Economic and Policy Implications of Brucellosis in the Greater Yellowstone Area

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Brucellosis eradication in livestock has been a long and arduous process, but it appears the 1998 target date set by the State-Federal Cooperative Brucellosis Eradication Program may be well within reach. This effort, which began over 50 years ago, has made dramatic strides. During the 1950's, approximately 124,000 cattle herds were under quarantine because of brucellosis. The number of quarantined herds dropped below 1,000 by 1990 and fell below 100 in 1995 (Burgess, Russell, USDA/APHIS, personal communication, August 1995).

Now that the livestock eradication program is nearing completion, more attention is being placed upon brucellosis in wildlife because of possible wildlife and livestock interactions. This focus is presently located in the Greater Yellowstone Area. The Greater Yellowstone Area consists of Yellowstone National Park and the surrounding area in Idaho, Montana and Wyoming. Because bison and elk, principal carriers of brucellosis in wildlife, are an enduring symbol of the pristine environment in the Greater Yellowstone Area, anxiety is mounting concerning possible repercussions any solution may have upon wildlife.

Brucellosis

*Brucella abortus* is one of a family of six bacterial strains that affect many species of mammals with brucellosis and can cause ungulate fever in humans. Sheep, goats, horses, swine and cattle serve as domestic hosts. Bison, elk, moose and white-tailed deer can be carriers in the wild (Aguirre and Hanson 1993). Females are the primary disease hosts and suffer the major effects. The bacterial infection occurs in the reproductive tract and lymph nodes. Clinical signs include abortion in the last trimester of gestation, placental retention, arthritis and bursitis. The disease may reduce milk production and cause temporary or permanent sterility. It can lead to nonviable or slow growing calves. The genetic quality of a rancher's livestock can be lost since infected animals must be removed to eradicate the disease (Anderson et al. 1978).

Transmission of brucellosis occurs from contaminated reproductive products, e.g., licking of the newborn or contact with amniotic fluid, the placenta or with aborted fetuses (Nicoletti 1980). The bacteria is sensitive to sunlight, heat and drying and typically does not serve as a source of infection in the environment for more than a few weeks. It

*Members of the Jackson Hole bison herd. Photograph, National Park Service.*
can survive in freezing conditions for over 100 days (Galloway 1974).

Eradication of brucellosis consists of detection, treatment and prevention measures. Testing is conducted on the milk or blood, though there are no reliable tests for detecting the disease during its 45 to 120 day incubation period (Blood and Radosits 1989). If positive tests occur in livestock, the entire herd is tested, with reactors sent to slaughter. Infected herds are quarantined to prevent infection spreading to other herds while subsequent testing is conducted. If the infection continues to spread, a region or state may be quarantined.

Many livestock producers have a veterinarian vaccinate their replacement heifers with a modified-live bacteria known as Strain 19. While an effective management tool, the vaccine is only 70 percent effective under usual field conditions. Some vaccinated calves can carry the antibody into adult life, making it difficult to differentiate between the disease and the vaccine bacteria in adults (Galloway 1974).

Transmission from elk and bison to cattle have only been proven under experimental or pasture conditions (Thorne and Herriges 1992). The perception is prevalent that transmission can occur under natural conditions. Wyoming state veterinarian Don Bosman indicates that the seven cases of brucellosis that occurred in Wyoming livestock herds between 1979 and 1989 “...were likely transmitted to the livestock by wildlife.” (Casper Star-Tribune 1995). Over 4,000 bison and almost 100,000 elk range in the Greater Yellowstone Area. Estimates as to the number of bison infected with brucellosis have been as high as 50 percent (Laramie Boomerang 1995). Elk losses on Wyoming’s 23 winter feedgrounds have been estimated at 6–12 percent of the annual calf crop (Williams 1995).

**Economic Impacts**

There are several types of costs associated with the effects and treatment of brucellosis. During fiscal year 1994, federal government and the State of Wyoming spent approximately $694,000 under the national brucellosis eradication program (Burgess, Russell, USDA/APHIS, personal communication, August 1995). Cattle owners contributed over $500,000 in expenses for testing and vaccinating animals. During 1994, over 27,000 animals were tested at an estimated average cost of $3.00 per head, and 242,000 calves were vaccinated at an estimated average cost per head of $1.75 (Bosman 1994). Additional producer costs are incurred from gathering and handling cattle.

