

V(A). Planned Program (Summary)

Program # 10

1. Name of the Planned Program

Animals and their Systems--research

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	0%	0%	15%	
302	Nutrient Utilization in Animals	0%	0%	15%	
303	Genetic Improvement of Animals	0%	0%	5%	
304	Animal Genome	0%	0%	5%	
305	Animal Physiological Processes	0%	0%	5%	
306	Environmental Stress in Animals	0%	0%	15%	
307	Animal Management Systems	0%	0%	5%	
308	Improved Animal Products (Before Harvest)	0%	0%	5%	
311	Animal Diseases	0%	0%	10%	
312	External Parasites and Pests of Animals	0%	0%	5%	
313	Internal Parasites in Animals	0%	0%	5%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals	0%	0%	5%	
315	Animal Welfare/Well-Being and Protection	0%	0%	5%	
	Total	0%	0%	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	33.0	0.0
Actual	0.0	0.0	4.8	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	146142	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	146142	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct research experiments
- Partnering

2. Brief description of the target audience

residents of Florida interested in animals and animal science.This includes

- Growers//Ranchers
- Producers/packaging
- General public
- Government officials
- Scientists

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2009

Plan: 1

Actual: 2

Patents listed

High Frequency Airway Oscillation for Exhaled Air Diagnostics

Fly Attractant System with Toxicant-Treated Cords

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	135	
Actual	0	150	150

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- {No Data Entered}

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Improve reproductive performance of animals
2	Improve nutrient utilization in animals
3	Improve genetics in animals
4	Increase knowledge in area of animal genome
5	Improve animal physiological processes
6	Reduce environmental stress in animals
7	Improve animal management systems
8	Improve animal products (before harvest)
9	Increase knowledge and decrease incidence of animal diseases
10	Reduce instances of external parasites and pests of animals
11	Reduce internal parasites in animals
12	Identify and reduce toxic chemicals, poisonous plants, naturally occurring toxins, and other hazards affecting animals
13	Increase animal welfare,/well-being and protection through improved BMPs

Outcome #1

1. Outcome Measures

Improve reproductive performance of animals

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Until recently, the beef cattle industry has never had the reproductive tools available to facilitate widespread, successful adoption of artificial insemination technologies. The need for increased efforts to transfer this technology to the industry has never before been greater. Pregnancy rates of 55% or greater to TAI in postpartum beef cows are now consistently achievable. Despite the relative success of these protocols, producers have been slow to adopt the technology. The driving force behind adoption of these reproductive management technologies should be the profit derived from improved calf uniformity at weaning and enhanced genetic potential. Ultimately, prior to adoption of any new technology, producers require confidence that the technology will not fail. Generally, that confidence is met when producers have witnessed success in other cattle operations. Therefore, together with traditional Extension dissemination methods and involvement of producers may be the necessary impetus to demonstrate success of these reproductive management practices and initiate an increase in adoption of TAI. EXPECTED IMPACTS/OUTCOMES. The anticipated outcomes of this program include enhanced working relationships among producers, extension specialists, and veterinarians and an increase in profit for beef operations resulting from improvements in reproductive management. Ultimately, increased profits for the producer will be achieved through a higher percentage of cows calving during a more concentrated time frame and earlier in the calving period, as well as an improvement in genetics resulting from use of high accuracy, genetically proven, superior sires.

What has been done

1. Development of cow-calf production systems which reduce unit cost of production while still producing high quality beef that meets the demands of today's consumer. 2. Development and integration of reproductive management technologies into management systems. 3. Maintain and enhance formal and informal linkages which facilitate outreach and information sharing among committee members and with beef cattle producers in the region.

