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# The Feasibility of Eliminating Brucellosis from Montana's Free-ranging Elk Herds

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Brucellosis is known to exist in free-ranging elk populations in Montana. Surveillance has been conducted since the early 1980's to determine the extent of the disease's range and seroprevalence. To date, brucellosis has only been detected in wild elk within the Greater Yellowstone Area (GYA). Recent cases of brucellosis in domestic cattle have potentially been linked to brucellosis-infected elk. As a result, concern over the disease in Montana elk herds has heightened, and there is increased demand for eradication of brucellosis where it exists in elk populations. USDA, APHIS has a goal of elimination of brucellosis in the Yellowstone area by 2010. The purpose of this paper is to evaluate the feasibility of eliminating brucellosis from Montana's free-ranging elk populations utilizing existing strategies and technology under current management conditions.

## Factors affecting seroprevalence in Montana elk

Brucellosis seroprevalence in Montana's elk populations in the upper Madison and Yellowstone Valleys appears to have increased (Anderson and Ramsey, unpublished data). Within the Madison Valley (HD 360&362) seroprevalence for yearling and older female elk tested during the winters of 1984-85 through 1992-93 averaged 1.8% (6/326). In the same area, seroprevalence during the winters of 2004-05 through 2007-08 averaged 3.7% (10/272). A similar trend was observed in elk tested in hunting district 313 of the upper Yellowstone River. Seroprevalence of adult female elk averaged 0.9% (7/744) during the time period of 1984-85 through 1991-92, but increased to 4.8% (8/165) in the time period from 2005-06 through 2006-07 (Anderson and Ramsey, unpublished data).

The precise reason for this increase is unknown, but in the Madison Valley, changes in land management practices have resulted in large herds of elk utilizing

specific areas within the valley. Some of these elk arrive on private property prior to the start of the general hunting season and remain there until mid June (Cunningham and Hamlin, unpublished data). Large numbers of elk utilizing an area as one amorphous unit creates an undesirable situation that could result in greater potential for elk-to-elk transmission. Seroprevalence in the Northern Yellowstone elk herd utilizing HD 313 as winter range has increased despite a reduction in population (Anderson and Ramsey, unpublished data). The Northern Yellowstone elk herd is approximately ½ the size it was in the early to mid 1990's. Further, emigration of elk from winter feed grounds in Wyoming, where seroprevalence averages from 9% to 37% (Dean et.al, 2004) and populations in eastern Idaho where seroprevalence ranged from 12%-80% (Etter and Drew, 2006) prior to closure of feed grounds in that area, may also be influencing seroprevalence for brucellosis in Montana's elk populations and may in part explain the increased seroprevalence observed in HD's 313, 360 and 362. Hamlin and Ross (2002) estimated female emigration rates ranging from 0.7 to 3.8% for female elk wintering on the Gravelly-Snowcrest Mountain ranges. If these rates apply to elk utilizing the upper Madison and Yellowstone Valleys, brucellosis infected elk moving into Montana from Wyoming or Idaho could be helping to maintain or increase seroprevalence in Montana. Other confounding factors may also be contributing to the observed increase in seroprevalence. Increasing seroprevalence is not unique to Montana. Wyoming is also seeing an increase in seroprevalence in areas adjacent to feed grounds, but where no feeding is occurring.

Bison-elk contact during the time period when abortions may occur due to brucellosis may also help to maintain seroprevalence in Montana elk populations. The majority of potential contact during this time period occurs within Yellowstone National Park, although some commingling may occur in the Gardiner and West Yellowstone areas. Elk and bison movement patterns surrounding Yellowstone National Park suggest that elk-bison commingling may be limited during the winter months.

**Management Options**

*Test and Slaughter*

Wyoming initiated a five-year pilot test and slaughter program in the Pinedale elk management unit during the winter of 2005-06. The goal of the program is to achieve a statistically measurable reduction in elk seroprevalence. Elk are captured by baiting them into a corral trap where a blood sample can be collected. The animals are tested for brucellosis, and those that test positive are removed from the population. Initial results suggest that seroprevalence has decreased in the management unit from 37% to 5% but a 9-10% seroconversion of previously negative animals was documented in 2007-08. Approximately 1250 adult and yearling female elk were tested on feed grounds from 2006 thru 2009 at a cost of $1,106,449 ($1,230/elk tested) (WFGD progress report, 2009).

Montana passed a law in 1995 banning the feeding of game animals that results in "an artificial concentration of game animals that may potentially contribute to the

transmission of disease or that constitutes a threat to public safety". Elk feed grounds have not been active in Montana since passage of that law. As a result, Montana has been able to maintain seroprevalence rates below 5% in the GYA. Montana has not conducted an active test and slaughter program, although positive animals detected through research activities have been removed from the population. Initial data from the Wyoming test and slaughter pilot program suggests that conducting a test and slaughter program in Montana could potentially result in a reduced seroprevalence in certain populations, but would not eliminate brucellosis in Montana elk herds. However, feeding elk for the purpose of capture could have a potential negative side effect of increasing seroprevalence. Should a test and slaughter program be initiated, a different means of capture would have to be used to avoid creating feed ground situations and potentially increasing seroprevalence in Montana elk.

