

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
502	New and Improved Food Products	0%		15%	
703	Nutrition Education and Behavior	90%		5%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	10%		80%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	10.0	0.0	0.6	0.0
Actual Paid	4.4	0.0	1.5	0.0
Actual Volunteer	0.6	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
247400	0	225478	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
247400	0	353885	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

OARDC's food safety research for advancing broad food safety goals will include both basic and applied research. Research will range from microbial studies to packaging. Laboratories, pilot plants, farms, and multiple business sites will all be available throughout state to permit data gathering and to continue long-term experiments. All functional laboratories and sites will be improved over time as program needs warrant.

Parallel OSU Extension food safety programs will be developed based on client demand and food safety standards set by both the industry and regulators. Food safety programs to reduce the incidence of foodborne illness and provide a safer food supply by addressing and eliminating causes will continue to be a primary program goal of OSU Extension and OARDC.

Specific activities of food safety education for consumers will include:

- Conducting food safety education classes
- Conducting ServSafe classes with food establishment managers and employees
- Conducting Safe Food Handling for Occasional Quantity Cooks classes with volunteer food preparers
- Providing research-based information to consumers through various forms of media, phone calls, fact sheets, and web pages

2. Brief description of the target audience

Targeted audiences within our food safety programs include, but are not limited to:

- Specific individuals or groups who have expressed a need for food safety research and Extension information that is to be derived through new research, extracted from on-going research, or is derived from scientific literature;
- Fellow academic units that partner with food scientists to create systems and processes needed to support not only the research, but also the adoption of the research findings by stakeholders;
- Fellow agencies or support organizations who will not only use the information but will also be brokers of that information, including embedding it into groups to encourage change;
- Populations who have not requested the information but will likely benefit from that information, e.g. persons who engage in home canning of food;
- Other scientists and scientific groups;
- Political entities;
- Students from pre-school to post-doctorate studies;
- News organizations;
- Businesses and industrial groups;
- Food establishment managers (ServSafe manager training; food service employees ServeSafe training);
- Volunteer food preparers (general population) (OQC);
- General consumers (via both formal or informal education)

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	9412	37717	0	0

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

Year: 2014
 Actual: 1

Patents listed

Anthocyanin-metallo complexation blue and purple colorants for food application

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	40	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of educational sessions held

Year	Actual
2014	207

Output #2

Output Measure

- individual instruction on food safety or preservation through phone calls

Year	Actual
2014	901

Output #3

Output Measure

- number of home canners (pressure of boiling water) tested

Year	Actual
2014	251

Output #4

Output Measure

- number of participants attending food preservation educational sessions

Year	Actual
2014	1850

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Contribute to the advancement of knowledge about food packaging technologies, e.g. ultrasonic sealing, controlled environment packaging, to the extent that, annually, the risk of contamination due to packaging is reduced measurably.
2	Expand the knowledge base for contamination detection within packaged foods by developing or refining technologies such as magnetic resonance or infrared spectroscopy that will, within ten years, eliminate the problem.
3	Reduce food borne pathogens in the food supply chain.
4	Number of participants who learned new information from this program. (OSUE)
5	Number of participants who plan to adopt one or more recommended practices. (OSUE)
6	Reduce health risk by releasing at least one major study every five years demonstrating nutritional health benefits, e.g. carotenoids and cataracts, anthocyanins and colon cancer or as a substitute for artificial dyes.
7	number of ServSafe® Level 2 attendees that answered "Agree" or "Strongly Agree" when presented with the statement "I am comfortable talking with coworkers about increasing the safety of food in my establishment."
8	increased knowledge around the topic of safe food handling, as demonstrated by the mean score on post-tests (out of a possible 10) compared to pre-tests for attendees of the 'Occasional Quantity Cooks' program.

