

V(A). Planned Program (Summary)

Program # 9

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
501	New and Improved Food Processing Technologies	25%		25%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	25%		25%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	25%		25%	
723	Hazards to Human Health and Safety	25%		25%	
	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	17.0	0.0	4.0	0.0
Actual Paid Professional	16.9	0.0	7.2	0.0
Actual Volunteer	0.4	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
550951	0	191679	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1456390	0	406524	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
554541	0	308575	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research investigated the presence of disease-causing microorganisms in poultry and beef from various sources; the development of genomics and molecular biology-based methods for tracking and controlling foodborne microorganisms in foods and the environment; and other topics.

Extension activities included the popular Cooking for Crowds workshops, attended by 1,064 people, and promoting safe food handling in festival and other special event booths; a food safety hotline; work with Master Food Preservers to promote safe canning techniques; testing and adjusting or advocating replacement of pressure canner dial gauges to ensure the safety of canned low-acid foods; and the Penn State Food Safety Certification/Serv Safe Certification (PSFSC/SSC) program. Through PSFSC/SSC, 2,137 food service workers completed 15 hours of classroom instruction and/or home study activities and passed an exam to maintain their ServSafe certification and comply with PA law. This program helped more than 1,240 food service facilities meet licensure requirements and continue operations. The TAP Online Food Safety training was also offered.

2. Brief description of the target audience

Agricultural producers, farmers, landowners, food scientists, academia and government researchers, general public, food safety specialists, food microbiologists, food industry personnel, architectural engineers, industrial hygienists, other scientists, nonprofit organizations, community groups, students/youth, volunteers/extension leaders

3. How was eXtension used?

Conducted two seminars for the Food Safety COP. Addressed a few Ask the Expert questions.

Penn State Cooperative Extension supports faculty and staff use of eXtension and promotes communities of practice as a way of broadening sources of information and outreach. Penn State Cooperative Extension supports the professional development offered through eXtension.org. Pennsylvania is represented by 152 eXtension members in 47 of the 73 approved CoPs.

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	10004	2471537	3	14

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

Patent Applications Submitted

Year: 2012
 Actual: 3

Patents listed

Serial No. 13/563,065; Filed 7/31/12; Title: Methods and Compositions for Improving the Nutritional Content of Mushrooms and Fungi

Serial No: 13/630,948; Filed: 9/28/12; Title: Rapid, Specific and Sensitive Immunoassays for the Detection of Highly Variable Gram Negative Bacterial Antigens

Serial No: PCT/US2012/5795 9; Filed: 9/28/12; Title: Rapid, Specific and Sensitive Immunoassays for the Detection of Highly Variable Gram Negative Bacterial Antigens

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	0	0	18

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of invention disclosures submitted.
 Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Number of people enrolled and/or registered in programs.
 Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of people enrolled and/or registered in all programs related to Food Safety

Year	Actual
2012	9137

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants who were evaluated and demonstrated increased knowledge and skills.
2	Number of participants who were evaluated in a follow-up and who implemented/adopted practices.
3	Number of volunteers that helped with program leadership or delivery.
4	Number of participants in all programs related to Food Safety who were evaluated and demonstrated increased knowledge and skills.
5	Number of participants in all programs related to Food Safety who were evaluated in a follow-up and who implemented/adopted practices.
6	Presence of hygiene indicators in farmers' market, supermarket organic, and supermarket broilers
7	Presence of shiga toxin-producing E. coli in beef samples from small and very small beef processing plants
8	Number of participants in Cooking for Crowds who were evaluated in a follow-up and who implemented/adopted practices related to improving food safety
9	Adjusted or replaced pressure canner dial gauges
10	Testing and optimizing high-pressure processing, a new treatment for ground beef against 6 virulent Shiga toxin-producing E. coli

Outcome #1

1. Outcome Measures

Number of participants who were evaluated and demonstrated increased knowledge and skills.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Number of participants who were evaluated in a follow-up and who implemented/adopted practices.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of volunteers that helped with program leadership or delivery.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number of participants in all programs related to Food Safety who were evaluated and demonstrated increased knowledge and skills.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	3083

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #5

1. Outcome Measures

Number of participants in all programs related to Food Safety who were evaluated in a follow-up and who implemented/adopted practices.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	304

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from

	Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #6

1. Outcome Measures

Presence of hygiene indicators in farmers' market, supermarket organic, and supermarket broilers

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Poultry purchased from farmers' markets in Pennsylvania may be more likely to be contaminated with Salmonella spp. and Campylobacter spp. than is conventionally processed poultry sold at supermarkets.

