

**V(A). Planned Program (Summary)**

**Program # 6**

**1. Name of the Planned Program**

Food Safety - contaminant-free, healthier foods

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
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources				50%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins				50%
<b>Total</b>					100%

**V(C). Planned Program (Inputs)**

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	9.4
Actual Paid Professional	0.0	0.0	0.0	6.5
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	0	331269
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	331269
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	276287

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

Identify risk factors for cross contamination by investigating storage practices of refrigerated foods. Determine the likelihood and mechanisms of cross contamination by mapping the fingerprints for strains of bacteria from the same refrigerator.  
 Change potentially unsafe consumer practices through effective intervention strategies.  
 Characterize, analyze, and identify antibiotic-resistant bacteria in the farm environment (animal manure, soil) and irrigation water.  
 Train students on isolation and characterization of foodborne pathogens in fresh produce and the farm environment.  
 Develop and deliver educational materials on hygienic agricultural practices needed to reduce the use of antibiotics and safe fresh produce handling practices.  
 The development, maintenance, and revision of an educational website and brochure on safe fresh produce handling practices and judicious use of antibiotic in agriculture.

**2. Brief description of the target audience**

Fresh produce farmers, consumers, food scientists, food production industry, households in the metropolitan Nashville area.

**3. How was eXtension used?**

Workshops, in-home visits and community presentations.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	65	55	0	0

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

**Patent Applications Submitted**

Year: 2012  
 Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2012	Extension	Research	Total
<b>Actual</b>	1	2	3

## V(F). State Defined Outputs

### Output Target

#### Output #1

##### Output Measure

- Website developed to educate consumers on antibiotic resistant pathogens on fresh produce.

Year	Actual
2012	0

#### Output #2

##### Output Measure

- Database of characterized antibiotic resistant microorganisms isolated from animal manure.

Year	Actual
2012	1

#### Output #3

##### Output Measure

- Database of characterized antibiotic resistant microorganisms isolated from irrigation water and watersheds.

Year	Actual
2012	1

#### Output #4

##### Output Measure

- Factsheets developed on improvement of kitchen cleanliness and prevention of cross-contamination.

Year	Actual
2012	1

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Consumers educated via booklets on the occurrence and prevention of antibiotic resistant pathogens on fresh produce.
2	Number of producers practicing judicious use of antibiotics on farms through improved agricultural practices.
3	Increase in number of consumers practicing safe fresh produce handling practices via food safety education.
4	Number of target consumers with increased knowledge of improved kitchen cleanliness.
5	Number of target consumers with increased knowledge of means to reduce the chance of cross contamination.
6	Number of target consumers adopting safer food storage practices.
7	Number of target consumers adopting improved cleaning skills.
8	Number of people with enhanced awareness of malnutrition and functional foods.
9	Number of industrial partners with interest in lab-scale formulations and processing technologies for functional foods.
10	Number of industrial partners utilizing developed technologies to produce functional foods.
11	Number of industrial partners assessing consumers' responses to new product lines consisting of functional foods.

## **Outcome #1**

### **1. Outcome Measures**

Consumers educated via booklets on the occurrence and prevention of antibiotic resistant pathogens on fresh produce.

### **2. Associated Institution Types**

- 1890 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	45

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Consumers have become increasingly aware of the risks of foodborne pathogens associated with fresh produce. There is more concern if the pathogens are resistant to antibiotics. Data obtained in this program will be used to educate consumers on safe handling practices. Consumers, who adopt to food safety practices reduce the risks of cross contaminating their fresh produce.

#### **What has been done**

Data from this program were used to develop booklets on safe handling of fresh produce. Families were invited for hands-on workshops on safe handling of fresh produce. Educational booklets were distributed to consumers via Tennessee State University extension workshops and mail distribution.

