

## Planned Program 5 (Summary)

### 1. Name of the Planned Program

Improving Human Health and Wellbeing through Food Function and Food Safety

### 2. Brief summary about Planned Program

In this planned program we will focus on four areas of emphasis: physical chemical characterization of food, food biotechnology, food safety, and health and wellness. We will emphasize fundamental research to elucidate the molecular basis of the health and functional properties of these components in food. We will investigate the development and production of functional foods specifically designed to maintain or improve human health and wellness. There is an urgent need for basic research in this area to identify, extract, process, incorporate and deliver bioactive food components, as well as to establish the physicochemical basis of their functional properties. There will be fundamental research on the physicochemical basis of bioactive food components, e.g., identification, extraction, incorporation, delivery and biological activity. Emphasis will also be placed on improving the yield of desirable compounds in herbs, spices and medicinal plants. We will explore how novel bioactive delivery systems can be designed and fabricated based on recent advances in fundamental soft matter physics and chemistry. We also intend to develop technologies to deliver micronutrients into water in a form where they are soluble, stable and bioavailable. This approach could be used to deliver important micronutrients to malnourished populations in under-developed populations. Work will focus on scaling up laboratory production processes of encapsulated compounds to pilot plant scale. We will also focus at the molecular level to investigate the mode of action of pathogens and toxins, mechanisms of control and rapid methods of detection and analysis. An essential aspect of maintaining a safe and healthy food supply requires rapid identification of food-borne pathogens and detection of potentially lethal toxins that may have been produced by the pathogens. The impact of food policy on decision making in the areas of food safety, food quality and food security is expected to be a growing emphasis for the program over the next few years.

3. Program existence : New (One year or less)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

## 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			16%	
502	New and Improved Food Products			15%	
503	Quality Maintenance in Storing and Marketing Food Products			11%	
701	Nutrient Composition of Food			1%	
702	Requirements and Function of Nutrients and Other Food			19%	
703	Nutrition Education and Behavior			6%	
711	Ensure Food Products Free of Harmful Chemicals, Including			3%	
712	Protect Food from Contamination by Pathogenic			29%	
	<b>Total</b>			100%	

## V(C). Planned Program (Situation and Scope)

### 1. Situation and priorities

Each year the U.S. medical costs for cardiovascular disease, diabetes, cancer and obesity exceed 400 billion dollars. A common thread among these diseases is that diet is very important in their prevention. Caloric intake is obviously a major consideration in obesity and an understanding of the type and ratio of macromolecules, fat, protein and carbohydrates, which are the source of calories, is essential to providing a healthy diet with optimal opportunities for weight control and control of diabetes. Thus, foods represent a critical tool that individuals can use to decrease their risk of cardiovascular disease, diabetes, cancer and obesity. Because convenience foods are now an integral part of our life and many of our health concerns are diet related, the food industry has a major challenge in producing healthy, nutritious convenience foods with high consumer acceptability. This challenge can be met by developing physiologically functional foods, which are foods that provide health benefits beyond normal nutrition. The functional food market is one of the fastest growing sectors of the food industry, with current sales in excess of \$10 billion/year. However, in order to produce functional foods that are both acceptable to consumers and efficacious, we need to further identify and characterize the properties and biochemical functionalities of bioactive food components as well as to develop cost-effective technologies that allow for their incorporation and stabilization in formulated foods. There are a huge number of minor and major food components that contribute to both the quality and healthfulness of food products, e.g., phytochemicals, dietary fiber, bioactive lipids. In addition, the effectiveness of bioactive food components is strongly dependent on how they are delivered to consumers, and so there is a need to develop food-based delivery systems for bioactive food components that will enable them to be successfully incorporated into foods (without adversely influencing product quality) and delivering them intact to the appropriate active site in the human digestive system. Successful development of functional foods requires a multidisciplinary approach to optimize the nutritional activity and stability of food components in formulated foods. Developments in bioengineering and biomedicine have recently led to breakthrough discoveries in terms of instrumentation, imaging, biotransport and biomechanics

with great implications for the field of food microbiology. Hence, there is an urgent need for basic research in food safety and food microbiology to integrate molecular and nanotechnological approaches to extract, identify, and subsequently remediate toxins and pathogens that may have been introduced in food products. These efforts range from analysis of the impact of food safety and nutritional attributes on consumer preferences to techniques for monitoring for the presence of pathogenic bacteria on specific food items.