What has been done

Whole broilers from farmers' markets and supermarkets were evaluated for hygiene indicators Salmonella and Campylobacter.

Results

28% and 90% of broilers from farmers' markets, 20% and 28% of supermarket organic, and 8% and 52% of supermarket broilers, were positive for Salmonella and Campylobacter, respectively. There is a need to develop food safety training for poultry vendors at farmers' markets to improve the safety of these products for public consumption.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Presence of shiga toxin-producing E. coli in beef samples from small and very small beef processing plants

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Small and very small beef processors may be a source of the various shiga toxin-producing E. coli (STEC), which can cause serious illness or death.

What has been done

Researchers tested for presence of various forms of STEC from beef carcasses, hides, ground beef, and the environment in small and very small beef processing plants.

Results

STEC O157, O145, O121, O113, O111, O103, O45, and O26 were isolated from carcass swabs, hide swabs, ground beef, and environmental samples from small and very small beef processing plants using a multiplex polymerase chain reaction assay. 35.0% of carcass samples, 56.6% of environmental samples, 85.2% of hide samples, and 17.0% of ground beef samples tested positive for STEC. This information may be of interest to regulatory officials, researchers, public health personnel, and beef industry professionals interested in the presence of these pathogens in the beef supply.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

Number of participants in Cooking for Crowds who were evaluated in a follow-up and who implemented/adopted practices related to improving food safety

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	127

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Many nonprofit organizations in Pennsylvania, such as fire companies, churches, schools, and civic groups, sell food at festivals and other special events for fundraising. Many times, the workers are volunteers and are not specifically trained in safe food handling techniques. This can lead to the spread of foodborne illness, much of which could be prevented with easily employed best practices.

What has been done

45 Cooking for Crowds workshops, covering personal health and hygiene, time and temperature controls, cross-contamination, and proper sanitizing procedures, were conducted with approximately 1064 individuals. These individuals represented 217 non-profit organizations; estimates showed that 180,662 customers and/or consumers attending 1,996 events could positively benefit from volunteers' increased knowledge and improved food safety practices as a result of attending the workshop. 127 participants completed a 3- to 6-month follow-up survey.

Results

When asked about food safety practices they have implemented within 3 to 6 months after the training, 66% (84 of 127) of the participants had implemented at least one new practice. 20% (26 of 127) implemented 4 or more new practices and 46% (58 of 127) implemented 1 to 3 new practices as a result of attending Cooking for Crowds. Participants also responded that they increased the frequency of food safety practices within 3 to 6 months after the training. 73% (93 of 127) had increased the frequency of at least one practice. 20% (25 of 127) increased the frequency of 4 or more practices, and 53% (68 of 127) increased the frequency of 1 to 3 new practices. Practices include checking food temperatures with a calibrated thermometer; cooking foods to the proper temperature; washing hands for 20 seconds; limiting the time food spends in the temperature danger zone; cooling foods quickly; separating raw from ready-to-eat foods during preparation, storage, and serving; and using appropriate strength sanitizer on utensils,

equipment, and food contact surfaces.

4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #9

1. Outcome Measures

Adjusted or replaced pressure canner dial gauges

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	298

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Low-acid foods require the higher temperatures achieved in a pressure canner to kill harmful bacteria. Spoilage organisms are commonly found in the environment. Most cannot be seen without a microscope. Bacteria thrive on foods with low acidity. Bacteria can also produce spores that survive higher temperatures than the bacteria themselves. If not killed during canning, the spores can grow into bacteria that produce harmful toxins. Of special concern are the very toxic botulism bacteria, which thrive on low-acid foods in the absence of air and in the presence of moisture, such as occurs inside a jar of canned vegetables, meats, or other low-acid foods.

What has been done

Educators and/or volunteers tested 298 pressure canner dial gauges.

Results

Results showed that 179 (60%) of the gauges tested needed adjustment or replacement to ensure proper processing of low-acid foods to prevent foodborne illness.