Part of the resources appropriated by the federal and state governments fund the Market Cattle Identification (MCI) program. This program is a market-level testing program administered by the Federal government. Blood samples are taken from slaughtered cattle over two years of age, except for spayed heifers and steers, and tested for brucellosis. If a blood sample reacts positively, test eligible animals must be presented for test by the owner. Of the animals presented for test, no cases of brucellosis infection in cattle or swine have been found in Wyoming since 1989. When the animals are presented for testing, the owner must bear the expense to gather, sort, and confine the animals while the state and federal government stand the expense of bleeding and administering the tests. A high or chronic infection rate may necessitate the removal of all breeding cattle to slaughter. Although the owner is paid a federal indemnity for all animals slaughtered, the genetic progress made over time as well as the reputation of the owner suffers. Loss of reputation may lead to a reduction in sales of breeding stock.

Most breeding stock buyers require purchased females to be tested for brucellosis. If the animals are purchased from a “Certified Brucellosis-Free” state, proof of vaccination, such as the ear tattoo acquired at vaccination suffices. If the state loses its “Brucellosis-Free” certification, animals require testing at the point of origin. Federal regulations require all bulls over 18 months of age and all vaccinated cows over 24 months to be tested for *Brucella abortus* before departing any non-free state. Each state likewise has its own entrance requirements. Many states require that cattle entering from a non-brucellosis free state be quarantined and retested 45 to 120 days after the first test. While the tests are relatively inexpensive (a $4 to $6 veterinary charge each per head for bleeding), the nuisance of going through the process can be a major deterrent to purchasing breeding stock from a non-certified area. To prevent the spread of brucellosis, information distributed by the Animal and Plant Health Inspection Service (APHIS) suggests that breeding stock buyers avoid purchasing cattle from herds with a history of brucellosis. The loss of a state’s “Certified Brucellosis-Free” status could cause cattle producers from other states and foreign countries to be reluctant to purchase breeding stock. Restricted movement of cattle due to an area-wide brucellosis quarantine may also reduce a producer’s ability to relocate cattle to take advantage of forage availability or marketing opportunities (Anderson et al. 1978).

Production losses to ranchers whose herds became infected with brucellosis would vary depending upon the number of animals vaccinated, the effectiveness of vaccination, and the speed of detection and containment. Anderson et al. (1978) identify the following six areas where production losses could occur:

1. losses due to abortion in infected cows;
2. losses from calves that are born weak and die within 7 days of birth;
3. infected calves that live, but are hindered in their growth;
4. loss of milking ability of infected cows;
5. decreased reproductive efficiency (breed back late or not at all);
6. loss of genetic potential due to involuntary culling of infected animals that would have contributed to the herd’s genetic makeup.

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1. The $1.75 per head estimate for vaccination costs is lower than the $2 to $5 per head quotation given by area veterinarians.
Production losses are associated with the inability of the producer to improve or increase the herd in a cost effective manner. Updating figures from Anderson et al. (1978), a total of over $200 per infected cow would be incurred in the first year of infection. During the second year, $5.82 per infected cow could be experienced from breeding problems, along with additional second year losses from abortion and weak calves depending upon detection, culling, and replacement rates. These figures could be classified as “worst-case scenarios” since an unvaccinated, undetected herd is assumed. Anderson et al. (1978) assume that pounds of calves lost per infected cow would be reduced by over 10 percent if the herd was vaccinated, but brucellosis was undetected.

Policy Alternatives

In 1995, the Greater Yellowstone Interagency Brucellosis Committee was formed under a Memorandum of Understanding among the states of Wyoming, Idaho and Montana, and the U.S. Departments of Agriculture and the Interior. This group was charged to develop and implement a brucellosis management plan that would protect public interests along with the economic viability of the livestock industry while sustaining the free-ranging elk and bison populations. The committee was to plan for elimination of brucellosis in the area by the year 2010.

Several Policy Options Have Been Suggested.