Results

Determining how cattle express differences in RFI based on breed, stage of production, and baseline stress components is critical to determining the physiological and metabolic differences between RFI classes of beef cattle. The potential economic impact, particularly to producers in the southern states that rely on the heat and disease resistance of sub-tropical breeds such as Brahman and Romosinuano, could be significant. Improvements in feed efficiency, resulting in the direct reduction of feed costs, can be an important selection tool that producers can use to increase margins and stay profitable in the commodity driven beef business. In fact, improving efficiency of cattle by 10% will reduce input costs associated with feed, thereby potentially impacting producers in the SE and Gulf Coast regions significantly. State cow/calf enterprise reports estimate that the cost of feed ranges from \$170 to \$330 (mean \$250) per cow. Therefore, a 10% decrease in feed cost could result in a \$25 per cow annual savings or, collectively, producers in the SE and Gulf Coast regions \$380 million per year.

4. Associated Knowledge Areas

KA Code **Knowledge Area**
 301 Reproductive Performance of Animals

Outcome #2

1. Outcome Measures

Improve nutrient utilization in animals

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Beef cattle, except finishing beef cattle, typically obtain most of their nutrition from forages. There are times, however, beef cattle must receive extra protein and (or) energy nutrition via supplemental feeding. Supplemental feeding is expensive. The use of relatively inexpensive by-products and other non-traditional feedstuffs for supplemental feeding could help to reduce production costs. Trials will be conducted to evaluate the suitability of various by-product/non-traditional feedstuffs (i.e. by-products/substandard products from food manufacturing industry) to provide supplemental protein and (or) energy for beef cattle consuming forage.

What has been done

Perennial peanut (*Arachis glabrata*) is a warm-season legume that is well adapted to the deep southeastern USA. Hay from this legume appears to have good nutritional value for beef cattle heifer development. Feedstuffs will be evaluated for their suitability to provide supplemental protein and (or) energy for cattle consuming low quality forages. Both growing cattle and mature gestating/lactating beef cows will be utilized.

Results

A two year study has recently been completed that evaluated growth performance and age at puberty of yearling beef cattle heifers consuming diets that include selected legume forages versus conventional feed sources. Forty (avg. initial weight of 276 kg) and 62 (291 kg) heifers of mixed breeding (Angus, Gelbvieh, Tuli and/or Brahman) were used for year one and year two, respectively. Within year, the heifers were divided evenly into two groups based on weight and genetic background. One group was fed bermudagrass hay (9 to 11% CP and 53 to 56% TDN) free choice plus a supplement of soybean hulls (12 to 13 % CP, 76 to 89% TDN) fed at 3.6 kg/head/day. The second group was fed the same as group one except approximately 50% of the grass hay was substituted with a legume hay (perennial peanut; *Arachis glabrata*; 12 to 14% CP and 58 to 62% TDN). The trails started late October each year and ended lat May. During late winter and spring, heifers were taken off hay and supplement, and allowed to graze either annual ryegrass (group one) or ryegrass and clover mixture (red and crimson clover; group two). Grazing was very limited each year due to drought - 75 and 51 days for years one and two, respectively. The proportion of clover in the pasture forage was small (5 to 35% for year one and 4 to 14% for year two). Blood samples were collected weekly and analyzed for progesterone concentration to determine onset of puberty. Preliminary results indicated that the addition of legume forage slightly improved growth rate (0.72 vs. 0.68 kg/d) but age at puberty appeared to not be affected.

4. Associated Knowledge Areas

KA Code **Knowledge Area**
 302 Nutrient Utilization in Animals

Outcome #3

1. Outcome Measures

Improve genetics in animals

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Accurate prediction of genetic values for economically important traits of purebred and crossbred animals is essential to devise appropriate mating and selection strategies in multibreed populations. This project seeks to develop genetic-economic models and procedures to improve mating and selection strategies in national and international multibreed populations under a variety of environmental conditions.

What has been done

New genetic-statistical models will be devised and subsequently tested and validated using simulated, experimental, and field national and international multibreed datasets of various degrees of unbalancedness. New computing algorithms will be incorporated and(or) devised as needed. National and international researchers will collaborate in various stages of the research.

