

V(A). Planned Program (Summary)**Program # 2****1. Name of the Planned Program**

Animal Health

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
121	Management of Range Resources			10%	
301	Reproductive Performance of Animals			10%	
302	Nutrient Utilization in Animals			10%	
303	Genetic Improvement of Animals			10%	
307	Animal Management Systems			10%	
311	Animal Diseases			35%	
315	Animal Welfare/Well-Being and Protection			10%	
902	Administration of Projects and Programs			5%	
	Total			100%	

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	100.0	0.0
Actual	0.0	0.0	81.4	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	621633	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	633284	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	8642637	0

V(D). Planned Program (Activity)**1. Brief description of the Activity**

Databases that are easily accessible by researchers and producers in order to make research results readily available
 Distribution of papers and research results at state nutrition conferences, field days, county meetings and state conventions
 Preparation of research articles, fact sheets and news releases for scientists and state media
 Strategic planning meetings with state agricultural groups

2. Brief description of the target audience

State agencies, animal health companies, state commodity groups, ranchers, seedstock industry representatives, colleagues, and related stakeholders.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	250	100	0	0
Actual	900	1100	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2009

Plan: 1

Actual: 2

Patents listed

Hardy, M.E. Snow Mountain Virus Genome Sequence, Virus-like Particles, and Methods of Use. U.S. Patent # 11/058,030 (2008)

Harmsen, A.G. PCT International Application N.: PCT/US2008/075,373; Converted from Provisional Patent Application Serial Nos.: 60/970,878 and 60/986,985; Entitled: "Protein Cages and Their Uses." Counsel Ref.: MONT-095/02WO (2008)

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	5	
Actual	10	28	38

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of research citations

Year	Target	Actual
2009	15	61

Output #2

Output Measure

- Building built through donations

Year	Target	Actual
2009	0	0

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Identify critical infection and resistance processes.
2	Number of ranches per year adopting enterprise management of animal health issues.
3	Number of novel vaccines developed per year.
4	Number of activities per year that prevent disease outbreaks or manage diseases of Montana livestock.
5	Meetings that maintain or enhance Montana's presence in the production of quality meat products.

Outcome #1**1. Outcome Measures**

Identify critical infection and resistance processes.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	1	1

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

Infectious disease can cause considerable losses for producers by reducing production and by reducing sales due to food safety concerns. A focus on disease management, reproduction, and carcass traits will help ensure that Montana meat products maintain the highest standards. Animal losses due to disease create the need for an improved understanding of factors affecting Montana livestock.

What has been done

Disease management and research programs that increase the quality of meat, milk, and fiber products continue to be major areas of research. One set of MSU studies is designed to optimize mucosal and systemic antibody responses in heifers to provide passive immunity to newborn calves that are especially susceptible to scours. Infectious disease research at MSU focuses on understanding the biology of each specific group of infectious agents and learning how these specific microbes produce disease when infections are established in people or animals. An MSU study seeks to better characterize the action of Yamoia (ground bark of Funtumia elastica tree) in an effort to stimulate the innate immune system for protection against a broad range of pathogens in bovine calves.

Results

The discovery of novel proteins that are essential to cell division will have a significant impact on the identification of new drug and vaccine targets for control of coccidiosis in livestock. A focus on disease management, reproduction, and carcass traits help ensure that Montana meat products maintain the highest standards. Research in targeted mutagenesis of cells in cattle will make milk and beef production more efficient, increase the value of cattle based commodities, and produce herds with improved traits, including disease resistance and increased production. Research is continuing in collaboration with researchers at the University of Montana and the NIH Rocky Mountain Lab to form a center for studying emerging infectious diseases in wildlife and livestock. Viral pneumonias cause substantial morbidity and mortality in the cattle industry. Research is underway to develop effective vaccines for these diseases. Mastitis remains one of the costliest diseases of the dairy industry. MSU researchers are developing a better understanding of mammary defense mechanisms to establish effective therapies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
303	Genetic Improvement of Animals
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

Outcome #2**1. Outcome Measures**

Number of ranches per year adopting enterprise management of animal health issues.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	10	10

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

Cow-calf enterprises are critical to the economic stability of the cattle industry in Montana. Reproductive health and estrus synchronization is important to producers in calving and marketing. Sheep production represents a growth opportunity for livestock producers in Montana. Decreasing input cost and increasing production revenues, will help producers achieve higher quality products, generate more income, and maintain Montana's position in the world livestock market.

What has been done

Programs that focus on management, nutrition, and health maintenance have been developed that provide cow-calf producers in Montana the tools to produce safe beef products and improve the quality. Research is demonstrating that improved nutrition is a major factor that can reduce lamb mortality and improve profitability. Our targeted grazing (TG) effort is a cooperative project between Montana Wool Growers Association and MSU and is dedicated to developing and implementing non traditional strategies that increase the competitiveness of Montana lamb and wool in the world market. A successful TG program causes significant damage to the invasive weed with limited damage to the surrounding vegetation. TG efforts are usually integrated with other control methods as part of an overall weed management strategy. Weed projects annually have directly involved over 100,000 acres of weed infested Montana rangeland and about 1000 landowners and 31 sheep producers utilizing 30,000 sheep and goats.

Results

Currently major weed projects are targeted at leafy spurge, spotted knapweed and Dalmatian toadflax. Research is demonstrating that controlled sheep and/or goat grazing is effective in managing established infestations of many of non-native weeds. In 2008 we conducted 15 projects with 22 monitoring sites utilizing 15,000 sheep and goats from 10 sheep producers involving 1000 private landowners, county weed supervisors, and public agencies. More enterprises are using controlled estrus and developing management plans to improve the economics of raising healthy calves to market.

