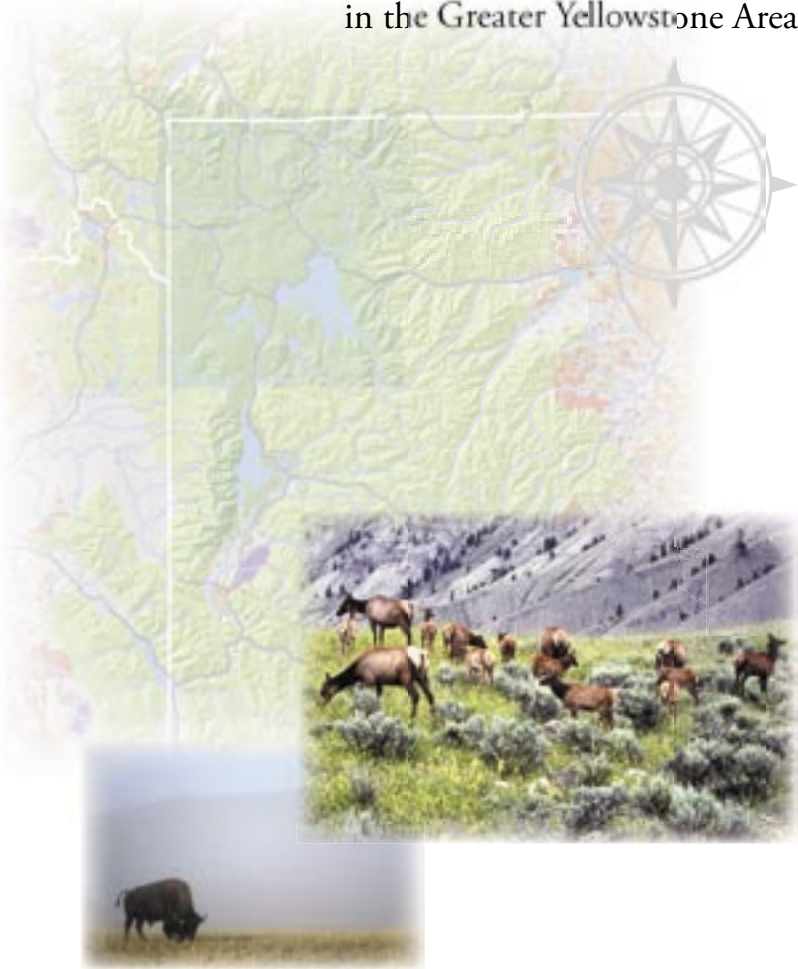


THE USAHA LARAMIE AGENDA

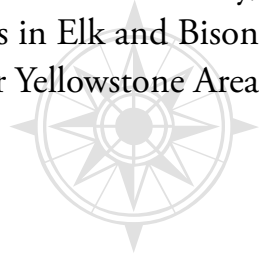
A Roadmap for Improved Vaccines, Vaccine Delivery,
and Testing for Brucellosis in Elk and Bison
in the Greater Yellowstone Area



Presented by the
United States Animal Health Association

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A Roadmap for Improved Vaccines, Vaccine Delivery,
and Testing for Brucellosis in Elk and Bison
in the Greater Yellowstone Area



August 2006

Presented by the
United States Animal Health Association

The Challenge



UNITED STATES ANIMAL HEALTH ASSOCIATION

8100 Three Chopt Road, Suite 203

P.O. Box K227

RICHMOND, VIRGINIA 23288

Dear Concerned Citizen:

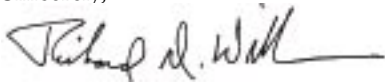
This nation is at a crossroads regarding the disease brucellosis. Over the past century, this disease has affected both animal and human health, food safety, international trade, and state and federal regulatory policies. After over six decades of eradication efforts and the expenditure of several billion dollars, brucellosis (*Brucella abortus*) has nearly been eliminated from this nation's cattle herds. Additional bold steps need to be taken now to successfully address the last remaining reservoir of brucellosis in free ranging elk and bison in the Greater Yellowstone Area. Current vaccine and diagnostic technologies to eliminate this disease in free ranging elk and bison are inadequate. Do we want to continue with the risk of this disease in wildlife and the periodic spillover into domestic animals? There are, in fact, steps that can and should be taken to move this issue forward to successful resolution.