Results

1) Less efficient steers (high RFI) had smaller longissimus muscle area (LMA) and higher marbling score (MAR) than more efficient steers (low RFI); 2) Higher % Brahman steers had tougher meat, lighter carcasses, smaller LMA, and lower MAR; 3) Exit velocity had no effect on carcass and meat quality traits; 4) Moderate heritabilities for pre and postweaning growth traits indicate that selection for these traits is feasible in a Colombian Blanco Orejinegro (BON)-Angus-Zebu commercial multibreed population; Calf genetic trends followed sire genetic trends closely suggesting a much higher emphasis on choosing sires than dams replacements; Low heritabilities for age at first calving (AFC) and calving interval suggested that improvements in nutrition and management were needed; A steep negative trend for AFC was likely due to the introduction of Angus and BON sires into the population; 5) Monthly milk yield per cow (MYC) and revenue per cow (MRC) in Thailand was similar across all districts and farm sizes (small, medium, large), except for Pattana Nikhom; Monthly MYC decreased from 2003 to 2007 likely due to insufficient feeding levels, whereas milk quality traits had small favorable improvements; Improving management and health care would be needed to reduce and maintain somatic cell count below recommended maximum levels; 6) Semen quantity and quality was influenced by year-season, ejaculation number, age, ambient temperature, and Holstein fraction in Central Thailand; Bulls that were 75% to 80% Holstein produced higher volume and semen quality than any other group suggesting that a small fraction of *Bos indicus* genes would be advantageous under Thai tropical conditions;

4. Associated Knowledge Areas

KA Code	Knowledge Area
303	Genetic Improvement of Animals

Outcome #4

1. Outcome Measures

Increase knowledge in area of animal genome

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Improve animal physiological processes

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Substantial embryonic losses occur in cattle during the first month of pregnancy. Approximately 40% of these losses occur at the time when a specific embryonic tissue, termed the trophectoderm, must proliferate and produce sufficient amounts of IFNt so that pregnancy may be maintained. The long-term goal of the proposed research is to elucidate the key physiological, endocrine and molecular mechanisms responsible for conceptus development and the establishment and maintenance of pregnancy in ruminants so that schemes for reducing embryonic losses can be developed in cattle and other domestic ruminants.

What has been done

Studies outlined in this proposal focus on determining if FGF-2 supplementation increases conceptus mass and IFNt production at the blastocyst stage (day 7-8 of pregnancy) and at day 16 of pregnancy in cattle. In the first series of studies, bovine conceptuses will be collected at day 16 to 18 of pregnancy and incubated in medium containing various quantities of FGF-2. Endpoint measurements will include determining IFNt protein secretion into medium and abundance of IFNt mRNA. In a second series of studies, blastocyst stage bovine embryos derived from in vitro maturation, fertilization, and development procedures will be incubated in medium supplemented with FGF-2 or no growth factor treatment. In one study embryos will be evaluated after 48 hours to determine the effect of the embryotrophic factor on cell number, IFNt secretion, and IFNt mRNA abundance. In a follow-up study FGF-2 treated or non-treated embryos will be transferred to recipients and collected 7 days later to determine the effect of FGF-2 on conceptus size and IFNt production.

Results

Several changes in knowledge have been generated through this work. First and foremost, it is now evident that hormone production by bovine embryos is affected by culture conditions. Also, providing specific factors (i.e. FGF2) can modify the production of these hormones.

4. Associated Knowledge Areas

KA Code **Knowledge Area**
305 Animal Physiological Processes

Outcome #6

1. Outcome Measures

Reduce environmental stress in animals

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Heat stress reduces fertility and milk yield of dairy cattle throughout much of the United States. The purpose of the project is to understand the changes in the cow's physiology when exposed to heat stress and use that information to improving fertility and milk production

What has been done

The impact of heat stress on oocyte/ embryonic development and survivability will be characterized to better understand the effects of heat stress around the time of breeding on subsequent conception and calving rates. Embryo transfer experiments will be conducted to determine the efficacy of this treatment for improving fertility during heat stress.

