Project: Brucellosis Vaccines for Livestock and Wildlife

Brief Description: MSU research will aid in eliminating the threat of brucellosis disease in wildlife and livestock through the development of effective new vaccines.

Executive Summary: The presence of *Brucella abortus* in the wildlife of Yellowstone National Park (YNP) poses a continuous threat to the livestock of states bordering the YNP, as evident by the recent outbreaks of brucellosis in Montana, Idaho, and Wyoming. The loss of livestock calves through abortion caused by infection with this microorganism and contamination of these states' milk supply threatens the agricultural economic base of surrounding states. Continued exposure will compromise the multimillion dollar investments of these states to obtain their brucellosis-free status, thus, devastating the market value of these livestock. Already these states have endured devaluation of their cattle because of these outbreaks. Aside from being problematic for wildlife and livestock, *B. abortus* also can be contracted by humans, causing an undulating fever and prolonged incapacitating fatigue, arthritis, and endocarditis.

Project Description: To address this threat, adequate measures need to be taken to manage the level of infection in the wildlife of YNP, or interventions need to be made to improve protection for the livestock at risk. In either scenario, better brucellosis vaccines would be required. Unfortunately, there are no available wildlife or human vaccines, and the commercial livestock vaccines show poor or no efficacy in either bison or elk. Even revaccination of livestock with current vaccines has done little to improve herd immunity. Current funding has enabled MSU investigators to develop promising vaccines as well as to understand mechanisms of host protection against *B. abortus*. Thus, the MSU investigators seek to continue this research testing in livestock, bison, and elk, which would ultimately eradicate *B. abortus*, such as achieved for smallpox and polio. Three areas of intensive investigation to achieve this end are: (1) develop an improved live *B. abortus* vaccine using a timed-release technology to sustain longer immunization that will result in enhanced efficacy over conventional vaccines; (2) address the differences in innate immunity between bison and elk versus cattle to aid in understanding *B. abortus* persistence in the animal; and (3) adapt innate immune modulators to help prevent *B. abortus* infections. These approaches will aid the development of methods to optimize livestock, bison, and elk immune responses to the brucellosis vaccine.

This request is to refine and simplify these vaccines for adaption to bison and livestock. To meet the described objectives, efforts will require additional investigations and challenge studies of vaccinated wildlife to facilitate brucellosis vaccine development. Past research has already enabled the rapid development of a protective brucellosis vaccine in bison. Favorable results show the feasibility of the work; however, additional testing will be required to develop efficacious vaccines by optimizing dose and vaccine regimen in wildlife.

Congressional Action Needed: An appropriation of $500,000 is requested.

Importance to Montana: *B. abortus* is a communicable disease that has already affected Montana's livestock industry and will continue to pose future threats until improved vaccines are developed. Montana must retain its *Brucella*-free status to sustain this industry. Furthermore, the presence of *Brucella abortus* in YNP poses a biosafety hazard to tourists that could impact the state's tourism industry, particularly, for southwestern Montana. Thus, efforts spearheaded by MSU investigators are warranted, and the development of novel vaccines and study of livestock and bison immune responses will have a tremendously positive impact for Montana agriculture.

Contacts at MSU:

Tom McCoy, Vice President for Research (406) 994-2891
Jeff Jacobsen, Dean and Director, COA/MAES (406) 994-3681