

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Animal Health And Production

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
301	Reproductive Performance of Animals	10%		15%	
302	Nutrient Utilization in Animals	10%		15%	
303	Genetic Improvement of Animals	5%		15%	
305	Animal Physiological Processes	0%		10%	
307	Animal Management Systems	20%		10%	
311	Animal Diseases	5%		15%	
315	Animal Welfare/Well-Being and Protection	45%		20%	
806	Youth Development	5%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	8.0	0.0	28.0	0.0
Actual Paid Professional	0.0	0.0	5.8	0.0
Actual Volunteer	0.0	0.0	0.0	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
30123	0	1578320	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
30123	0	1578320	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
282693	0	9800418	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities included the use of a system dynamics modeling approach to explore the U.S. reproductive value chain's information markets [the stylized model focuses on four key performance and commercial herd profitability metrics: litter size, number of pigs born alive, weaning weight, and leanness], development of data suggesting that calcium oxide treatment of distillers grains with solubles [wet or dry] may be beneficial on its own without treatment of the corn stover [this is a much less laborious procedure and will save producers time and money], the use of microfluidics to study biological systems [because microfluidics can deal with a small number of cells, the characteristics of cellular structure and function and the microenvironment of the stem cells can be understood in a more precise manner], and an experiment investigating the influence of genes important in the proliferation of organ cells on the growth of skeletal muscle.

Activities also included research with the goal of defining the early mechanisms of Apicomplexa-host interactions and to identify new drug candidates that can block these interactions, work to advance technology for the practical use of cryopreserved boar sperm to improve opportunities for profitable pork production, project outputs that demonstrate the utility of high-density marker platforms such as the PorcineSNP60 Genotyping BeadChip to identify regions of the genome harboring QTL for economically-important production traits, experiments to assess changes in circulating androgen concentrations and in androgen biosynthesis in three different groups of pigs [Ossabaw pigs, Ossabaw pigs fed a high fat diet that became obese, and Landrace pigs], results from a project which show clearly that diet components can meaningfully improve pig health and thus the efficiency of pork production [these findings are so striking that we can now confidently argue that the diet should be part of a swine herd health management program], identification of molecules on the porcine oviduct that bind sperm, and studies which indicate that fowlpox virus containing full-length REV is widespread in poultry [since virus isolation is time consuming and expensive, isolation of viral genome from the formalin fixed tissue section for genetic characterization provides essential information].

Conference presentations included the Illinois Cattle Feeders Meeting, International Embryo Transfer Society Annual Meeting, American Society of Animal Science Midwest Section, National Veterinary Scholars Symposium, Midwest Conference on Stem Cell Biology and Therapy, National Congress of Swine Production, Midwest Swine Nutrition Conference, Pork Expo, V Colegio Latinoamericano de Nutricion Animal, Society for the Study of Reproduction, Association for Applied Andrology, Gordon Conference on Fertilization and Activation of Development, National Cattlemen's Beef Association, Youth Beef Industry Council, North American Regenerative Medicine Association, International Poxvirus Asfarvirus and Iridovirus Conference, American Association of Avian Pathologists, American Veterinary Medicine Association, Orthopaedic Research Society, Veterinary Orthopaedic Society, and the North

American Veterinary Regenerative Medicine Association.