A Special Committee of the United States Animal Health Association addressed this issue. That Committee held a working symposium of scientists to identify the research needs for new and improved brucellosis vaccines, vaccine delivery systems, and diagnostic tests for use in elk and bison. The Special Committee also addressed the cost for this research. A summary of the results of that working symposium are contained in the USAHA Laramie Agenda. While the total cost of the needed research is substantial, there are several steps that can be initiated right now, including:

-
- Initiate vaccine challenge trials in elk, bison, and cattle using existing novel brucellosis vaccines, including RB51 “plus” developed at the Virginia-Maryland Regional College of Veterinary Medicine, and Strain 82 developed at the All-Russian Veterinary Institute;
 - Dramatically increase the use of established brucellosis vaccines in elk, bison, and cattle in the Greater Yellowstone Area; and
 - Reassess the allocation of United States Department of Agriculture funding for the National Brucellosis Eradication Program in order to identify monies that can be utilized for needed brucellosis research in cattle and wildlife.

Which path will we, as a nation, take? Do we accept continuation of brucellosis in wildlife, or make the investment in better tools to eventually eliminate it? The choice is ours; the decision is difficult. USAHA believes the choice is clear. I hope you can support our efforts to move the USAHA Laramie Agenda forward.

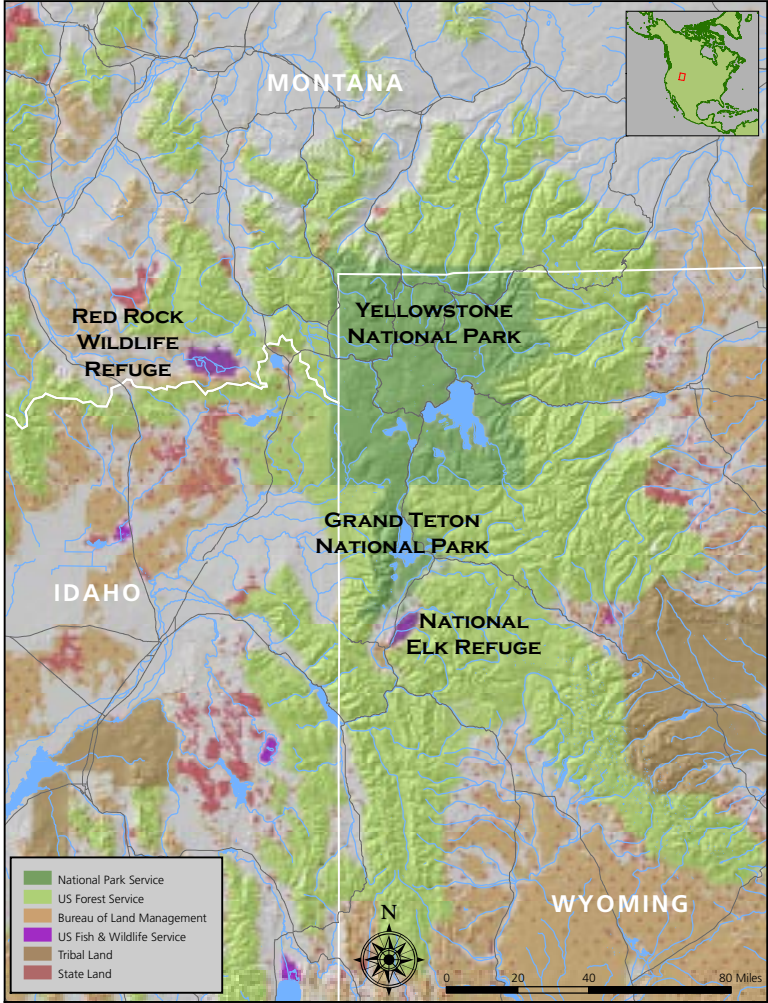
Sincerely,



Richard D. Willer, DVM
Past President



*This nation is at a crossroads
regarding the disease brucellosis.*



The Greater Yellowstone Area.