## 2. Scope of the Program

- Integrated Research and Extension
- In-State Research
- Multistate Research

## V(D). Planned Program (Assumptions and Goals)

### 1. Assumptions made for the Program

Today's society places increasing emphasis on health and health products. Our understanding of the health values of medicinal and food crops is limited by a lack of hypothesis based research. With the advent of globalization and the rising threat of bioterrorism, the safety of the U.S. food supply has been of increasing concern. The opportunities of introducing pathogens or toxins into our food supply either accidentally or as an act of terrorism are an ever-present danger to our citizens. Nationally and internationally, obesity and diabetes have become major contributors to ill health in a majority of the population. Research in food safety and quality is undergoing dramatic changes due to a new scientific base, new definitions of total quality and heightened consumer awareness. An integrated multidisciplinary approach involving researchers from food science, nutrition, chemistry, physics and engineering is essential for making important advances in this area.

### 2. Ultimate goal(s) of this Program

To produce functional foods that are both acceptable to consumers and efficacious, to protect consumers from food-borne pathogens, to enable foods to be designed with optimal health benefits in a rational and systematic fashion.

## V(E). Planned Program (Inputs)

### 1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2009	0.0	0.0	7.8	0.0
2010	0.0	0.0	7.8	0.0
2011	0.0	0.0	7.8	0.0
2012	0.0	0.0	7.8	0.0
2013	0.0	0.0	7.8	0.0

## V(F). Planned Program (Activity)

### 1. Activity for the Program

Conduct research and produce refereed publications in the scientific literature. Hold international scientific symposia

**2. Type(s) of methods to be used to reach direct and indirect contacts**

Extension	
Direct Methods	Indirect Methods
● {NO DATA ENTERED}	● {NO DATA ENTERED}

**3. Description of targeted audience**

Consumers, Industry, Health Care, School Systems, Fruit Industry, Elderly, Nutritionists, Food Processors

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

**1. Standard output measures**

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0
2013	0	0	0	0

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

**Expected Patent Applications**

2009 :0                      2010 :1                      2011 :1                      2012 :1                      2013 :0

**3. Expected Peer Review Publications**

Year	Research Target	Extension Target	Total
2009	40	0	0
2010	40	0	0
2011	40	0	0
2012	40	0	0
2013	40	0	0

**V(H). State Defined Outputs**

**1. Output Target**

- # of refereed publications

2009 :10                      2010 :10                      2011 :10                      2012 :10                      2013 :10

- # of international symposia

2009 :1                      2010 :1                      2011 :1                      2012 :1                      2013 :1

**V(I). State Defined Outcome**

**1. Outcome Target**

Accurate research on functional foods made available and shared

**2. Outcome Type :** Change in Knowledge Outcome Measure

2009 :0                      2010 : 0                      2011 : 0                      2012 :0                      2013 : 0

**3. Associated Institute Type(s)**

- 1862 Research

**4. Associated Knowledge Area(s)**

- 501 - New and Improved Food Processing Technologies
- 502 - New and Improved Food Products
- 503 - Quality Maintenance in Storing and Marketing Food Products
- 701 - Nutrient Composition of Food
- 702 - Requirements and Function of Nutrients and Other Food Components
- 703 - Nutrition Education and Behavior
- 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 Occuring Toxins

**1. Outcome Target**

Accurate research on food safety made availalbe and shared

**2. Outcome Type :** Change in Knowledge Outcome Measure

2009 :0                      2010 : 0                      2011 : 0                      2012 :0                      2013 : 0

**3. Associated Institute Type(s)**

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**4. Associated Knowledge Area(s)**

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## **V(J). Planned Program (External Factors)**

### **1. External Factors which may affect Outcomes**

- Competing Public priorities

#### **Description**

In the absence of direct threats to the food supply, public concern over food safety may diminish over time.

## **V(K). Planned Program (Evaluation Studies and Data Collection)**

### **1. Evaluation Studies Planned**

- Other (scientific peer review)

#### **Description**

## **V(F). Planned Program (Activity)**

### **2. Data Collection Methods**

- Journals

#### **Description**

{NO DATA ENTERED}