#### **Results**

Hands-on workshops resulted in families knowledgeable of safe handling of fresh produce. Families were educated on the risks of antibiotic resistant bacteria in irrigation water and animal manure. Profiles on different types of antibiotic resistant bacteria in water, soil, and animal manure were shared with consumers and were able to see the evidence of antibiotic resistant bacteria in farm environment.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
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

### **Outcome #2**

#### **1. Outcome Measures**

Number of producers practicing judicious use of antibiotics on farms through improved agricultural practices.

#### **2. Associated Institution Types**

- 1890 Research

#### **3a. Outcome Type:**

Change in Action Outcome Measure

#### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	6

#### **3c. Qualitative Outcome or Impact Statement**

##### **Issue (Who cares and Why)**

Antibiotic resistant foodborne pathogens in fresh produce may cause personal distress, preventable death, and avoidable economic burden. Profiles of antibiotic resistant bacteria obtained from animal manure and irrigation water are used to educate growers on the importance of judicious use of antibiotics in food production. This is one portion of a strategy to reduce the prevalence of antibiotic resistant bacteria in farms.

##### **What has been done**

Data from this program were used to develop booklets on antibiotic use in farms. The major focus of the information are guidelines set to reduce the use of antibiotics in farming to prevent the rise of antibiotic resistant bacteria in farming communities. Educational materials on judicious use of antibiotics were distributed to producers. Focus group have been organized to gather information on behavior/farm practices change on antibiotic use after the receipt of educational materials.

##### **Results**

Profiles of antibiotic resistant bacteria in water and animal manure have been constructed. Producer's focus groups are scheduled to determine the level of changes in farm operation, including keeping records of antibiotic administration to farm animals, use, dose, period, list of antibiotics purchased, and interaction with veterinarians.

#### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
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- 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

### **Outcome #3**

#### **1. Outcome Measures**

Increase in number of consumers practicing safe fresh produce handling practices via food safety education.

#### **2. Associated Institution Types**

- 1890 Research

#### **3a. Outcome Type:**

Change in Action Outcome Measure

#### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	20

#### **3c. Qualitative Outcome or Impact Statement**

##### **Issue (Who cares and Why)**

Contaminated produce is a risk to the public. As more consumers increase consumption of raw greens in their diets, this risk has increased.

##### **What has been done**

A workshop was organized to communicate basic information regarding current food handling practices; consumers were educated on safe handling of fresh produce. Booklets on safe handling of fresh produce were developed and distributed through mailing and Tennessee State University extension program workshops.

##### **Results**

Consumers are sensitized to the risks of cross contamination of fresh produce with foodborne pathogens. Food preparers adopted new hand washing practices, cleaning of preparation areas before and after food preparation, and generally taking steps to reduce cross contamination. Additionally, 60 consumers received food safety training and educated on safe food handling practices; 75 consumers received food safety training and educated on safe food handling practices. Data collection on consumer fresh produce practices is still in progress.

#### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
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- 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

#### **Outcome #4**

##### **1. Outcome Measures**

Number of target consumers with increased knowledge of improved kitchen cleanliness.

##### **2. Associated Institution Types**

- 1890 Research

##### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

##### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	45

##### **3c. Qualitative Outcome or Impact Statement**

###### **Issue (Who cares and Why)**

Cross-contamination during food handling, preparation, and storage is one of the major contributing factors in the transmission of foodborne diseases in the home. Improving the effectiveness of microbiological control measures in home kitchens is crucial in preventing foodborne diseases.

###### **What has been done**

Information on proper cleaning practices to control microbiological contamination in home kitchens were discussed with participants during home visits.

###### **Results**

Participants have learned proper cleaning methods to improve kitchen cleanliness and contaminant reduction.

##### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
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

## **Outcome #5**

### **1. Outcome Measures**

Number of target consumers with increased knowledge of means to reduce the chance of cross contamination.

### **2. Associated Institution Types**

- 1890 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	45

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Home refrigerators can harbor pathogenic bacteria that pose a potential to contaminate stored foods. Consumers should be informed about safe handling of refrigerated foods to reduce the risk of food contamination.

#### **What has been done**

Information on proper storage of refrigerated leftovers were discussed with the participants during home visits.