Results

A major goal of the work is to improve fertility during the summer. Embryo transfer has been shown to be the most effective way to do so. In the project period, we have improved the quality of embryos for transfer by treating embryos during the culture period with either CSF-2 or hyaluronan. Another area of interest is finding genetic determinants of heat tolerance at the physiological or cellular level. The finding of breed differences in body temperature regulation provides the impetus for further work to identify genes controlling thermotolerance. Lastly, work comparing the temperature-humidity index with other measures of heat stress has resulted in the knowledge that the index is no more accurate than simpler measures of heat stress such as air temperature, at least under humid conditions. This conclusion will help dairy farmers easily assess the degree of heat stress experienced by their cows.

4. Associated Knowledge Areas

KA Code **Knowledge Area**
301 Reproductive Performance of Animals
306 Environmental Stress in Animals

Outcome #7

1. Outcome Measures

Improve animal management systems

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A greater characterization of the nutritive value of grazed forages in Florida is needed. Currently, little published knowledge exists concerning forage quality of Florida bahiagrass pastures. Forage quality data that does exist is composed of forage samples harvested by hand at regular intervals following hay harvest. This data ignores pasture grazing conditions, animal selection, and the plant-animal dynamic. This work would provide research that would enhance production of established subtropical cattle production by developing knowledge for enhanced forage and animal production practices to promote sustainable and productive practices. This work would also develop and deliver information to be utilized in decision support packages to improve production efficiency and integrate forage and cattle variables to implement best management practices to effectively utilize land, labor, and capital resources.

What has been done

The overall objective of the research proposed is to increase the management capacity and decision making ability of cattle producers in Florida. There are several specific objectives. The first objective is to characterize the chemical composition of the diet selected by cattle grazing bahiagrass forages located throughout Florida during the year. The second objective is to characterize the rumen degradable and undegradable protein fractions in forage selected by grazing cattle. An additional objective is to compare the nutritive value and protein fractions of forage selected by grazing cattle to forage collected by hand to determine if hand sampling is an adequate method to collect forage for qualitative analysis. The final objective is to model scenarios that incorporate cattle requirements and characterized forage values to determine appropriate supplements for optimal animal performance

Results

With improved nutrient profiling of the available pasture forage that is utilized for grazing, strategic and economical supplementation programs can be implemented. The idea of optimal supplementation is important because stored/supplemental feeds constitute the largest, potentially most variable, and costliest feedstuff for the cow herd. Proper supplementation programs are beneficial; to the cow by providing nutrients in the proper amounts and proportions that are not supplied in the grazed forage, to the producer by optimizing cost outlays for supplement in the form of improved cow performance, and the environment by reducing over-feeding of nutrients, and eliminating supplement and animal waste. A reduction in introduced nutrients into the beef cattle enterprise will be fiscally and environmentally beneficial. Information and production parameters were developed that will assist beef cattle producers to make improved decision regarding forage and supplement utilization. The complex matrix of forage-supplement-cattle was elucidated. Specific recommendations can be generated based upon the data analysis of the heifer development and growing steer research conducted.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems

Outcome #8

1. Outcome Measures

Improve animal products (before harvest)

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There are very few federally approved and labelled drugs for use in ornamental aquaculture. Use of bacteriophages to prevent and combat microbial diseases has proven successful, but has not been employed in tropical aquaculture. Tropical aquaculture in Florida relies primarily on non-native species, and the science is lacking on measured impacts when released into the environment or methods for measuring risks and mitigating impacts for producers. Pond technologies in Florida tropical fish production are primitive in relation to other forms of aquaculture. Adoption of modern technologies by producers is dependent largely on providing evidence of positive results including demonstration field days. This project will examine environmental impacts of non-native species in Florida waters and methods for measuring risks of species in production. This project will conduct research and collect data necessary to support federal labels for drugs used in ornamental fish production. This project will initiate a research protocol and program for use of bacteriophages in tropical aquaculture disease management. This project will enhance the abilities to test and demonstrate impacts of new pond technologies.