Drought management was a major focus for 2012 with information delivered at a series of meetings, webinars, blogs, and news releases that addressed pasture management/hay shortages and feeding strategies. Two Extension educators located in research stations provided leadership for a number of programs that focused on beef production that included beef field days, three regional winter cow-calf days, and the **Illinois Cattle Feeders Meeting** and **Southern Illinois Beef Conference**. In addition, Illinois hosted the **Heart of America Grazing Conference**. The annual sheep and goat workshop was offered in the northeastern part of the state, and the annual **Illinois Dairy Days** and three **Dairy Summit** meetings were held throughout the state for dairy producers. Illinois continued to collaborate on delivering the latest dairy production information on milk quality, increased feed efficiency, milk marketing, improved animal health, and lowering consumer milk prices at the **Four-State Dairy Nutrition Management Conference** sponsored in conjunction with Iowa, Wisconsin, and Minnesota. The University of Illinois College of Veterinary Medicine also offered the **Executive Pork Producers Program** which addressed essential skills for excellence in swine business management and the **Executive Veterinary Program in Swine Health Management** which covered the essential aspects of swine production medicine for veterinarians. An **Illinois Horse Breeders Short Course** and **Certified Livestock Manager Training Workshops** targeted at manure management are examples of programs that were delivered by Extension staff to audiences at campus and off-campus sites.

A number of Extension campus faculty and staff members help conduct horse, poultry, dairy, meats, and livestock judging contests for 4-H members. Other 4-H activities include the state **Dairy Quiz Bowl**, regional and state **Horse Bowl/Hippology**, and speech contests. The Extension faculty specialist in poultry taught teachers how to use the curriculum and incubators for the 4-H chick incubation and embryology project in 313 classrooms that included nearly 14,000 youth during the 2011-12 school year [also discussed in the 4-H Youth Development planned program]. In addition, Illinois 4-H and FFA members completed the seven modules of the online **Quality Assurance and Ethics Certification** training and quiz for beef, dairy, goats, horses, sheep and swine covering topics related to care and administration of medicine for livestock.

2. Brief description of the target audience

Members of the target audience include pork producers, beef cattle producers, those who influence diet formulations and health programs for swine, practicing nutritionists, geneticists, biologists, pathologists, veterinarians, reproductive biologists, animal scientists, commercial egg producers and poultry nutritionists, and academic veterinarians and clinicians. Extension activities focused on livestock producers, custom manure haulers, regulatory agency representatives, livestock commodity group representatives, veterinarians, horse owners and breeders, the livestock feed industry, companion animal owners, community leaders, and youth.

3. How was eXtension used?

Eight Extension staff are members of various animal-related eXtension Communities of Practice including Beef Cattle, Companion Animals, HorseQuest, and Livestock and Poultry Environmental Learning Centers.

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1901	2272	13665	0

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

Patent Applications Submitted

Year: 2012

Actual: 1

Patents listed

TF08051-DIV2 - Composition And Method For Facilitating The Internalization Of A Therapeutic Agent In A Cell

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	0	63	63

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Research Projects

Year	Actual
2012	9

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increased Knowledge Of Livestock Care And Management
2	Utilization Of Waste Management Tools Such As The Illinois Manure Management Plan Workbook And Website
3	Treating Forages Prior To Feeding To Improve Feeding Value
4	Defining The Early Mechanisms Of Apicomplexa-Host Interactions
5	Improved Control Of Porcine Reproductive And Respiratory Syndrome [PRRS]
6	Identification Of Genes Responsible For The Economically-Important Traits Of Food Animal Species
7	A More Holistic Understanding Of Tissue Response To Infection
8	Increased Knowledge Of Best Practices In Grazing

Outcome #1

1. Outcome Measures

Increased Knowledge Of Livestock Care And Management

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	2812

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Humane care of animals helps young people to develop social and emotional skills.

What has been done

Training is provided to 4-H youth enrolled in livestock projects via an online module on ethical treatment of animals that also includes an examination to certify that they have the required knowledge. In addition, face-to-face training is offered in some locations that combines ethics and actual livestock production basics.

Results

Online module training records indicate that 2,812 youth were successfully certified in 2011-12.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
307	Animal Management Systems
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection
806	Youth Development

Outcome #2

1. Outcome Measures

Utilization Of Waste Management Tools Such As The Illinois Manure Management Plan Workbook And Website

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Treating Forages Prior To Feeding To Improve Feeding Value

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

After corn grain is harvested, the remaining parts of the corn plant are termed corn stover. Historically, corn stover has been left on the field as a carbon source, grazed by cattle, or baled and fed as poor quality forage. In feedlot cattle diets, forage is limited to less than 15% of the diet to maximize energy intake; however, if forage digestibility is improved, concentrations included in feedlot diets could be increased. Therefore, research is needed to improve the quality of stover so it can be used as a forage replacement for feedlot cattle without impacting performance.