What is the Issue?

The Greater Yellowstone Area (GYA) is home to approximately 125,000 wild elk and 5,000 wild bison distributed across 32,000 square miles of rugged mountainous terrain in Montana, Idaho, and Wyoming.

Following the highly successful national brucellosis eradication program among domestic livestock and captive wildlife, wild GYA elk and bison are now recognized as the last reservoir of bovine brucellosis (*Brucella abortus*) in the United States.

Although we can never be certain, most believe that GYA elk and bison initially contracted brucellosis from diseased cattle in the early twentieth century.

Unlike domestic livestock, brucellosis exposed or infected wildlife in the GYA live in remote wilderness habitats and cannot routinely be approached closely for traditional vaccination or disease testing.

In 1998, the United States National Research Council reported that vaccination of wild elk and bison needs to be part of the overall strategy to control or eliminate brucellosis in the GYA, but that much improvement is needed before current vaccines and vaccine delivery systems will be adequate for use in wildlife.



Everyone involved . . . now agrees that we do not have highly effective tools for elk and bison brucellosis vaccination and surveillance.

Developing a Roadmap

The national importance of brucellosis in GYA wildlife has been reviewed by the responsible state and federal animal health and wildlife agencies, and oversight organizations such as the National Research Council, Government Accountability Office, and the Greater Yellowstone Interagency Brucellosis Committee.

Recognizing the regional and national importance of this issue, in 2005 the United States Animal Health Association (USAHA) convened a Special Committee on Brucellosis in the GYA.

This Special Committee included 15 recognized brucellosis experts and was charged to conduct an international working symposium to identify the most important opportunities and costs for improved vaccines, vaccine delivery systems, and disease testing for brucellosis in elk and bison.

The symposium received bipartisan support and was jointly underwritten by the U.S. Departments of Interior and Agriculture, with broad backing from the biotech industry, and several regional and national livestock associations and wildlife organizations.

The working symposium was held August 16–18, 2005, at the University of Wyoming in Laramie, Wyoming, with 43 additional animal disease experts from around the world, and over 80 additional key stakeholders from across the United States and Canada.



*. . . this symposium succeeded in
developing a realistic roadmap . . .*

The workshop was a significant step in the long journey to address the brucellosis challenges in the GYA. It was the first time that technical experts from around the world were assembled with the specific task of addressing the vaccine, vaccine delivery, and diagnostic challenges of elk and bison in the GYA. The participants willingly shared their thoughts and ideas, and their efforts have established a course of action.

For the first time in the history of this issue, this symposium succeeded in developing a realistic roadmap for improving the vaccine, vaccine delivery, and disease testing tools for wildlife brucellosis in the GYA.

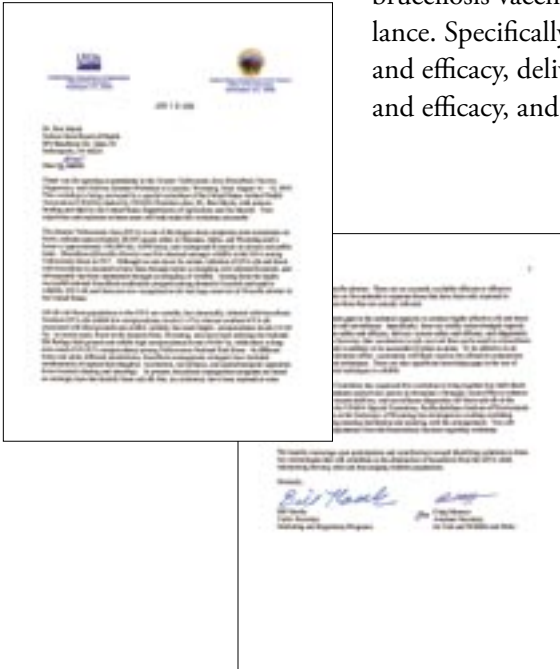
Details of this roadmap are presented in a comprehensive technical report, “Enhancing Brucellosis Vaccines, Vaccine Delivery, and Surveillance Diagnostics for Elk and Bison in the Greater Yellowstone Area” (*see full citation on last page*).