What has been done

The Tropical Aquaculture Laboratory (TAL) in Ruskin is an arm of the Department of Fisheries and Aquatic Sciences dedicated to providing research and extension programs for Florida's ornamental aquaculture industry. This project will provide key enhancements to several areas of this effort. Aquatic Animal Health programs include disease diagnosis and research into prevention and cures, including labeling of drugs and chemicals, as well as studying alternative treatment and prevention strategies using probiotics including bacteriophages. This project will provide a research biologist to assist in drug labeling research and reporting to FDA for 3 drugs; Metomidate, Florfenicol, and Slice. Clinical trials performed both at the TAL and on farms will be used to produce necessary efficacy and target animal safety data towards this effort. A post doctoral veterinarian will also be employed with the task of conducting a thorough review of the science and literature surrounding the recent breakthroughs achieved in use of bacteriophages. This review will then be used to develop research designs, facility requirements, and funding sources for such an effort in tropical aquaculture. Start up equipment for studies of non-native aquatic species in the environment will be procured to allow the assistant professor with these duties to perform necessary research. The start-up will include items needed for both field (electrofishing) and laboratory (greenhouse) studies. The fish farm associated with the TAL will be renovated and improved to allow for the conduction of replicated pond trials of new technologies including aeration and pond feeding and fertilization studies.

Results

Faculty are now equipped to perform both field and lab-based studies on non-native aquatic species, and further studies have been funded in large part due to increased capacity. Access to Methyltestosterone as a masculinizing agent for *Xiphophorus helleri* promises to greatly increase the profitability of this segment of the industry. Successful indexing of Ovaprim will significantly decrease the costs associated with managing this product as an INAD, and allow its use on a wider number of ornamental species.

4. Associated Knowledge Areas

KA Code	Knowledge Area
308	Improved Animal Products (Before Harvest)

Outcome #9

1. Outcome Measures

Increase knowledge and decrease incidence of animal diseases

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

{No Data Entered}

What has been done

{No Data Entered}

Results

{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases

Outcome #10

1. Outcome Measures

Reduce instances of external parasites and pests of animals

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Today, uncontrolled tick populations and bovine anaplasmosis (BA) in cattle are major concerns among livestock producers in Puerto Rico (PR). The livestock industry, particularly the dairy cattle industry, is continuously facing major economic constraints, which are threatening the stability and the economy of the agricultural sector in the island. Major economic losses include high mortality in adult cattle, abortion, poor growth performance, reduction in milk production, and poor fertility rates. An estimated economic loss of US \$20 million was reported in 1989 in PR due to the presence of anaplasmosis, babesiosis, and *Boophilus microplus* (Canestrini). A. This project will determine the seroprevalence of bovine anaplasmosis among dairy cattle at the herd and individual animal level in Puerto Rico. B. This project will determine spatial patterns and risk factors for bovine anaplasmosis in Puerto Rico. C. This project will determine the distribution of *Boophilus microplus*, the tick vector for BA, in Puerto Rico. D. The purpose of this study is to learn about the current epidemiology of bovine anaplasmosis (BA) among dairy cattle in Puerto Rico (PR) and to establish national spatio-epidemiological data that may help to formulate and implement efficient and strategic control plans for BA and *B. microplus* in PR.

What has been done

investigate the current epidemiology of bovine anaplasmosis (BA) among dairy cattle in Puerto Rico (PR) and to establish national spatio-epidemiological data that may help to formulate and implement efficient and strategic control plans for BA and *B. microplus* in PR. The specific objectives of the project are: OBJECTIVE 1- To determine the serological prevalence of antibodies against *Anaplasma marginale* among dairy cattle at herd and individual animal levels in Puerto Rico using MSP-5 competitive ELISA. OBJECTIVE 2- To determine spatial patterns for antibody levels against *Anaplasma marginale* and identify risk factors associated with cattle premises, location, cattle demographics, and management factors, on cluster of bovine anaplasmosis in Puerto Rico by means of geographic information systems and spatial data analyses. OBJECTIVE 3- To determine the influence of ecological factors, temperature, humidity, and type of vegetation, within geographic and agricultural areas of Puerto Rico on the distribution of *Boophilus microplus* by means of remote satellite imagery.