#### **Results**

Participants have learned proper storage of refrigerated leftovers to reduce the chances of cross contamination.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
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

## **Outcome #6**

### **1. Outcome Measures**

Number of target consumers adopting safer food storage practices.

### **2. Associated Institution Types**

- 1890 Research

### **3a. Outcome Type:**

Change in Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	38

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Cross-contamination during food preparation and storage is one of the major contributing factors in the transmission of foodborne diseases. Many foods, such as raw poultry, meat, eggs, fish, shellfish, fruits and vegetables have been cited as the potential contamination sources by foodborne pathogens. Proper food handling and storage practices by consumers will reduce the risk of foodborne illness at home.

#### **What has been done**

In-home interviews and observations were conducted in forty-five homes in Nashville, Tennessee.

#### **Results**

Eighty-four percent of the observed leftover containers were covered, but only 3.3% of the leftovers had a date labeled. When asked about how long the leftovers were in the refrigerator, 20.5% answered longer than two weeks and 38.5% did not know. Consumers received counseling on proper management of leftovers. Followup studies are underway.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
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

## **Outcome #7**

### **1. Outcome Measures**

Number of target consumers adopting improved cleaning skills.

### **2. Associated Institution Types**

- 1890 Research

### **3a. Outcome Type:**

Change in Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	32

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Consumer hygiene practices have been frequently reported to be inefficient in controlling bacterial growth and survival in the kitchen environment. Practice of effective cleaning methods by consumers will reduce microbial contamination in home kitchens.

#### **What has been done**

Swab samples were taken from shelf surfaces in the refrigerators and food samples (including home prepared foods, leftovers, and opened packages of ready-to-eat foods) were collected from participant's refrigerators. Microbiological analyses were performed and molecular fingerprints of *Staphylococcus aureus*, and *Bacillus cereus* were studied using Pulsed Field Gel Electrophoresis.

#### **Results**

A significant number of food samples contained high levels of *Staphylococcus aureus* and *Bacillus cereus*, both are a potential source for foodborne illness. In some cases, contamination can be traced to the refrigerator surfaces. The needs for developing effective intervention strategies to improve consumer's refrigeration practices were identified.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
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

**Outcome #8**

**1. Outcome Measures**

Number of people with enhanced awareness of malnutrition and functional foods.

Not Reporting on this Outcome Measure

**Outcome #9**

**1. Outcome Measures**

Number of industrial partners with interest in lab-scale formulations and processing technologies for functional foods.

Not Reporting on this Outcome Measure

**Outcome #10**

**1. Outcome Measures**

Number of industrial partners utilizing developed technologies to produce functional foods.

Not Reporting on this Outcome Measure

**Outcome #11**

**1. Outcome Measures**

Number of industrial partners assessing consumers' responses to new product lines consisting of functional foods.

Not Reporting on this Outcome Measure

**V(H). Planned Program (External Factors)**

**External factors which affected outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes

**Brief Explanation**

Research in the area of nutritional foods was suspended due to a change in program priorities and personnel changes.

**V(I). Planned Program (Evaluation Studies)**

## **Evaluation Results**

Outcomes were evaluated by follow-up phone interviews with consumers who participated in the earlier home visiting studies. The evaluation criteria are

- Effectiveness of direct communication to improve consumer food storage practices and cleaning skills: More than seventy percent of consumers reported an increase of frequency in cleaning refrigerator and checking refrigerator temperature. Eight-five percent of consumers reported taking safety measures to prevent cross contamination when storing raw meat and poultry in their refrigerators.
- Number of peer-reviewed articles reported: A peer-reviewed research paper has been published in the Food Protection Trends, a scientific journal broadly distributed to food safety professionals and government regulatory agencies.
- Number of target consumers with increased knowledge of improved kitchen cleanliness: Twenty-five participants have learned proper cleaning methods to improve kitchen cleanliness.
- Number of target consumers with increased knowledge of means to reduce the chance of cross contamination: Fifteen participants have learned proper storage of refrigerated leftovers to reduce the chances of cross contamination.

## **Key Items of Evaluation**