Working symposium attendees.

Letter from USDA and USDI

“There are important gaps in the technical capacity to conduct highly effective elk and bison brucellosis vaccination and surveillance. Specifically...vaccine safety and efficacy, delivery system safety and efficacy, and diagnostics.”



“The USAHA Special Committee organized this workshop to bring together key individuals from federal, state, academic and private sectors to formulate a Strategic Action Plan to enhance brucellosis vaccines, vaccine delivery, and surveillance diagnostics for bison and elk in the GYA.”



New funding will be required.

Supporting the Roadmap

New funding will be required to undertake improvements of brucellosis vaccines, vaccine delivery, and disease testing of elk and bison in the GYA. The research recommended on the following pages will need to be coordinated across multiple research teams to ensure effective allocation of research funds and ensure productivity and deliverables.

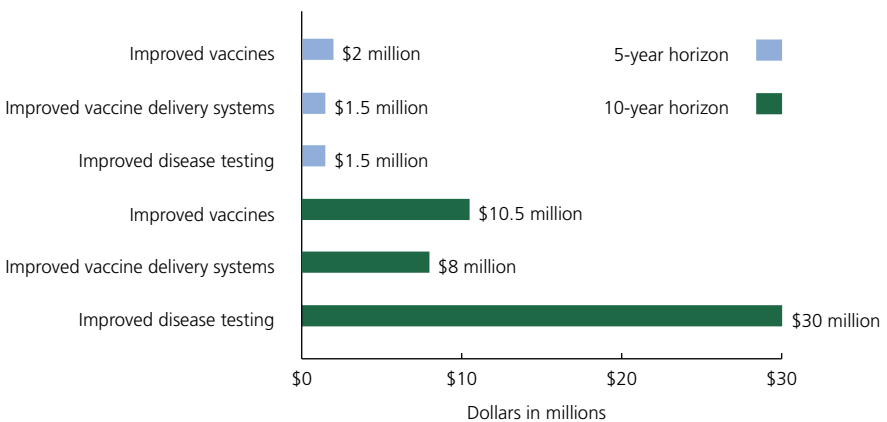
Near-Term Priority – Five-Year Horizon

- Research totals \$5 million.

Long-Term Priority – Ten-Year Horizon

- Research totals \$48.5 million.

New Funding Required



Productivity and Deliverables

This challenge will require unprecedented collaboration to fully harness the research and development capacities of the federal, state, university, and private sectors.

An oversight collaboration consortium needs to be authorized to facilitate and oversee a ten-year agenda for the brucellosis research efforts on elk and bison recommended on the following pages.

This oversight group could be university-based to identify and procure funds, prioritize research, coordinate multidisciplinary research teams, and ensure productivity and deliverables.

- Oversight consortium estimated at approximately \$200,000 per year for 10 years, \$2 million total.



*The way a team plays as a whole
determines its success.*

Babe Ruth



Captured bison in Yellowstone National Park.



Elk feeding at Jackson, Wyoming, elk refuge.



Brucellosis card test.



Centrifuge used for testing blood.



Transferring bison serum.

Improved Vaccines

In recognition of the Select Agent status of *Brucella abortus*, USDA has recently worked with USAHA to develop an approved check-list to conduct large animal brucellosis vaccine challenge trials in outdoor facilities at approved animal health research facilities.

Historically, two brucellosis vaccines developed for livestock have been available for use in elk or bison (Strain 19 and Strain RB51). Neither of these vaccines perform well for elk, and RB51 offers only moderate protection in bison.

Two additional vaccines (Strain RB51 “plus” and Strain 82) have been developed for livestock and show promise for elk and bison.

Strain RB51 “plus” was developed at the Virginia-Maryland Regional College of Veterinary Medicine and has been successfully tested in small animal trials, and is now ready to move to testing in elk and bison pending availability of facilities and funding.

Strain 82 was developed at the All-Russian Veterinary Institute (ARVI) and remains the standard brucellosis vaccine across the Russian Federation. As an outgrowth of the working symposium, ARVI scientists have agreed to work with U.S. scientists to publish data from over 20 years of clinical and field trials in Russia as a precursor to testing Strain 82 in elk and bison pending available facilities and funding.



