

V(A). Planned Program (Summary)

Program # 4

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	5%		5%	
204	Plant Product Quality and Utility (Preharvest)	5%		5%	
212	Pathogens and Nematodes Affecting Plants	5%		5%	
216	Integrated Pest Management Systems	5%		5%	
308	Improved Animal Products (Before Harvest)	10%		10%	
501	New and Improved Food Processing Technologies	20%		20%	
503	Quality Maintenance in Storing and Marketing Food Products	10%		10%	
504	Home and Commercial Food Service	10%		10%	
607	Consumer Economics	5%		5%	
702	Requirements and Function of Nutrients and Other Food Components	5%		5%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	5%		5%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	15%		15%	
	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	5.1	0.0	7.9	0.0

Actual Paid Professional	3.4	0.0	13.5	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
958480	0	443129	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1383106	0	1970063	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
231595	0	853898	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research-based programs will focus on conducting research experiments and programs emphasizing our key interest areas including detection and control of foodborne pathogens.

A wide variety of programs will be delivered to our targeted audiences. Some programs will include a complete development of curriculum, while others will involve the use of readily available programs used in other states and/or available for purchase through different organizations. Our output effort will include:

- partnering with important stakeholders,
- development of workshop materials and curricula
- conducting workshops
- development of web-based and distance education materials
- working with the media

We expect to increase our offerings through distance education and/or web-based materials. Most programs involve some type of collaboration or partnerships with our stakeholders, with industry, with consumers, or with regulatory agencies. Evaluation tools vary greatly depending on the intended audience and program type ranging from surveys, to pre-and post test, to national certification exams, and intensive follow up surveys to better assess knowledge gain.

2. Brief description of the target audience

- Animal production personnel
- Plant production personnel
- Food manufacturing and processing plant personnel
- Food service and food retail workers
- Consumers
- Youth
- State and county health departments
- Federal regulatory officials
- State industry associations
- First Responders

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	13622	418977	1895	185

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

Patent Applications Submitted

Year: 2012

Actual: 1

Patents listed

8114622

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	0	130	130

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of food safety programs offered to consumers

Year	Actual
2012	173

Output #2

Output Measure

- Number of programs offered to the food industry

Year	Actual
2012	97

Output #3

Output Measure

- Number of research projects on food safety

Year	Actual
2012	32

Output #4

Output Measure

- Number of research publications related to control of foodborne hazards

Year	Actual
2012	44

Output #5

Output Measure

- Number of research publications related to detection of foodborne pathogens

Year	Actual
2012	59

Output #6

Output Measure

- Number of research publications related to food defense and protection

Year	Actual
2012	27

Output #7

Output Measure

- Number of Extension publications related to food safety

Year	Actual
2012	34

Output #8

Output Measure

- Number of volunteers

Not reporting on this Output for this Annual Report

Output #9

Output Measure

- Number of consultations

Year	Actual
2012	362

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of incidents of foodborne illness associated with unsafe food handling practices
2	Number of persons who increased their knowledge of cooking foods adequately
3	Number of persons who increased their knowledge of avoiding cross-contamination
4	Number of persons who increased their knowledge of keeping food at a safe temperature
5	Number of persons who increased their knowledge of storing foods properly
6	Number of persons who increased their knowledge of proper hand washing
7	Number of participants passing food handler certificate
8	Number of participants adopting best management practices related to food safety
9	New tools, technology, research programs, knowledge that can or has the potential to improve food safety.
10	Number of persons increasing knowledge of food processing safety

Outcome #1

1. Outcome Measures

Number of incidents of foodborne illness associated with unsafe food handling practices

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Number of persons who increased their knowledge of cooking foods adequately

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of persons who increased their knowledge of avoiding cross-contamination

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number of persons who increased their knowledge of keeping food at a safe temperature

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Number of persons who increased their knowledge of storing foods properly

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Number of persons who increased their knowledge of proper hand washing

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Number of participants passing food handler certificate

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Number of participants adopting best management practices related to food safety

Not Reporting on this Outcome Measure

Outcome #9

1. Outcome Measures

New tools, technology, research programs, knowledge that can or has the potential to improve food safety.

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)

Improving sensitivity and specificity detection of foodborne pathogens is a major focus within Food Science at Purdue. We continue to improve assay procedures with light scattering sensors that detect foodborne pathogens using pathogen-specific selective growth media. We now understand the pathogenic mechanism of *Listeria monocytogenes* during intestinal phase of infection. This is important for developing a disease prevention strategy in high risk populations.

What has been done

We have built a laser-based optical light scattering sensor to directly detect and identify bacterial colonies as they grow on agar surface in Petri-dish. Upon shining of the laser on the bacterial colony, it generates a unique scatter signature for each colony that is captured by a CCD camera. Image analysis software allows identification and classification of bacteria at genus, species and even at serovar level in minutes. Selective and chromogenic agar media help generate unique differential scatter signatures for bacteria and it is highly reproducible and specific. Bacterial Rapid Detection using Optical light scattering Technology (BARDOT). BARDOT has been extensively studied for use in foodborne bacterial identification including *Listeria*, *Salmonella*, *Escherichia coli*, *Vibrio*, *Bacillus* and other pathogens. BARDOT is licensed to Advanced Bioimaging Systems, LLC (West Lafayette, IN). Our pathogenesis studies revealed that a specific domain within an adhesion protein of *Listeria* is crucial for interaction with the hosts cell receptor. A probiotic strain was engineered to express *Listeria* adhesion protein for controlling *Listeria* infection.

Results

These studies revealed that a specific domain within an adhesion protein of *Listeria* is crucial for interaction with the hosts cell receptor. A probiotic strain was engineered to express *Listeria* adhesion protein for controlling *Listeria* infection. Two significant impacts have come from this work. First, the improved assay procedures are highly sensitive for detecting serovars of *Salmonella* and Shiga-toxigenic *E. coli* (STEC) and will aid in the detection of these in food in a cost-effective manner. Second, the knowledge gained from the pathogenesis study helped develop a bioengineered probiotic strain that reduced pathogenesis *Listeria monocytogenes* infection by 90% in mice. Such a probiotic, which is Generally Regarded as Safe (GRAS) has the potential to be further developed for use as a dietary supplement to prevent *L. monocytogenes* infection in high risk humans.

4. Associated Knowledge Areas

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

Outcome #10

1. Outcome Measures

Number of persons increasing knowledge of food processing safety

2. Associated Institution Types

- 1862 Extension
- 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)

Food safety is critical to the health of Indiana residents. Those who inspect food processing need to have skills for accurate assessment.

What has been done

Purdue Extension specialists delivered a program to Food Processing and Technology for Federal and State food inspectors. This 5-day program focused on food preservation including canning/thermal processing, freezing, cooling, drying, and non-thermal methods.

Results

245 food inspectors completed training in 2012 and were trained on all the key elements critical to completing the required FDA-administered test for their job assignment with the FDA.

4. Associated Knowledge Areas

KA Code	Knowledge Area
503	Quality Maintenance in Storing and Marketing Food Products
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources

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.)
- Other (state and national priorities)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

- Outcome 9 - lab study - detection and differentiation serovars of Salmonella and Shiga-toxigenic E. coli and Bacillus
- Outcome 10 - posttest - FDA food inspectors

Key Items of Evaluation

- Outcome 9 - improved assay procedures highly sensitive for detecting serovars of Salmonella, Shiga-toxigenic E. coli; bioengineered probiotic strain reduced Listeria monocytogenes infection by 90% in mice.
- Outcome 10 - FDA food inspectors prepared to take required test for job placement