What has been done

The following trials were designed to evaluate a 'new technology' concept: treating forages or high fiber energy sources prior to feeding to improve feeding value. Calcium oxide treatment of either corn stover [a mature forage source] or distillers grains with solubles [wet-WDGS, dry-DDGS] was employed. The first experiment focused on the value of treating corn stover versus feeding an immature fiber source [corn silage] to feedlot heifers. In this study, heifers consuming the corn silage ration gained better than the heifers consuming the untreated corn stover ration, despite having similar dry matter intake. Therefore, the heifers fed corn silage-based diets were more efficient. Heifers consuming a treated corn stover diet ate less than those fed untreated corn stover or silage, and gained less as well. Further analysis of these data is ongoing. The second

trial evaluated the effects of corn stover treatment versus WDGS treatment on steer performance. Contrary to our hypothesis, steers fed untreated corn stover gained more than steers fed treated stover or treated WDGS. This is likely because steers fed untreated corn stover ate more than those fed treated stover or treated WDGS. Further analysis of these data is ongoing. In the third trial conducted, diets containing 50% DDGS or 50% MWDGS were fed to 140 steers. DGS were either treated with 2.5% CaO or untreated. There was no effect of treatment on gains; however, treatment with CaO reduced DMI.

Results

Because of the reduction in DMI without impacting gain, cattle were more efficient, regardless of type of DGS inclusion. Efficiency is a large driver of economics in the feedlot industry and improving efficiency in cattle fed 50% DGS diets will improve producer profitability. These data are contradictory to information published by other institutions that show improved performance when cattle are fed diets containing CaO treated corn stover. Currently, industry is telling producers to treat corn stover to improve feeding value. This process is laborious and requires equipment that not all producers may have. Our data suggest that CaO treatment of DGS [wet or dry] may be beneficial on its own, without treatment of the corn stover. This is a much less laborious procedure and may save producers time and money. Further trials will be conducted to investigate these findings.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
305	Animal Physiological Processes
307	Animal Management Systems
315	Animal Welfare/Well-Being and Protection

Outcome #4

1. Outcome Measures

Defining The Early Mechanisms Of Apicomplexa-Host Interactions

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The phylum, Apicomplexa, contains some of the most significant pathogens infecting humans and animals. Of the more than 4,000 species of apicomplexan parasites, malaria parasites, *Toxoplasma gondii*, and Cryptosporidia are the most important pathogens of humans, causing death or disability for millions of people each year.

What has been done

The goal of our research in this area is to define the early mechanisms of Apicomplexa-host interactions and to identify new drug candidates that can block these interactions. We have developed a battery of complementary in vitro and in vivo assays that allow us to quantify *Cryptosporidium*, *Toxoplasma*, and *Plasmodium* microbial adhesion, microneme secretion, gliding motility, in vitro and in vivo infectivity, and to determine the mechanism by which the infectivity/growth of these parasites is inhibited by selected inhibitors of parasite microneme secretion.

Results

These studies are now culminating in the screening of novel small molecular weight inhibitors of CDPK for the development of new drugs that show broad efficacy for treatment of apicomplexan parasitic diseases.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Improved Control Of Porcine Reproductive And Respiratory Syndrome [PRRS]

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Porcine reproductive and respiratory syndrome [PRRS] is arguably the most troublesome swine disease the industry faces. Our observations that certain plant extracts reduce serum concentrations of the virus that causes PRRS, that one yeast-derived mannan product reduces fever in pigs with PRRS, and that another such product improves feed efficiency of pigs with PRRS may lead the industry to use these products to control the damage caused by this widespread disease. More broadly, proper function of the immune system is essential to keep pigs healthy, but excessive immune activation is quite costly as it reduces pig growth and other productive functions by cutting feed consumption and diverting energy and amino acids from production to immune function.

