V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Food Safety

☑ 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
201	Plant Genome, Genetics, and Genetic Mechanisms			1%	
311	Animal Diseases			14%	
501	New and Improved Food Processing Technologies			20%	
502	New and Improved Food Products			16%	
503	Quality Maintenance in Storing and Marketing Food Products			1%	
605	Natural Resource and Environmental Economics			3%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources			3%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins			42%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.6	0.0
Actual Paid	0.0	0.0	2.3	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	192816	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	281284	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?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	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: 2014

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	15	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- # of other publications

Year	Actual
2014	3

Output #2

Output Measure

- Released new Capsicum germplasm containing high levels of capsinoids (bioactive compounds)

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increase number of viable technologies to improve food safety
2	Reduce incidence of foodborne illness
3	Increase adoption of recommended safe food-handling practices at the individual, family, community, production and supply system levels.
4	Using cranberries to improve food safety
5	New ways to control Toxoplasma gondii contamination

Outcome #1

1. Outcome Measures

Increase number of viable technologies to improve food safety

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Many potato farmers lose potatoes during storage due to the length of storage and microbial contamination. During harvesting, potatoes may become injured and susceptible to microorganisms such as yeast and molds and bacteria. When in storage, bacteria and fungi that were potentially introduced during harvesting may contaminate some potatoes.

What has been done
MAFES food scientists developed a novel, simple gaseous chlorine dioxide (ClO2) method that could effectively control microorganisms on potatoes during storage.

Results
Results were effective for yeasts and molds, natural microbiota, and P. aeruginosa. Gaseous ClO2 did not affect the overall visual quality of the potato. The residue of ClO2 decreased to < 1mg/l after 14 days consistently for each treatment. Gaseous ClO2 may be scaled up to increase profitability of Maine?s potato farms as it reduces crop loss in storage due to microbial contamination.

4. Associated Knowledge Areas

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

Outcome #2

1. **Outcome Measures**

Reduce incidence of foodborne illness

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Increase adoption of recommended safe food-handling practices at the individual, family, community, production and supply system levels.

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Using cranberries to improve food safety

2. **Associated Institution Types**

- 1862 Research

3a. **Outcome Type:**

Change in Knowledge Outcome Measure

3b. **Quantitative Outcome**

Year	Actual
2014	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 one of the most traditional techniques. However, consumers today are increasingly concerned about the safety of these chemical additives in foods and prefer natural, healthy, and unadulterated foods. Consequently, many researchers are searching for naturally occurring antimicrobial compounds from sources such as fruit, plants and herbs.

What has been done
MAFES researchers studied the antimicrobial mechanisms of action of bioactive compounds in cranberries on cellular and molecular levels against human pathogens.

Results
The researchers? results indicated that each fraction of bioactive compounds showed significant antimicrobial effects ($P < 0.05$) compared to the control (0%) at 24h. They also developed chitosan films containing cranberry concentrate and tested for antibacterial activity on poultry drumsticks over a period of 5 days. Due to the antibacterial nature of these films, they present themselves as an effective means of naturally treating poultry with cranberry that does not decrease the aesthetic appeal of the product.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

New ways to control Toxoplasma gondii contamination

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Protozoan parasite Toxoplasma gondii is one of three pathogens (together with Salmonella and Listeria) that account for >75% of all deaths due to foodborne disease in the USA. One-third of the human world population is infected with T. gondii. The high disease burden in combination with disappointing results of the currently available treatments has led to a plea for more effective prevention.

What has been done

Working with wild blueberries because of their economic importance to the state of Maine, the researchers have examined the effectiveness of using peroxyacetic acid, lactic acid, chlorine dioxide, and chlorine washes to remove T. gondii oocysts inoculated on the surface of blueberries.

Results

The peroxyacetic acid and lactic acid washes removed significantly ($p<0.05$) more oocysts, 4.9 and 4.8 log, respectively, than the water wash, whereas the ClO2 and NaClO washes removed similar levels of oocysts as the water wash. The chemical wash treatments did not alter the appearance of blueberries. This study suggests that peroxyacetic and lactic acid washes are more effective in removing T. gondii oocysts from blueberry surface than ClO2, NaClO and water washes. Interventions targeting the oocyst stage are imperative for controlling T. gondii contamination of fruits and other produce. The use of peroxyacetic acid and lactic acid washing could be a viable method of controlling T. gondii oocysts contamination on blueberries. Additionally, this project has expanded the number of scientists conducting research on T. gondii through training by collaborators in the USDA. It has lead to the creation of facilities and protocols to handle working with a protozoan. New standard operating procedures have been developed both at the University of Maine and the Eastern Regional Research Center at Wyndmoor, PA.

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

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. This program area ended in FY2014, and projects have been moved to the Maine Food Systems program area

starting with the FY2015 Plan of Work.

Key Items of Evaluation

This program area ended in FY2014, and projects have been moved to the Maine Food Systems program area starting with the FY2015 Plan of Work.