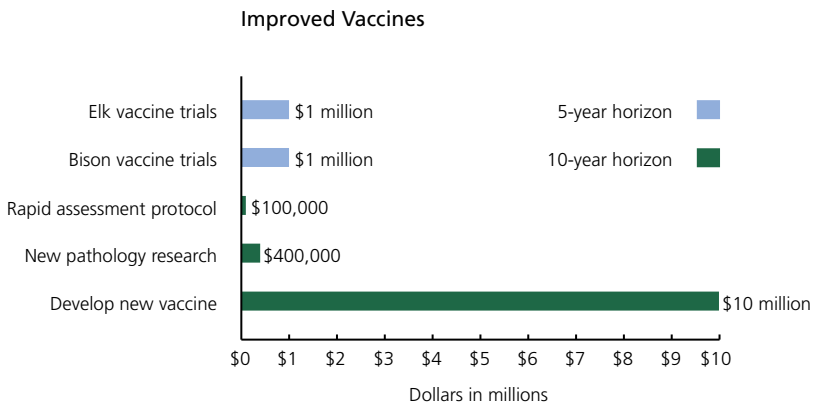
Historically, two brucellosis vaccines developed for livestock have been available for use . . . Neither of these vaccines perform well . . .

Near-Term Priority – Five-Year Horizon

- Rapidly move to conduct clinical challenge trials on RB51 “plus” and Strain 82 vaccines at \$500,000 per vaccine per species (\$2 million total).

Long-Term Priority – Ten-Year Horizon

- From existing knowledge, develop a rapid assessment protocol to screen additional promising vaccine candidates for efficacy in elk and bison (\$100,000).
- Conduct new research to improve our admittedly weak knowledge of basic brucellosis disease pathology in elk and bison (\$400,000).
- Develop and license a totally new vaccine engineered specifically for elk and/or bison (\$10 million).



Improved Vaccine Delivery Systems

Existing vaccine delivery systems need additional development to become effective vaccine delivery tools for the GYA.

Given the great complexity of brucellosis management in the GYA, it is highly unlikely that one system will work for all areas, in all circumstances, and in both species.

Key technical elements of oral and remote ballistic delivery methods that require improvement include achieving sustained release, effective biomarkers to evaluate vaccine delivery, vaccine stability and storage/shelf life, and vaccine dosage.

Vaccine delivery methods will need to be compatible with social and ecological considerations.

Delivery methods need to be cost effective and able to reach a large number of animals in a large landscape. The logistical challenges will be great.

Field validation trials should be conducted to evaluate effectiveness of vaccine delivery before widespread application of vaccination programs in the GYA.



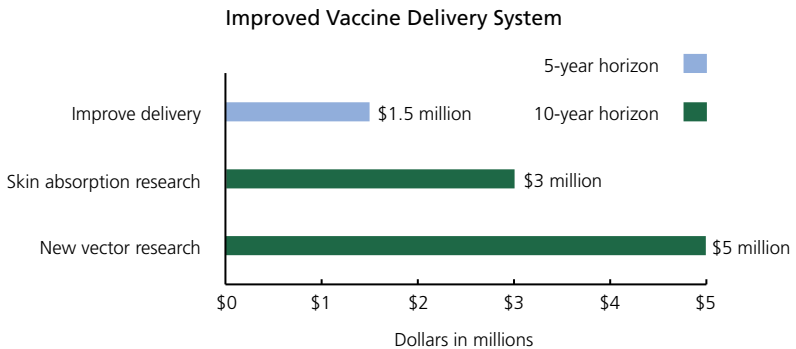
*The logistical challenges
will be great.*

Near-Term Priority – Five-Year Horizon

- Rapidly improve key technical elements of oral methods that require an animal to ingest the vaccine and remote ballistic methods where the vaccine is delivered directly to animal tissues by biocompatible bullets (\$1.5 million).

Long-Term Priority – Ten-Year Horizon

- Initiate new research to adapt existing technologies where the vaccine is directly absorbed through the skin (\$3 million).
- Initiate new research to evaluate the feasibility of natural forages, insects, phages, viruses, bacteria, or nematodes as biological vector of a vaccine antigen (\$5 million).