Results

The present study is the first in PR to assess the overall seroprevalence for *A. marginale* and *B. bovis* and identify farm management factors significantly associated with high seropositivity. The study sample was limited to adult lactating cattle from commercial dairy farms. Therefore, inferences about the present study might not represent other cattle populations. Serological results indicated that *A. marginale* and *B. bovis* are common and widely distributed in PR. Overall seroprevalence for *A. marginale* and *B. bovis* in PR was within the lower range documented for other islands in the Caribbean region. Spatial distribution was random suggesting limited influence by geographic predictors. Therefore, management factors appear to be of primary importance in the understanding and control of bovine anaplasmosis and babesiosis in PR. The presence of *R. (Boophilus) microplus* larvae in PR is determined by the presence of any cattle (beef or dairy) and the landscape habitat conditions, particularly the percent of bushes and shrubs in the site. We suggest that at the time designers of tick and tick-borne disease control programs in PR implement measures to control bovine anaplasmosis and babesiosis they should consider the biology of the tick and the current knowledge of the epidemiology of bovine anaplasmosis and babesiosis.

4. Associated Knowledge Areas

KA Code	Knowledge Area
312	External Parasites and Pests of Animals

Outcome #11

1. Outcome Measures

Reduce internal parasites in animals

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In natural and anthropogenic ecosystems, microbial communities play important roles in nutrient cycling, promoting plant growth, and in the removal/sequestration of toxins and xenobiotics. Bacterial diseases of plants, animals and humans cause millions of dollars in damages. Based on the CDC estimates, over 4 billion cases of diarrhea caused by water- and food-borne bacteria claim lives of over 2 million people worldwide. In Florida, bacterial pathogens seriously threaten the quality of beaches and recreation areas, citrus and seafood industries. Tourism industry in FL is valued at \$50 billion, citrus industry is at \$8.5 bln, and the output of the seafood industry is \$1.2 bln. Host-associated beneficial bacteria impact Florida economy as well. Beneficial bacteria promote healthy rhizosphere communities and fix atmospheric dinitrogen for both legumes and grasses. The ability to efficiently fix atmospheric nitrogen and supply it to the crops will reduce the need for N fertilizers. Based on the estimates of the Florida Department of Agriculture and Consumer Services, approximately 220,000 tons of Nitrogen-containing fertilizers are applied annually. Plant-associated nitrogen fixing bacteria can provide at least 40% of this nitrogen to their host plants at the "right" time in a "slow release" form. The goal of this study is to understand the role of bacterial cell-to-cell communication in the structuring of host-associated microbial communities. We aim to identify mechanisms that eukaryotes use to interfere with bacterial signaling.

What has been done

Objective 1. Identify genes in *Sinorhizobium meliloti* that are regulated by Quorum Sensing (QS) during symbiotic interactions with its plant host *Medicago truncatula*. Technically, this Objective will be accomplished in three steps: 1.1) identification of the in vivo QS regulon using RIVET screen 1.2) expression analysis of the QS regulated genes during different stages of symbiosis (candidate genes will be selected based on RIVET screen results, and also on the results of our proteomic studies, and in vitro promoter-trap screening (Gao et al., unpublished) 1.3) interesting genes regulated by QS and/or AHL-mimics will be disrupted, and their symbiotic behavior will be tested. Objective 2. Test the role of QS and host AHL mimics in the timing of symbiotic steps. Because we hypothesize that QS and plant AHL-mimics contribute to the precise timing of the symbiotic events, mutants which are turned ON or OFF at the wrong time or are insensitive to AHLs or plant signals may also prove informative in understanding the role of QS in the symbiosis. By studying the symbiotic behavior of these mutants, we may learn ? for example - that QS is important to controlling proliferation of rhizobia inside the infection thread or nodules. QS may prove central to preventing rhizobia from rupturing host cells and becoming a pathogen. These hypotheses will be tested in three steps: 2.1) QS mutants with altered timing of their expression will be generated, and their behavior in planta will be studied 2.2) the role of host AHL mimics and other host signals in manipulating bacterial QS genes will be assayed. Interesting novel host compounds will be purified. 2.3) disruption of the host AHL-mimic synthesis will be attempted. Objective 3. Identification of other bacterial regulatory pathways subject to manipulation by eukaryotic signals. Control over the interactions of bacteria with their eukaryotic hosts is not limited to QS. Recent high-throughput screens confirmed that other regulators (e.g. two component regulatory system GacS/GacA), as well as novel, uncharacterized genes are required for the interaction of bacteria with their hosts. Learning about the role of the *gacS/gacA* homologues in the pathogenesis may help to control many devastating

