V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Food Safety

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
311	Animal Diseases			13%	
315	Animal Welfare/Well-Being and Protection			12%	
501	New and Improved Food Processing Technologies			10%	
603	Market Economics			5%	
607	Consumer Economics			5%	
701	Nutrient Composition of Food			12%	
703	Nutrition Education and Behavior			5%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources			13%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins			25%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.6	0.0
Actual Paid Professional	0.0	0.0	2.7	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**
0	0	242675	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	448040	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 scientific research. Publish peer-reviewed journal articles and other publications. Present findings at professional and public meetings and at other venues, and provide training sessions for food producers and processors. Educate undergraduate and graduate students.

2. Brief description of the target audience

Maine food producers and processors, Cooperative Extension staff, other scientists, state policymakers, regulators, and legislators, classroom teachers

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	9	9

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of other publications

Year	Actual
2011	7

Output #2

Output Measure

- Completed research projects

Year	Actual
2011	0

Output #3

Output Measure

- Number of professional presentations

Year	Actual
2011	27

Output #4

Output Measure

- Development of a real-time enrichment and detection system for viable Escherichia coli O157:H7 and Listeria monocytogenes by a piezoelectric biosensor quartz crystal microbalance (QCM).

Year	Actual
2011	0

Output #5

Output Measure

- A mail survey collecting data from pregnant women about their fish consumption; the data are being used to measure the effectiveness of Maine CDC's education strategy to have pregnant

and nursing women switch away from eating fish with high levels of mercury contamination to fish with low levels of contamination.

Year	Actual
2011	0

Output #6

Output Measure

- Development of a biosensing method based on aggregation of oligonucletide-functionalized gold nanoparticles (AuNPs) due to sandwich hybridization of probes and the complementary target sequence for the detection of E. coli O157:H7 by naked eyes.

Year	Actual
2011	0

Output #7

Output Measure

- Development of chitosan films containing cranberry concentrate.

Year	Actual
2011	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Federal food safety agencies may alter the way they calculate the benefits of food safety programs and may change their food safety program priorities
2	Percentage of Maine food industry and food producers adopting new effective methods to eliminate microbial contaminations
3	Percentage of Maine food industry and food producers using ingredients with natural antimicrobial properties in food products to control foodborne pathogens
4	Safer food supply and protection against foodborne illness and bacterial infection for the people of Maine
5	Increased number of regional dairy farmers using an alternative teat dip
6	Reduction in use of disinfectant teat dips will increase level of human health
7	Development of analytical methods for monitoring organic chemicals in food
8	Improve mastitis prevention/control efforts for Maine dairy farms
9	Increase outreach/education efforts for mastitis prevention and control for Maine dairy farms
10	Increase number of viable technologies to improve food safety for fresh produce
11	Increase number of viable technologies to improve food safety through the antimicrobial effects of cranberries

Outcome #1

1. **Outcome Measures**

Federal food safety agencies may alter the way they calculate the benefits of food safety programs and may change their food safety program priorities

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Percentage of Maine food industry and food producers adopting new effective methods to eliminate microbial contaminations

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Percentage of Maine food industry and food producers using ingredients with natural antimicrobial properties in food products to control foodborne pathogens

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Safer food supply and protection against foodborne illness and bacterial infection for the people of Maine

Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

Increased number of regional dairy farmers using an alternative teat dip

Not Reporting on this Outcome Measure

Outcome #6

1. **Outcome Measures**

Reduction in use of disinfectant teat dips will increase level of human health

Not Reporting on this Outcome Measure

Outcome #7

1. **Outcome Measures**

Development of analytical methods for monitoring organic chemicals in food

Not Reporting on this Outcome Measure

Outcome #8

1. **Outcome Measures**

Improve mastitis prevention/control efforts for Maine dairy farms

2. **Associated Institution Types**

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Mastitis continues to be a major economic risk, capable of devastating the small or large dairy operation. Prevention and control have relied on hygiene during and between milkings, antibiotic treatment or teat sealants during the dry period, antibiotic treatment of clinically detectable mastitis, and culling of seriously affected cattle. Due to human health concerns, dairy farmers follow strict regulations, and are encouraged to avoid exogenous chemicals or drugs.

What has been done
During 2010-2011, a bulk tank filter prototheca survey of Maine dairies was completed, including

culture and PCR testing.

Results
Based on this work, a pasteurization resistance study of the prototheca isolates found in Maine was conducted. MAFES scientists found that several of the Maine isolates were not completely eliminated using standard pasteurization methods, and they reported finding to the state CDC and to groups of Maine veterinarians. They are continuing to evaluate sensitivity in all Maine isolates of prototheca and to evaluate mechanisms of resistance. By evaluating milk and filter samples, the researchers will follow the success of Maine farms in eliminating prototheca from their milking herd. Since the diagnostic lab conducts mastitis screening and diagnosis for a number of dairies in the state, the y will be able Maine report overall mastitis pathogen prevalence and antimicrobial resistance pattern to our dairy producers and veterinarians.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases

Outcome #9

1. Outcome Measures

Increase outreach/education efforts for mastitis prevention and control for Maine dairy farms

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Mastitis continues to be a major economic risk, capable of devastating the small or large dairy operation. Prevention and control have relied on hygiene during and between milkings, antibiotic treatment or teat sealants during the dry period, antibiotic treatment of clinically detectable mastitis, and culling of seriously affected cattle. Due to human health concerns, dairy farmers follow strict regulations, and are encouraged to avoid exogenous chemicals or drugs.