Improved Disease Testing

Although originally developed for cattle, many of the current diagnostic tools have been extrapolated for use in wildlife without rigorous evaluation.

There is a need to establish a clearinghouse for sharing information that also identifies a process for sharing reagents, contains a master database, and maintains a repository of well-characterized diagnostic materials.

Meta-analysis of the current data through the incorporation of existing publications as well as unpublished findings to determine the existing base of knowledge on diagnostic tests for brucellosis.

The World Organization for Animal Health standards for validation of disease testing can be used as a guide.



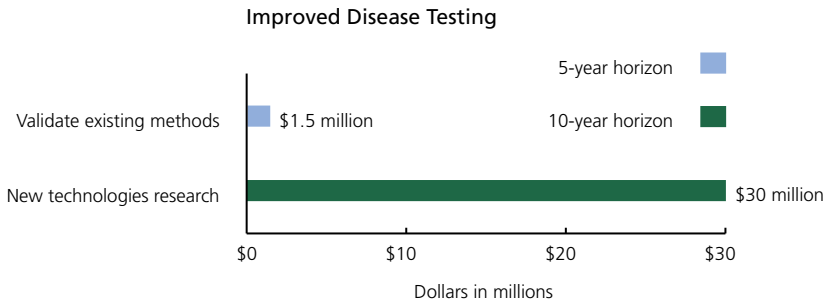
... many of the current diagnostic tools have been extrapolated for use in wildlife without rigorous evaluation.

Near-Term Priority – Five-Year Horizon

- Validate the existing brucellosis diagnostic methods that are applied to wildlife (\$1.5 million).

Long-Term Priority – Ten-Year Horizon

- Initiate new research to develop and validate new technologies such as rapid genomic diagnostic tests involving Polymerase Chain Reaction (PCR) and vaccine biomarkers (\$30 million).



About the USAHA

The United States Animal Health Association (USAHA), the nation's animal health forum for over a century, is a science-based, non-profit, voluntary organization. Its 1,400 members are state and federal animal health officials, national allied organizations, regional representatives, and individual members. USAHA works with state and federal governments, universities, veterinarians, livestock producers, national livestock and poultry organizations, research scientists, the extension service, and seven foreign countries to control livestock diseases in the United States. USAHA represents all 50 states, 7 foreign countries, and 18 allied groups serving health, technical, and consumer markets.

USAHA's mission is to protect animal and public health by:

- Serving as a national forum for communication and coordination concerning: disease eradication, animal health, emergency preparedness, emergency response and recovery, emerging diseases, food safety, public health, animal welfare, and international trade.
- Serving as a clearinghouse for new information and methods for policy and programs development.
- Developing solutions for animal health issues.

USAHA's prime objective is to prevent, control, and eliminate livestock diseases that cost ranchers, farmers, and consumers approximately \$1 billion per year. The Association's mission is implemented through deliberations of its 33 species and subject area science-based committees and the adoption of resolutions and recommendations aimed at solving animal health problems. Committee size varies from 11 to 135 members.

USAHA is administered and its policy determined by the Executive Committee and Board of Directors.

Formed in 1897, USAHA has met annually and produces a printed proceedings of each meeting. The proceedings represent the most complete history of the nation's animal health endeavors over the past century.

Citation of technical report:

United States Animal Health Association. 2006. Enhancing Brucellosis Vaccines, Vaccine Delivery, and Surveillance Diagnostics for Elk and Bison in the Greater Yellowstone Area: A Technical Report from a Working Symposium held August 16–18, 2005, at the University of Wyoming. Terry Kreeger and Glenn Plumb (eds.). The University of Wyoming Haub School and Ruckelshaus Institute of Environment and Natural Resources, Laramie, WY 82071. 80 pp.

The Technical Report is available at www.USAHA.org/pubs/2006Aug_TechnicalReport_GYA-Elk-Bison-Brucellosis.pdf.

This *USAHA Laramie Agenda* can be found at www.USAHA.org/pubs/2006Aug_USAHA_LaramieAgenda.pdf.

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