and economically important diseases. For example, *gacS*, *gacA* homologs are found in *Xylella* spp and *Xanthomonas* spp, although their functions in disease are not yet known. *Xylella* and *Xanthomonas* pathogens cause citrus diseases (variegated chlorosis and citrus canker, respectively) with the potential to devastate Florida citrus culture.

Results

1. *Salmonella* persistence in non-host environments: To identify promoters that are strongly regulated in *Salmonella* during colonization of fruits, the promoter libraries were screened after a week-long incubation in tomatoes and constitutive promoters were eliminated after growth in LB and a subsequent FACS sort. The promoter-gfp probes recovered as tomato-specific were sequenced. A comparison of the tomato-regulated genes with the *Salmonella* genes required for attachment to surfaces of alfalfa sprouts suggests that genes involved in the synthesis of cellulose may be evolutionarily-conserved requirements for plant (but not animal) colonization and infection. These studies indicate that the on-going FACS screen will be a very useful approach for identifying *Salmonella* genes that are strongly regulated during tomato colonization, and that these genes are likely to have functions that are important to persistence in tomato. To validate the results of the FACS promoter probe experiments, we tested the competitive proliferation of the corresponding mutants within red ripe tomatoes. These results suggest that the set of "tomato-related" *Salmonella* genes is likely to be different from those that this pathogen uses to colonize abiotic surfaces and invade its animal hosts. This conclusion further supports the proposed mutant screen as a potent approach to the identification of genes that are relevant to persistence in tomato fruits.

2. Coral microbiology In collaboration with Dr. Ritchie, we defined mechanisms by which coral-associated bacteria protect their ecological niche (and hence the endangered *A. palmata*) from the invasion by opportunistic pathogens. To grow on coral mucus, most *Serratia* and native coral bacteria activated at least half a dozen of different carbohydrate-degrading enzymes. Coral commensals only digest the terminal residues in mucus, while pathogens seem to preferentially degrade its structural backbone (Krediet et al., 2009a, Krediet et al., 2009b). Furthermore, when commensals sense that they have begun degrading the mucus backbone, their enzymatic activities stop; this is opposite from coral pathogens which continue degrading mucus backbone and thus acquire direct access to the coral tissues (Krediet et al., 2009a). These results are important because we now understand that commensal and pathogenic bacteria colonize corals with different biochemical strategies. Therefore, it should be possible to target and disrupt undesirable behaviors in multiple pathogens, without significantly affecting native microbiota. β-galactopyranosidase was one of the enzymes involved in the ability of the tested *Serratia* strains to grow on mucus of *A. palmate*. The identification of this enzyme is consistent with earlier reports that mucus of Acroporid corals contains a significant proportion of β-galactopyranose. This characterization of enzymes gave us an opportunity to target and disrupt growth of *S. marcescens* during colonization of the coral.

4. Associated Knowledge Areas

KA Code	Knowledge Area
313	Internal Parasites in Animals

Outcome #12

1. Outcome Measures

Identify and reduce toxic chemicals, poisonous plants, naturally occurring toxins, and other hazards affecting animals

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Little information is known concerning the weed control spectrum for newly released herbicides in pastures. Additionally, the short term and/or long term impacts on forages are unknown. Furthermore, the biology of many of the common weed species found in Florida pastures has not been investigated with regards to growth analysis, seed germination and viability, and total seed production. Invasive weeds are detrimental to pasture productivity, displace native species in natural areas, and reduce visibility in highway rights-of-ways. This project examines the weed control spectrum of herbicides and forage tolerance to herbicides, while relying upon the biology of weedy species to develop management practices for weed control (native and invasive) in pasture and rangeland, natural areas, and highway rights-of-ways.