What has been done

Our research makes clear that several feed components [yeast-derived mannans, certain plant extracts, and spray-dried plasma] dampen the costly excessive immune activation. We have shown this in disease-challenged animals, in ex vivo or in vitro studies with immune cells taken from pig lungs, and in measures of expression of immune genes. This dampening of immune function is likely one of the mechanisms through which these products improve growth performance and our work provides further confidence in the value of these products. Our findings with mice suggest that feeding spray-dried plasma to stressed sows may improve their reproductive success. We found that acids in diets of young pigs do not necessarily improve their growth performance; this result will likely influence choices made by nutritionists. Our emphasis is on pigs, but our results may be relevant to other species, including humans.

Results

The results of this project show clearly that diet components can meaningfully improve pig health, and thus the efficiency of pork production. These findings are so striking that we can now confidently argue that diet should be part of a swine herd health management program. Diseases continue to impair pig well-being, the efficiency of use of valuable resources in pork production, herd productivity, and the profits of pork producers. Young pigs soon after weaning are especially susceptible to enteric diseases. Our work has shown that inclusion in the diet of certain plant extracts or certain clays or insoluble fiber [as found in distillers dried grains with solubles] can reduce clinical enteric disease. We fully expect the industry to use these new tools effectively in improving the health of young pigs, and perhaps older ones as well.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
305	Animal Physiological Processes
307	Animal Management Systems
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

Outcome #6

1. Outcome Measures

Identification Of Genes Responsible For The Economically-Important Traits Of Food Animal Species

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A major challenge is to identify additional genes and the accompanying genetic mechanisms that are responsible for the economically-important traits of food animal species. Only a few of the 'low hanging fruits' have been harvested for direct application by the livestock industry. By using the complete DNA sequences of the human, mouse, cattle, and pig genomes, and by applying comparative genomics and other advanced technologies developed at Illinois, we will be able to identify many more genes affecting economically-important traits.

What has been done

The results of resequencing the two dairy bull genomes demonstrate that haplotype reconstruction of an ancestral proband by whole-genome resequencing in combination with high-density SNP genotyping of descendants can be used for rapid, genome-wide identification of the ancestor's alleles that have been subjected to artificial selection. Diagnostics for eight of the mutations causing abnormalities in cattle and sheep have been released for public use.

Results

To date, these diagnostics have been used in more than 200,000 individuals worldwide. For many of these mutations, the allele frequency within specific populations has decreased significantly. The pig genome sequence provides an important resource for further improvements of this important livestock species, and our identification of many putative disease-causing variants extends the potential of the pig as a biomedical model.

4. Associated Knowledge Areas

KA Code	Knowledge Area
303	Genetic Improvement of Animals

305	Animal Physiological Processes
307	Animal Management Systems
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

Outcome #7

1. Outcome Measures

A More Holistic Understanding Of Tissue Response To Infection

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Mastitis is the most frequent and most costly disease of dairy cattle in the U.S. It adversely impacts milk production, milk quality, and animal well-being and often requires administration of antibiotics.

What has been done

Profiling of microRNA in healthy mammary tissue and *S. uberis*-infected mammary tissue was completed. In addition, bioinformatics analysis of gene targets of the microRNA analyzed was performed to study the potential functional implications of altered microRNA expression during infection.