What has been done

During 2010-2011, a bulk tank filter prototheca survey of Maine dairies was completed, including culture and PCR testing.

Results
Of the 9 Maine farms with prototheca, 4 have participated in outreach efforts including repeated testing and on-farm investigation of possible reservoirs of infection. Attending veterinarians have participated in this outreach, and a followup study to evaluate the effectiveness of teat sealants for prevention and control of prototheca intramammary infection in the dry period is planned.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases

Outcome #10

1. Outcome Measures

Increase number of viable technologies to improve food safety for fresh produce

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Consumption of fresh fruits and vegetables has increased in recent years. With an increase in consumption has come an increased frequency of foodborne outbreaks associated with raw or minimally processed fruits and vegetables. Bacterial foodborne outbreaks have been associated with fresh fruit and vegetable products including a recent Escherichia coli O157:H7 outbreak associated with spinach. Therefore, research is needed to better understand not only the mechanisms through which pathogens can contaminate fresh fruits and vegetables, but also the procedures for eliminating pathogens once they are present, either on the surface or in internal tissues, and the analytical methods for pathogen detection.

What has been done
MAFES food scientists have developed a novel, simple, inexpensive, instrument-free gaseous ClO2 approach for disinfection of fresh produce. Gaseous ClO2 was generated by combining an equal amount of impregnates sodium chloride and activating acids (slow or fast release materials)

in a small sachet. After activation, the sachet was placed in a sealable bag containing E. coli O157:H7 inoculated spinach or blueberries.

Results
The researchers found that gaseous ClO2 is effective for decontamination of E. coli O157:H7 on spinach using the slow release. In addition, the low concentration of ClO2 over 7 days did not affect visual quality of spinach leaves. The researchers also found that fast release treatment successfully decontaminated the blueberries and that gaseous ClO2 did not affect the overall visual quality of blueberries. The scientist believe that gaseous ClO2 could be an affective disinfectant against E. coli O157:H7 on spinach and blueberries. This simple method can easily be incorporated into the existing processes and provides advantages to producers who wish to preserve the appearance of their sanitized produce.

4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #11

1. Outcome Measures

Increase number of viable technologies to improve food safety through the antimicrobial effects of cranberries

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Control of foodborne pathogens and the reduction in the potential health risks to consumers from pathogens is one of the most urgent problems confronting the food industry. Chemical agents with antimicrobial activity have been used as a traditional techniques, but consumers today are increasingly concerned about the safety of these chemical additives in foods and prefer natural and unadulterated foods.

What has been done

MAFES food scientists studied the antimicrobial effects of a cranberry marinade against Salmonella Typhimurium inoculated on chicken wings, along with the consumer acceptability of cranberry marinated chicken wings.

Results

The scientists found that chicken wings marinated with original and double concentrations of cranberry sauce had 1.18 and 1.5 log CFU/g reductions of S. Typhimurium, respectively. The marinade containing hot sauce only did not cause any reduction. Their sensory evaluation showed that the original and the double concentrated cranberry marinade had no significant differences from each other in appearance and flavor. Furthermore, they had higher scores than the hot-sauce-only marinade and the control. Texture and overall acceptability ratings of the original cranberry marinated chicken wings were the highest among the other treatments and the control. Considering the antimicrobial effects and health benefits of cranberries, cranberry marinated chicken wings may be a potential safe and healthy product preferred by consumers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluations are currently conducted at the project and program levels.

At the project level, all projects are reviewed by an internal research council and external peer reviewers when initiated and again at completion by the research council. During the research council final evaluation, the focus is on determining if terminating projects met their stated objectives, secured extramural funding, and produced peer-reviewed publications. For FY11, no projects went through the review process in this program area. As for other measures of successful research programs, faculty in this program area published 9 peer-reviewed articles. Furthermore, in FY11 research published by faculty in this program area was cited by peers more than 130 times in other peer-reviewed journals.

Researchers use a variety of methods to evaluate their own research projects including evaluations retrospectively, before-after, and during the life of the project; case studies; and comparisons between treatment/intervention and nontreatment/nonintervention. Researchers involved in testing the antimicrobial effects of a cranberry marinade against Salmonella Typhimurium inoculated on chicken wings used consumer testing to gauge the acceptability of cranberry marinated chicken wings.

At the program level, external NIFA review teams are asked to review the research programs of schools/departments. These teams provide input on the impact and productivity of research programs supported through the station. The station is working to develop a standard program-level evaluation process, which will be used to evaluate each station program area. Our current plans include an approach based on use of expert panels as recommended by the federal Government Accounting Office with individual program evaluations occurring every four to five years on a staggered time table.

Key Items of Evaluation

Chicken wings marinated with original and double concentrations of cranberry sauce had 1.18 and 1.5 log CFU/g reductions of Salmonella Typhimurium, respectively, while the hot-sauce-only marinade did not cause any reduction. Sensory evaluation showed the original and the double concentrated cranberry marinade had no significant differences from each other in appearance and flavor, and they have higher scores than the hot-sauce-only marinade and the control. Texture and overall acceptability ratings of the original cranberry marinated chicken wings were the highest among the other treatments and the control ($P<0.05$). Considering the antimicrobial effects and health benefits of cranberries, cranberry marinated chicken wings may be a potential safe and healthy product preferred by consumers.