4. Associated Knowledge Areas

KA Code	Knowledge Area
121	Management of Range Resources
301	Reproductive Performance of Animals
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

Outcome #3**1. Outcome Measures**

Number of novel vaccines developed per year.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	1	0

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

Brucellosis (*Brucella abortus*) remains a threat to the health and well-being of livestock in Montana, Idaho, and Wyoming. Cohabitation of infected wildlife (elk and bison) with cattle has compromised Montana's brucellosis-free status. There are no efficacious brucellosis vaccines for bison, and current vaccines are only partially effective in livestock.

What has been done

The development of a subunit vaccine for brucellosis combined with live attenuated vaccines will provide improved disease prevention for livestock. Once appropriately formulated, we believe that we will be able to develop a cheap and effective brucellosis vaccine for wildlife and cattle.

Results

Studies, in cooperation with Texas A&M, have produced new subunit and live brucellosis vaccines that may effectively protect bison and cattle against brucellosis. Our results from the bison and mouse vaccination studies are encouraging because protective efficacy was obtained in both animal systems. The discovery of novel proteins that are essential to cell division will have a significant impact on the identification of new drug and vaccine targets for control of coccidiosis in livestock. Over 150,000 "drug-like" candidates have been screened for their activity against agonists in cattle.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

Outcome #4**1. Outcome Measures**

Number of activities per year that prevent disease outbreaks or manage diseases of Montana livestock.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	1	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Animal losses due to environmental stresses, disease, and death create the need for an improved understanding of factors affecting Montana livestock. Infectious disease causes considerable loss for livestock producers by reducing production of animal units and by reduced sales because of food safety concerns. Disease outbreaks are closely monitored in Montana to ensure quality and disease-free calves are shipped to other states. Investigating the mechanisms by which calves resist lung infections will help us better understand why these calves become susceptible to infection.

What has been done

The Veterinary Molecular Biology research unit at MSU is focused on animal health, particularly on the study of infectious diseases of cattle. MSU is testing a mucosal vaccine delivery system to provide the basis for a future generation of ruminant vaccines. Programs that focus on management, nutrition, and health maintenance have been developed that provide cow-calf producers in Montana the tools to produce safe beef and improve the quality of the beef that is raised. Programs are in place to investigate vaccines for rotavirus, which is the major viral cause of diarrhea in cattle and costs the industry \$500 million per year. A rotavirus vaccine is commercially available, but is sub-optimal, as it fails to protect calves throughout the most susceptible periods.

Results

Prion diseases, such as bovine spongiform encephalopathy (BSE) in cattle, scrapie in sheep, and chronic wasting disease (CWD) in deer and elk, are caused by novel infectious agents and result in fatal degeneration of the central nervous system. Research is being conducted to define the pathway of prion agents following infection to improve our understanding of how they spread within a host. A rotavirus vaccine is commercially available, but is sub-optimal as it fails to protect calves throughout the most susceptible periods. We are investigating new vaccines that have potential to develop into effective controls for these agents. The discovery of novel proteins that are essential to cell division will have a significant impact on the identification of new drug and vaccine targets for control of coccidiosis in livestock.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

Outcome #5

1. Outcome Measures

Meetings that maintain or enhance Montana's presence in the production of quality meat products.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	1	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Consumers critique every bite of meat they consume. Producers know that the diets fed to cattle can affect meat quality. Determining the effect that grain type and variety in the diet have on color, stability, and finishing quality is important to Montana producers. Food safety is a very visible consumer and producer concern and has become a concern for the livestock industry at all production levels. Consumers, both domestic and international, are demanding more information about the beef they purchase, including the age and source of the animal and the health, nutrition, and handling management. Information is being demanded by consumers on labeling the country of origin (COOL) and to ensuring that the products they are buying are safe.

What has been done

Diets using Montana produced grains, including barley, are being tested to determine finishing characteristics of beef. Changes in growth potential could explain some of the variation in tenderness seen in the marketplace. Current information helps give us more information about how growth rate affects tenderness, meat quality and cellular-level response. Research and development strategies and tactics are being investigated that will lead to more economically and biologically efficient beef production. Results will be summarized and disseminated to producers, researchers, rangeland managers, and other interested parties.

Results

Identification of barley varieties that affect color stability could result in designing diets specifically for improved color and increase the use of barley as a finishing grain. A critical and stressful time for feedlot cattle is early in the finishing period. Valier Barley with increased levels of beta-glucan may make it possible to get enough beta-glucan through the rumen in order to stimulate the immune system of ruminants and result in an improvement of animal health. Beef producers must address methods to improve and document ranch biosecurity and biocontainment protocols to prevent food safety events and irreparable harm to the beef industry.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection
902	Administration of Projects and Programs

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Appropriations changes
- Public Policy changes
- Government Regulations

Brief Explanation

The loss of Montana's "brucellosis free" status has created increasing demand for vaccines that can be administered to livestock or wildlife. Maintaining Montana's presence as a primary source of calves for the feeding and finishing markets is compromised by the change in status. While weather conditions and market strength affect the sustainability of the livestock industry in Montana, efforts at MSU continue to offset these factors with the development of new approaches to disease and livestock management.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Retrospective (post program)
- During (during program)
- Other (Review with state agencies)

Evaluation Results

Disease outbreaks have been minimized and quarantines implemented.

Key Items of Evaluation

Cooperation with the State of Montana Livestock Veterinarian has produced programs to control and eradicate animal diseases and prevent the transmission of wildlife diseases to livestock, thereby protecting the livestock industry from significant long-term negative economic impacts.