(1) One of the simplest but most controversial options is to parallel with wildlife the eradication process the livestock industry has used. Vaccination accompanied by test and slaughter techniques have not been attempted on large free-ranging herds and its effectiveness is uncertain. The value of a bison vaccination program is also questionable since current vaccination practices can cause bison to abort and may not work on bison calves (Davis et al. 1991). Strain 19 vaccine, though, has been successfully used in the vaccination of elk at Wyoming’s winter feedgrounds (Williams 1995). Public sentiment towards wildlife as well as the potential impacts that reduced wildlife numbers would have on the multi-million dollar outfitting, hunting and wildlife viewing industry in the Greater Yellowstone Area make a full implementation of the slaughter alternative questionable.

(2) Brucellosis is easily transmitted between highly concentrated elk during the winter feeding season. The Animal and Plant Health Inspection Service (APHIS) has suggested that the Wyoming Game and Fish department develop a plan to close their elk winter feedgrounds in western Wyoming (Laramie Daily Boomerang 1995). Expenditures for the feedground program exceed $1,000,000 annually. If the time elk spend at the feeding stations could be reduced or eliminated, transmission of brucellosis between elk could be reduced, and program funds redirected to range improvement projects. One alternative would be to improve the carrying capacity of winter range via prescribed burning in sage and timber edge habitats for winter feeding programs.

(3) Additional elk winter range may be obtained from purchases of ranches in the Greater Yellowstone Area. Ranch purchases would address two needs: an increase in wildlife winter range and a reduction in the possibility of cattle exposure to brucellosis-infected wildlife. Although a possi-
ble brucellosis management solution, a reduction in the ranch operations in Northwestern Wyoming would have adverse economic impacts on nearby communities. This conversion of ranchland into wildlife range would also have impacts on adjacent private lands and on the natural habitat resulting from the predominate use by elk.

(4) One approach to reducing the probability of contact between wildlife and livestock is to reduce the numbers of elk and bison in the Greater Yellowstone Area. Current National Park Service policy would need to be changed since it dictates that wildlife be allowed to fully occupy park habitat and that populations be regulated by natural forces. Natural forces have yet to maintain population numbers and increased winter pressure on private lands from bison and elk continues. Native Americans have suggested bison populations be controlled through the Intertribal Bison Cooperative. This group suggests bison leaving the park be captured and tested. Bison testing positive would be slaughtered. Those testing negative would be taken by the cooperative for quarantine and retesting. Bison certified brucellosis-free would then be used by tribes to start or supplement their own herds (Gern, 1995).

(5) An ecosystem approach is suggested by Keither and Froelicher (1993). A political boundary would be drawn around the Greater Yellowstone Area. Management of elk and bison would be coordinated by state and federal agencies. Management would concentrate on maintaining genetically viable bison and elk populations while controlling the interaction between wildlife and cattle. Programs would be tailored to bison, elk and cattle management on public lands with each having equal privilege and access to forage and habitat. The main strategy would consist of delineating bison habitat management zones in the National Parks, the National Forests and adjacent state lands. Movement out of these zones would be restricted to protect nearby private holdings. Feedground closures together with winter range improvements on public lands would address the transmission of brucellosis from elk. A key element in this management option is obtaining accurate measures of carrying capacity in various parts of the Greater Yellowstone Area to maintain sustainable herd sizes. Cattle grazed in this area would have to be managed more intensely, including mandatory vaccination and careful herd dispersion, to minimize interaction with elk or bison. Keither and Froelicher (1993, p. 60) indicate that separating wildlife from cattle might include "...shifting grazing allotments, shortening or delaying the grazing season, or perhaps limiting grazing to steers and spayed heifers...". Under such a program, a brucellosis outbreak originating in the Greater Yellowstone Area would most likely be confined to the region. The infected herd(s) could then be confined and treated. This would prevent entire states from losing their brucellosis-free status. Federal officials currently have authority to divide states into zones of various brucellosis status.

Summary

Brucellosis is an expensive disease. Production losses from a brucellosis outbreak can be confined to a few herds and diminished by an aggressive vaccination program. The major expenses incurred by livestock producers if a state were to lose its "Certified Brucellosis-Free" status would be the lack of freedom to move breeding stock without testing.

Management strategies must address the potential transmission of brucellosis from wildlife to cattle. An ecosystem management approach that includes defining bison habitat requirements, elk winter range improvement and changes in cattle grazing patterns is a possible alternative to the purchase of area ranches or to bison and elk slaughter.

References


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