Results

The combined analysis of microRNA profiles and their target genes allowed for a better mechanistic understanding of the molecular adaptations of the mammary gland during mastitis infection. Changes in mammary tissue immune, metabolic, and cell growth-related signaling pathways during infection might have been mediated in part through effects of microRNA on gene transcription. Differential expression of microRNA supports the view from nonruminant cells and tissues that certain microRNA might be essential for the tissue's adaptive response to infection. The combination of microRNA profiling, microarrays, and bioinformatics analyses was essential for generating a more holistic understanding of tissue response to infection.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

Increased Knowledge Of Best Practices In Grazing

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	101

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

To maintain profitability of certain livestock enterprises and quality production of meat animals to meet consumers' demands, producers need to use best forage management practices. This past year Illinois producers experienced dramatic drought impact [no pasture to graze, very little hay made/stored for winter feeding, high concentrate and hay prices] and increased prices for all classes of cattle. Producer's concerns over the economic viability of feeding cattle during this coming year are expected to continue.

What has been done

Extension educators and specialists assisted in organizing, promoting and teaching a number of events which include field days at livestock research field stations, beef cow-calf workshops, pasture walks, and web postings. The Heart of American Grazing Conference was held in Mt. Vernon, Illinois on January 25 and 26, 2012 and included 12 separate topical sessions as well as a producer panel discussion. The 145 attendees were also able to visit with various vendors who provided relevant exhibits. In addition, a pasture drought clinic was held that included six topics to meet the educational needs of 52 livestock producer attendees from Illinois. The results below summarize responses to items included in an end-of-conference evaluation that was distributed and collected from 86 of the 145 individuals [59%] who attended the Heart of America Grazing Conference and from 22 of the 52 individuals [38%] who attended the Illinois Pasture Drought Clinic.

Results

Heart of America Grazing Conference participants were offered an option to rate the knowledge they gained through each of the individual sessions using a 1-5 scale [1=None/Already knew and 5= Learned a great deal]. All but three of those who responded checked at least one topic as a 4 or 5, while 65 checked a 5 rating for at least one session topic. Participants were asked to list one management technique learned at the conference that they plan to implement [39 responded]. Most frequently mentioned were techniques related to planting cover crops and warm season grasses. Using the same evaluation structure and rating scale, participants in the Pasture Drought Clinic indicated the most knowledge gained about the following topics: [1] effects of cover crops on crop insurance; [2] alfalfa and hay management; and [3] soil moisture trends. Details are included in the evaluation section of this planned program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
307	Animal Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Heart Of America Grazing Conference

Participants were offered an option to rate the knowledge they gained through each of the individual sessions using a 1-5 scale [1=None/Already knew and 5= Learned a great deal]. All but three of those who responded checked at least one topic as a 4 or 5, while 65 checked a 5 rating for at least one session topic. Topics rated 4 or 5 by the largest number of those who responded were: [1] Warm Season Grasses-Place and Economics -- rated 4 or 5 by 65 individuals [80%]; [2] Grazing for Parasite Prevention -- rated 4 or 5 by 62 individuals [77%]; [3] Cover Crops and Their Implications for Grazing -- rated 4 or 5 by 59 individuals [71%]; [4] Mob Grazing-Does it Work on Midwest Soils and Pastures? -- rated 4 or 5 by 59 individuals [71%]; and [5] Benefits of Grazing and Added Value of Clover -- rated 4 or 5 by 58 individuals [70%]. Participants were asked to list one management technique learned at the conference that they plan to implement [39 responded]. Most frequently mentioned were techniques related to planting cover crops and warm season grasses.

Pasture Drought Clinic

Using the same evaluation structure and rating scale, participants in the Pasture Drought Clinic indicated the most knowledge gained about the following topics: [1] Effects of Cover Crops on Crop Insurance -- rated 4 or 5 by 15 respondents [79%]; [2] Alfalfa and Hay Management -- rated 4 or 5 by 12 individuals [63%]; and Soil Moisture Trends -- rated 4 or 5 by 10 respondents [53%].

Key Items of Evaluation

All livestock producers who completed the evaluation gained knowledge primarily through one or more of the presentations and 65% identified drought risk grazing management actions they plan to take including planting difference forages, increasing rotational grazing, monitoring rainfall, and adjusting stocking rates.