Bison

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KEITH WELLER (K7846-10)

This bison is part of a 13-head herd involved in a brucellosis vaccine study at the National Animal Disease Center in Ames, Iowa.

A new chapter is being written in the history of brucellosis—a disease that costs U.S. beef and dairy farmers about $30 million a year.

In a multiagency effort, scientists from USDA's Animal and Plant Health Inspection Service (APHIS) and Agricultural Research Service (ARS) are monitoring the incidence of brucellosis among bison living in Yellowstone National Park.

Brucellosis is caused by the bacterium *Brucella abortus*. In cattle, infection with the organism induces abortions, decreases fertility, and reduces milk production, says Steven C. Olsen. A veterinarian at the National Animal Disease Center (NADC) in Ames, Iowa, Olsen is leading the ARS part of the program to study how brucellosis infects bison and how it may be transmitted to cattle.

No treatment or preventive drug has ever been developed for cattle brucellosis. Since the early 1940s, vaccines based on *B. abortus* strain 19 have been the chief defense against this devastating disease—one that can be transmitted from animals to humans.

People can get brucellosis through handling infected carcasses at slaughter or from infected cows during calving. It causes the disease called undulant fever and produces severe flulike symptoms that can last for months—or years, if left untreated. Consumption of unpasteurized milk and dairy products can also cause undulant fever.

A bane of cattle producers since the 1840s, brucellosis has been nearly eradicated in this country. Much of the success of the cooperative federal-state brucellosis eradication program that began in 1934 can be credited to the subsequent partnership of ARS and APHIS.

Currently, 37 states have been classified brucellosis-free. Free status means that no cattle or domestic bison have been found infected in a state for 12 consecutive months. Thirteen states maintain a class A status, which indicates a herd infection rate of less than 0.25 percent.

Cattle ranchers in a few states, however, fear losing brucellosis-free status because the last major sources of the *B. abortus* organism are the free-living elk and bison in the Greater Yellowstone Area. This includes Yellowstone and Grand Teton National Parks and adjacent land.

The National Park Service has set a goal of eliminating brucellosis in bison and elk in the Yellowstone area by 2010.

Last winter, nearly 1,300 bison left the park to forage in cattle-populated areas of Montana, Wyoming, and Idaho. APHIS monitored the prevalence of brucellosis among these animals and found that about 50 percent tested positive for exposure to brucellosis, according to APHIS veterinarian Jack C. Rhyan in Ames, Iowa.

For the last 2 years, ARS and APHIS researchers have repeatedly sampled a small number of bison (both exposed and unexposed to *B. abortus*) by using radio collars to track their movements in Yellowstone National Park.

"Over the next 5 years, our goal is to better understand this disease in bison so that a program can be developed to eradicate it," says Olsen. "Texas A&M researchers have shown that bison can transmit the *B. abortus* organism to cattle, but no one knows for sure how the organism infects bison or if the potential for its transmission could be reduced if bison were vaccinated."

Last year, ARS researchers demonstrated the effectiveness of a new vaccine for calves using *B. abortus* strain RB51. This vaccine made by Colorado Serum Company in Denver, Colorado, is now the official vaccine in many states, having replaced the strain 19 vaccine. As an alternative to strain 19, the RB51 vaccine solved a major obstacle in the eradication program.

"Vaccines made with strain 19 can produce false signs of infection in blood tests of vaccinated animals, making identification of truly infected animals difficult," says Olsen.

He and the ARS research team of Mark G. Stevens, Mitchell V. Palmer, Shirley M. Halling, Betsy J. Bricker, and Norman F. Cheville tested the vaccine in cattle.

"These researchers performed years of work behind the scenes—vaccinating calves, raising them to breeding age, waiting until they were pregnant, and exposing them to the bacteria to see if the vaccine prevented abortions," says Carole A. Bolin, who heads the Zoonotic Diseases Research Unit at NADC.

The last major sources of the brucellosis organism are the free-living elk and bison in the Greater Yellowstone Area, including Grand Teton National Park and adjacent land.

The NADC researchers also tested the new vaccine in a few experimentally infected bison at Ames.

"Our preliminary results are encouraging," says Olsen. "The RB51-vaccinated bison showed an immune response comparable to what has been achieved in cattle vaccinated with RB51.

"Another plus: None of the RB51-vaccinated bison shed the live bacterium in the environment. This information is important, because we need to know if other animal species could get the live organism and become infected," he says. "Of particular concern are moose, because they can die if infected with *B. abortus*."

Olsen found that the vaccine takes about 18 to 24 weeks to clear from the bison's circulatory system. This is longer than the 13 weeks or so it takes to clear in cattle. "We want the live vaccine to stay long enough to provide immunity, then disappear," says Olsen.

This year the bison will be bred and any pregnant females will be infected with the *Brucella* organism to see if the vaccine protects them.

RB51 was first identified in 1981 by Gerhardt Schurig, a microbiologist with Virginia Polytechnic and State University at Blacksburg, Virginia.

More than 1,000 pregnant cows were inoculated with the live RB51 vaccine in studies conducted in Alabama, Kansas, Georgia, Texas, and Florida. Of these, only one animal aborted because of RB51. The information gained from this study helped define the way abortion occurs in cattle with brucellosis and provided the researchers with a better understanding of the disease.—By **Linda Cooke,** ARS.

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Technician Aileen Duit checks a culture sample for the persistence of *Brucella abortus* strain RB51 in the bloodstream of a vaccinated bison.