Outcome #1

1. Outcome Measures

Contribute to the advancement of knowledge about food packaging technologies, e.g. ultrasonic sealing, controlled environment packaging, to the extent that, annually, the risk of contamination due to packaging is reduced measurably.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Expand the knowledge base for contamination detection within packaged foods by developing or refining technologies such as magnetic resonance or infrared spectroscopy that will, within ten years, eliminate the problem.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Reduce food borne pathogens in the food supply chain.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number of participants who learned new information from this program. (OSUE)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	5669

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

All adult consumers in Ohio handle food that has the potential of making them ill. Foodborne illnesses cause between \$1 billion and \$7.2 billion in health care costs, affect quality of life, and decrease work productivity. With potential impacts such as the ones detailed above, the need for food safety education is evident.

What has been done

OSU Extension offers several curricula that focus on food safety education. ServSafe® is a nationally recognized food safety training and certification program established by the National Restaurant Association. The ServSafe® food safety program is recognized by more jurisdictions than any other food safety program. Home food preservation sessions are offered, teaching the basics of home canning and preservation through demonstrations and workshops. The science behind preservation is emphasized, so that all participants understand why certain procedures must be followed to ensure a high-quality, safe product. Additionally, the program Occasional Quantity Cooks is offered to individuals and groups preparing large meals on an infrequent basis. All OSUE staff and volunteers complete a Safe Food Handling class.

Results

Of a total of 9412 individuals participating in Food Safety-related programming, 5669 (60.2%) class participants reported on end-of-program evaluations that they learned recommended safe food handling skills.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Number of participants who plan to adopt one or more recommended practices. (OSUE)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
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2014

4847

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

All adult consumers in Ohio handle food that has the potential of making them ill. Foodborne illnesses cause between \$1 billion and \$7.2 billion in health care costs, affect quality of life, and decrease work productivity. With potential impacts such as the ones detailed above, the need for food safety education is evident.

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Results

4847 participants reported on end-of-program evaluations that they intended to adopt one or more of the recommended safe food handling practices. Practices include: keeping foods at the correct temperature for the correct amount of time, safe canning methods, preventing cross-contamination, and cleaning and sanitizing methods.

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Reduce health risk by releasing at least one major study every five years demonstrating nutritional health benefits, e.g. carotenoids and cataracts, anthocyanins and colon cancer or as a substitute for artificial dyes.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Anthocyanins are powerful antioxidants that give color to most red, orange, purple and blue fruits and vegetables. These antioxidants are hot commodities because of their potential as cancer-fighters and natural food dyes. Food processors have several options for natural red dyes, but with blues, the alternatives are limited. In nature, anthocyanins produce a wide range of colors: orange, red, purple, violet, and different shades of purple and blue, even some black colors.

What has been done

Until recently, anthocyanins have been difficult and expensive to isolate into pure forms. OARDC food scientists have developed and patented a new, economical technique to extract the pigments, achieving highly purified anthocyanin blends.

Results

This unique process slashes the cost of producing anthocyanins 10- to 20-fold and will be commercialized by a new startup company, Anthocyantific LLC. The new products' availability and low cost will galvanize new research into the pigments.

In addition, because of OARDC's research, Ohio State University and MARS Chocolate North America, producer of candies including M&Ms, have submitted three patent applications for anthocyanin-based blue colorants.

OARDC's innovative research comes on the heels of an announcement by Kraft Foods, which revealed it would be replacing artificial dyes with natural ones in its macaroni-and-cheese products marketed to children. The issue is gaining more attention both by consumers and by the scientific community. The availability of food coloring through a natural product, anthocyanins, provides the food processing industry with an innovative product to meet consumers demands to eliminate unnatural dyes in foods.

4. Associated Knowledge Areas

KA Code	Knowledge Area
502	New and Improved Food Products

Outcome #7

1. Outcome Measures

number of ServSafe® Level 2 attendees that answered "Agree" or "Strongly Agree" when presented with the statement "I am comfortable talking with coworkers about increasing the safety of food in my establishment."

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	210

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Building a culture of safe food handling practices in restaurants is important for the overall reduction in foodborne illnesses. All employees of an establishment that serves food should be demonstrating sound techniques in this area.