What has been done

The new herbicide, aminocyclopyrachlor (ACP), has been tested for control of weeds in pastures and rights-of-ways. It was observed to provide excellent control *Bidens alba*, at levels as good or better than aminopyralid. Other projects are underway to better understand bahiagrass and common bermudagrass injury associated with ACP application. Other experiments were conducted to determine the efficacy of aminopyralid on woody brush control. It was observed that aminopyralid is of limited effectiveness on non-leguminous species such as oak, sweet gum, and maple.

Results

Aminocyclopyrachlor (ACP) was found to be highly effective on a wide variety of annual and perennial weed species. Safety on desirable grasses was negligible in these trials. Therefore, additional research is planned to determine if plant growth regulators can be added to ACP to enhance weed control and minimize the growth potential of desirable grasses - thus reducing the necessity of regular mowing cycles. Numerous trials were completed to determine if aminopyralid, when applied with imazapyr, glyphosate, or triclopyr, would enhance control of woody brush. It was observed that broadcast applications of aminopyralid did not significantly improve brush control over imazapyr or triclopyr alone. Individual plant treatments were equally ineffective. From these data, we will not recommend the use of aminopyralid for control of mixed brush.

4. Associated Knowledge Areas

KA Code	Knowledge Area
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals

Outcome #13

1. Outcome Measures

Increase animal welfare, well-being and protection through improved BMPs

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Florida is a state located in the tropics. Natural disasters such as tropical storms and hurricanes are common annual occurrences in this state. Severe weather conditions such as droughts frequently lead to large-scale fires. Florida also has other weather extremes such as floods leading to large scale damage especially along coastal regions and rivers that can impact research studies.

Florida has three international shipping ports and four international airports with a new one scheduled to open in 2010. Besides imported goods over 53 million tourists visited annually from around the world. It has been estimated that because of this international influx into the state, we are the entry point for one new invasive plant, pest or disease each week. Any of these external factors can adversely affect the 1862 research outcomes.

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

1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)
- Case Study
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

UF research projects are varied and look at a multitude of issues that affect animals in Florida especially those related to stress, climate and diseases including those related to internal and external parasites and pests. Cattle are an important commodity in Florida and the need to improve productivity and sustainability are of paramount importance. The environment plays an important role in animal production and there are also projects related to integrated pest management systems for Florida livestock and horse operations.

UF research also frequently does studies in other parts of the world on problems such as diseases that may soon impact Florida because of the amount of imported plants, animals and other foodstuff that comes through Florida ports. Researchers often look at international problems that may have some value to problems that have been identified in Florida. For example in the research example listed as a key item below we do not have issues with leopards in Florida but because of the urban sprawl in Florida many mammalian carnivores such as panthers and other wildlife that are presently being impacted by human population growth and expansion into wildlife habitats. Work in these other animals can be used to provide important information for dealing with issues within Florida.

Key Items of Evaluation

Mammalian carnivores are critical elements of functioning ecosystems but because they must travel widely to meet their energetic needs they are particularly vulnerable to habitat loss and fragmentation. These concerns are especially relevant to the large-bodied species. My studies are directed at development of an understanding of the landscape-scale patterns and conditions that are favorable for the long-term persistence of mammalian carnivore populations in a changing and human-dominated landscape.

To help conserve endangered and threatened species it is essential to understand their basic ecology. The leopard is under great threat in India from poaching and habitat destruction. Despite being a large charismatic carnivore, little research has done on this species in India. This study provided baseline estimates of prey abundance, which resource managers can use to monitor prey populations. Prey densities are good predictors of carnivore densities. The dietary preference of leopards was illuminated. This study also provided the first rigorous estimate of leopard density for the region. The construction of a predictive habitat model indicated the amount and nature of habitat that is available for the conservation of leopards in south-central Madhya Pradesh. This information will be useful for the conservation authorities in India to help manage leopard populations.