4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #10

1. Outcome Measures

Testing and optimizing high-pressure processing, a new treatment for ground beef against 6 virulent Shiga toxin-producing E. coli

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

High-pressure processing (HPP) is a commercially available process that uses water under pressure to reduce pathogens while also extending the shelf life of the product. Researchers have documented the effectiveness of HPP on pathogens in a variety of muscle foods. However, very little information has addressed the effect of HPP on Shiga toxin-producing E. coli (STEC), including E. coli O145, O26, O45, O103, O111, and O121 (the "Big 6" STEC). Treatment of fresh ground beef with HPP to eliminate these STEC could provide a means to protect consumers against food-borne illness.

What has been done

80:20 or 93:7 (lean:fat) irradiated ground beef was experimentally inoculated with ~1 million colony forming units/gram of various STEC (O145, O26, O45, O103, O111, O121, and O157:H7), formed into patties (~50 grams), crust-frozen with liquid nitrogen, vacuum-packaged, stored at 4 degrees C, and subjected to HPP.

Results

Multiple, 1-minute HPP cycles were more effective in reducing STEC than single cycles for longer periods of time, so 4 cycles were used. Treatments resulted in a 99.99% reduction of STEC. The greatest reductions were found in 93:7 ground beef, so a higher fat content may allow for increased survival of STEC. Unfortunately, HPP-treated ground-beef patties in unopened vacuum

packages appeared gray in color, so a subsequent sensory experiment was conducted in which HPP was applied similarly to the above procedures.

Seventy participants compared HPP-treated and untreated ground beef for overall liking, texture, juiciness, and flavor. Consumers preferred untreated patties. When evaluated for texture and juiciness, treated products were slightly chewier and less juicy.

These results suggest some sensory attributes of ground beef may be affected negatively by HPP treatment. However, sensory evaluation was conducted on 'naked' ground-beef patties (no bun, seasoning, or condiments).

These results suggest that HPP may be a suitable intervention for reducing the 'Big 6' STEC in ground beef. However, HPP treatments may affect color and eating quality of ground beef.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Government Regulations
- Competing Programmatic Challenges
- Other (Extramural Funding)

Brief Explanation

Across the state of Pennsylvania community groups and organizations depend on volunteer manpower to prepare food for a variety of events and activities. Volunteers preparing food for community activities may be experienced at preparing family meals but may not have the skills to prepare and store large quantities of foods. The Cooking for Crowds: A Volunteer's Guide to Safe Food Handling curriculum was developed specifically for nonprofit groups and volunteers. The program is designed to help them understand the food safety risks when cooking large volumes of food and how to reduce these risks so that the food prepared is safe for the public. Local nonprofit groups often have traditional fundraisers featuring local and ethnic foods. The money from these events helps support the mission of the groups throughout the year.

Retirement of some educators caused some food safety program data to go unreported. With the loss of many mentoring educators from the food safety program, we lost contact with some Master Food Preservers and may not be aware of all programming conducted.

We struggled with collecting data post-class because of the change to standardized evaluation and the use of Survey Monkey. Many of the workshops occurred late in the program year and follow-up data would not have been collected prior to the reporting

deadline.

Reduced State funding impacted both the research and extension functions of the College of Agricultural Sciences and resulted in retirements and layoffs of key faculty and staff across all areas of the College.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

A standardized survey tool for post-class and 3-6 month follow-up surveys was developed and implemented on Survey Monkey for this year for the Food Preservation extension program. The survey was designed to gather key information on knowledge and intent to change on critical practices related to home food preservation, such as recommended method to use and process for time and temperature control for safety. Although 1,329 individuals participated in food preservation workshops, only 267 survey results were entered into Survey Monkey. The 3-6 month follow-up survey gathered information on actual changes made as a result of the program attended. Fifty of these surveys were entered into survey monkey. This should be an area of focus for the coming year to ensure that next year's data more accurately and completely reflect the knowledge and action changes generated.

Many of the workshops occurred late in the program year and follow-up data would not have been collected prior to the reporting deadline. We could try to move more of the programs earlier in the year so as to allow the completion of 3- or 6-month follow-ups before the end of the reporting period. Alternatively, we could report on that data from the previous year.

The generation of outcomes from existing programs and the development of new programs require improved evaluation that identifies pre- and post- responses to information and monitoring for long-term behavioral changes that result in improved environmental outcomes. The evaluations conducted thus far provide initial measures of implementation, but long-term monitoring is needed to ensure that the practices are successfully managed over time.

Key Items of Evaluation

See also highlights of state-defined outcomes in this planned program.