*Vaccination*

Vaccination is often considered a "magic bullet" in the goal of eliminating or eradicating disease. However, no vaccine is considered to be 100% effective. Roffe et. al. (2004) found that single calfhood vaccination of elk with Strain 19 vaccine had low efficacy and would likely have little to no effect on Brucellosis prevalence in elk. Efficacy of RB51, the brucellosis vaccine now commonly used in cattle and bison has also been studied in elk with disappointing results. In challenge studies carried out in 2000 and 2002, vaccination of elk with RB51 failed to prevent abortion (Kreeger et. al., 2000; Kreeger et. al., 2002). In one study, abortion strictly due to the RB51 vaccine could not be ruled out (Kreeger et. al, 2000). In another study, 16/16 elk vaccinated once with RB51 aborted and 13/14 elk that received an initial plus a booster vaccine aborted (Kreeger et. al., 2002). Intramuscular vaccination of elk on Wyoming feed grounds has been carried out using biobullet inoculation. This method of inoculation allows quick vaccination of large numbers of animals. Although biobullet vaccination appears to be safe, there is some evidence that suggests that oral vaccination may be more efficacious (Elzer and Davis, 1997; Kreeger et. al, 2002). Further study is needed to determine the true efficacy relative to the route of administration. The reason for the lack of brucellosis vaccine efficacy in elk is not clearly understood, but is thought to be due to the fact that elk mount a different type of immune response than cattle after vaccination.

If an effective vaccine could be developed for elk, it may play a role in controlling disease; however, a vaccine alone is rarely enough to completely eliminate disease, especially in wildlife populations where logistic difficulties are common. Vaccination of wildlife populations presents several obstacles that make it different from vaccination of domestic livestock herds. Wildlife populations cannot be managed as a closed herd due to the extent of emigration, immigration, and overlap of elk herd ranges.

*Population Reduction*

Of Montana hunting districts with elk, approximately 35% are over objective relative to population size and current distribution. Efforts are in place to reduce

numbers to objectives. Reducing overall numbers may not alter seroprevalence but could reduce the number of potentially infected elk on the landscape. Hunting is Montana FWP's most effective population management tool, but harvest is affected by access to elk. That access is influenced by weather and the ability of hunters to utilize public and private property. Population reduction will not result in elimination of brucellosis in Montana's elk herds but could reduce the risk brucellosis infected elk pose to cattle producers.

*Elk Dispersal*

The way in which elk use the landscape can affect not only seroprevalence but also risk to domestic cattle. The potential for elk-to-elk transmission through an abortion event is increased in areas where large numbers of elk congregate. When elk are present on private property for extended periods of time, especially during the third trimester of pregnancy (mid January through mid June) which is considered to be the "high risk" time period, the risk of elk-to-cattle transmission is increased in areas where commingling occurs. Currently, situations exist within the GYA that allow large numbers of elk to congregate on private property during the "high risk" time period. Information indicates that elk sub-herds have progressively altered migratory patterns, residing on private agricultural lands for much of the year or even yearlong where refuges from hunters have occurred (Hamlin and Cunningham, unpublished data). These highly productive sub-herds resident to agricultural lands will become the greatest brucellosis threat if the disease becomes endemic rather than immigration dependent (Hamlin and Cunningham, unpublished data). Management strategies that alter that behavior may be beneficial to reducing seroprevalence as well as the risk to domestic livestock.

Montana is currently in a situation in which elk exposed to Brucellosis are likely immigrating into Montana from infected populations in Wyoming and Idaho. Current management strategies in Wyoming, Idaho and Yellowstone National Park are not likely to result in elimination of brucellosis from either bison or elk populations. There is potential for bison-elk transmission in and around Yellowstone National Park. In Montana, land management patterns and possibly other factors, including the presence of wolves, are influencing elk behavior and creating a situation detrimental to reducing seroprevalence and ultimately elimination of brucellosis. An effective vaccine and delivery system for brucellosis in elk does not exist, and will not likely be developed in the near future. Currently, elk and bison management strategies in areas adjacent to Montana, combined with the unlikelihood of development of a 100% efficacious vaccine with a delivery system capable of vaccinating large numbers of elk, and elk dispersal patterns in areas of the GYA and within Montana make elimination of brucellosis in the GYA and Montana unlikely.

***Position statement***

Although elimination of brucellosis from elk and bison populations in the GYA is a worthy goal, it is not possible given current management strategies outside of Montana and the lack of effective tools to address brucellosis prevalence in free-ranging elk

populations. Until management policies allowing the feeding of elk are addressed and brucellosis is eliminated from or drastically reduced in bison populations within YNP, elimination of brucellosis in Montana elk populations is not feasible. Until these situations are addressed, Montana will have to focus on risk mitigation. Montana FWP will work with landowners, producers, sportsmen and the public to manage brucellosis in elk populations by striving to reduce elk populations to meet objectives outlined in the Montana Elk Management Plan, alter elk distribution patterns deemed detrimental to reducing seroprevalence in elk populations, conduct surveillance to address the extent of brucellosis within Montana and evaluate the effectiveness of management actions and reduce the potential of cattle-elk commingling during high risk periods of the year.

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