What has been done

ServSafe® classes not only educate food industry employees but encourage them to take what they have learned back to their place of employment. ServSafe® Level 2 classes are designed for managers. In the courses, managers learn to implement essential food safety practices and create a culture of food safety. All content and materials taught are based on actual job tasks identified by food service industry experts.

Results

210 (93.2%) respondents on the ServSafe® Level 2 post-test answered "Agree" or "Strongly Agree" when presented with the statement, "I am comfortable talking with coworkers about increasing the safety of food in my establishment." This was compared to only 39.3% on the pre-test.

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

increased knowledge around the topic of safe food handling, as demonstrated by the mean score on post-tests (out of a possible 10) compared to pre-tests for attendees of the 'Occasional Quantity Cooks' program.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	9

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The production of meals for large numbers of people is a regular occurrence for churches, clubs, and other organizations. Individuals who volunteer for food preparation at these events often lack basic knowledge of safe food handling practices, creating an environment which may contribute to foodborne illness.

What has been done

The 'Occasional Quantity Cooks' program was developed to teach volunteer food service workers. The curriculum addresses practices and responsibilities of food service workers, using a critical thinking approach, and HACCP. Topics include planning and purchasing; storing food supplies; preparing food; transporting, storing, and serving cooked food; and handling leftovers.

Results

Participants in the 'Occasional Quantity Cooks' program take a pre-test and post-test survey containing 10 items that test knowledge around safe food handling practices. Before the program, the mean score was 8.2 among participants, while the mean score after the program / on the post-test was 9.7 (quantitative value would not allow for a decimal. 9.7 is the correct value for a quantitative outcome).

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

- 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 (National Security Threats)

Brief Explanation

Food safety is impacted by all sectors of agbioscience: physical, chemical, biological, social, economic, and environmental. Climatic extremes, for example, impact food safety to the extent that they impact supply or foster growth and dispersion of pests and pathogens. Climatic extremes that are now occurring throughout the world impact the quantity and quality of food supplied as well as the timely distribution of food before contamination is an issue.

Economic shifts, such as the cost of processing equipment or production costs, public policy shifts, regulations, and shifts in demand will impact outcomes. Food trends/ fads, food advertising agendas, new biological and chemical threats, and public nutritional health-related issues are also external factors that affect outcomes. All of these place greater demands on the land grant system.

Factors such as the availability of base funding to ensure a core faculty and staff, availability of extramural funds, and programmatic demands that far exceed resources, are affecting outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

For OSUE programming in the area of food safety, all programmatic efforts are directed at reducing the incidence of foodborne illnesses by teaching safe food handling, preparation, storage, and freezing methods. The following evaluation results show proof of strong educational gains by participants of OSUE Food Safety programming efforts.

The following evaluation results are based on a retrospective evaluation tool, administered by OSU Extension professionals, given at the end of home food preservation workshops. Participants reported to "Always" do the following Extension-recommended behaviors when preserving food at home:

- 67.1% will acidify tomatoes with lemon juice or citric acid (up from 16.3% on the pre-

test)

- 71.8% will use a boiling water bath canner to process high acid foods (up from 33.1% on the pre-test)
- 65.9% will use a pressure canner to process low-acid foods (up from 22.1% on the pre-test)
- 82.9% will use the correct headspace after filling the jars (up from 34.6% on the pre-test)
- 83.5% will prepare bands, lids, and jars according to guidelines (up from 46.2% on the pre-test)
- 78.1% will use current OSU Extension and USDA canning and freezing recommendations (up from 16.5% on the pre-test)
- 71.8% will blanch vegetables before freezing (up from 36.1% on the pre-test)
- 91.6% will wash their hands with soap and warm running water for at least 20 seconds before working with foods (up from 67.8% on the pre-test)

Key Items of Evaluation

OARDC's unique, patented process will help jump-start development of natural food dyes with cancer-fighting antioxidants.

"[OARDC researcher] Monica Giusti's work is both cost-effective and innovative -- a powerful combination that's attractive to industry partners. Companies are working with Ohio State not only to fund her research but to commercialize it as well."

-- Melissa Kelly, licensing manager, The Ohio State University Technology Commercialization Office.