

V(A). Planned Program (Summary)

Program # 12

1. Name of the Planned Program

Human Health (OARDC Led)

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
721	Insects and Other Pests Affecting Humans	0%		20%	
722	Zoonotic Diseases and Parasites Affecting Humans	0%		60%	
723	Hazards to Human Health and Safety	0%		20%	
	Total	0%		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	1.0	0.0
Actual Paid Professional	0.0	0.0	0.4	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
0	0	49515	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	107300	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

On-going research activities to advance human health goals for societal well being include both basic and applied research. Effective research requires a mixture of laboratory and gathering places for subjects to maximize research knowledge. Emerging threats now require more advanced facilities such as a biosecurity lab, particularly needed in the study infectious animal diseases that may directly impact humans. All functional laboratories and sites are improved over time as program need warrants. OARDC faculty and staff will engage in appropriate levels of outreach, engagement, and consultation with both internal stakeholders such as fellow extension personnel, and with external stakeholders.

2. Brief description of the target audience

Targeted audiences include, but are not limited to: specific individuals or groups who have expressed a need for health, obesity, and safety information that is to be derived through new research, extracted from on-going research, or is derived from scientific literature; fellow academic units that depend on scientists in this program for support information and for new health and safety technologies and approaches/measures fellow agencies or support organizations who will not only use the information but will also extend that information; populations who have not requested the information but will likely benefit from that information; other scientists and scientific groups; political entities; extension personnel; students from pre-school to post doctorate studies; news organizations; and business and industrial groups.

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	0	0	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
Actual	0	25	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of graduate students completed
Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Release studies on insects, ticks, and mites to protect human health that will provide a set of alternatives leading to health gains with lowered risks, and within economic realities, for the affected populations.
2	Advance the understanding of means and methods related to transmission of zoonotic diseases to humans, including prevention, that meets consumer demand/health threat, as or before such emerges.
3	Reduce through research, development, and outreach the exposure to biohazards, pathogens, and similar to the extent that annually such are reduced per capita with an overall time and economic savings to those who may be affected.
4	Reduce health risk by releasing at least one major study each five years demonstrating techniques, procedures, or products that lessen the chance of contacting, or the impact if contacted, zoonotic diseases.
5	Create a growing base of knowledge that supports improving human health as it relates to food, environment, and lifestyle
6	2. Create a growing base of knowledge that supports improving human health as it relates to food, environment, and lifestyle
7	3. Create a growing base of knowledge that supports improving human health as it relates to food, environment, and lifestyle.

Outcome #1

1. Outcome Measures

Release studies on insects, ticks, and mites to protect human health that will provide a set of alternatives leading to health gains with lowered risks, and within economic realities, for the affected populations.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Advance the understanding of means and methods related to transmission of zoonotic diseases to humans, including prevention, that meets consumer demand/health threat, as or before such emerges.

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)

Worldwide, mosquito-borne diseases cause more human suffering than any other organism. Over one million people worldwide die from mosquito-borne diseases each year. Interrupting the mosquito life cycle is being explored on multiple fronts as one approach to reducing the human health impacts.

What has been done

One approach employs molecular mechanisms that regulate insect overwintering (diapause), an RNA-interference technique. An OARDC scientist and colleagues have developed a novel technique for delivering double-stranded RNA into mosquito larvae by exploiting the larva's dehydration tolerance. Larvae were dehydrated in a NaCl solution and then rehydrated in water containing double-stranded RNA. Using larvae of *Culex pipiens*, they demonstrated the principle by knocking down expression of the gene encoding heat shock protein 90. The knockdown persisted through the pupal stage and into adulthood, with a knockdown of rate 77% that was still evident on the third day of adult life.

Results

These scientists have successfully targeted major genes that regulate fat accumulation and utilization, as well as genes and transcription factors in the insulin signaling pathway, a pathway used to regulate the mosquito diapause response. Mosquitoes that have been treated with various RNA constructs fail to survive the winter. This relatively simple procedure will prove useful for knocking down expression of other genes in larvae of this mosquito and in others.

4. Associated Knowledge Areas

KA Code	Knowledge Area
721	Insects and Other Pests Affecting Humans
722	Zoonotic Diseases and Parasites Affecting Humans
723	Hazards to Human Health and Safety

Outcome #3

1. Outcome Measures

Reduce through research, development, and outreach the exposure to biohazards, pathogens, and similar to the extent that annually such are reduced per capita with an overall time and economic savings to those who may be affected.

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)

There is an urgent need for new antibiotics because resistance to currently available drugs is growing.

What has been done

N-terminal acetylation was discovered in paenibacillin, a novel lantibiotic recently reported as a product of *Paenibacillus polymyxa* OSY-DF. This N-terminal modification is unprecedented among bacteria-derived antimicrobial peptides. Lantibiotics are produced by a large number of Gram-positive bacteria such as *Streptococcus* and *Streptomyces* to attack other Gram-positive

bacteria. Additionally, the primary structure of paenibacillin has been finally determined unequivocally by the extensive NMR analysis taken together with previous MS/MS results. These analyses revealed the structure of paenibacillin as one of the most post-translationally modified lantibiotics.

Results

Researchers at OSU have identified a novel antimicrobial agent, paenibacillin. The newly identified compound has potential for use against drug resistant pathogens. The compound was isolated from *Paenibacillus polymyxa* and identified as a member of the lantibiotic class. Lantiotics have been known and used for many years in food production; their instability at higher physiological pH has historically made them unsuitable for medical use. The newly discovered compound contains a more highly modified peptide than other lantibiotics and has shown increased thermal and alkaline stability and excellent water solubility that may make it suitable for medical therapeutic use. Paenibacillin has been shown to have considerable antimicrobial potency against numerous gram-positive and gram-negative bacteria, including food-borne and antibiotic-resistant organisms.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety

Outcome #4

1. Outcome Measures

Reduce health risk by releasing at least one major study each five years demonstrating techniques, procedures, or products that lessen the chance of contacting, or the impact if contacted, zoonotic diseases.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Create a growing base of knowledge that supports improving human health as it relates to food, environment, and lifestyle

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
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2012

0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

LDL cholesterol interacts with free radicals to become oxidized and at that point is more likely to promote inflammation and cause tissue damage. LDL cholesterol, or "bad" cholesterol, becomes even more dangerous when it is oxidized. Oxidized LDL can produce inflammation in arteries that supply blood to the organs and other tissues, thus promoting atherosclerosis and increasing the risk of having a heart attack or stroke.

What has been done

An OARDC study in the OSU College of Education and Human Ecology found that apples lowered blood levels of oxidized LDL cholesterol. When LDL cholesterol interacts with free radicals to become oxidized, the cholesterol is more likely to promote inflammation and can cause tissue damage and it takes on a form that hardens arteries. The researchers achieved a strong effect against LDL being oxidized with just one apple a day for four weeks. The difference was similar to that found between people with normal coronary arteries versus those with coronary artery disease.

Results

OARDC scientist found that in a study of healthy, middle-aged adults, consumption of one apple a day for four weeks lowered by 40 percent blood levels of a substance linked to hardening of the arteries. Taking capsules containing polyphenols, a type of antioxidant found in apples, had a similar, but not as large, effect. Eating an apple a day might in fact help keep the cardiologist away.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety

Outcome #6

1. Outcome Measures

2. Create a growing base of knowledge that supports improving human health as it relates to food, environment, and lifestyle

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)

Turmeric, commonly used in Southeast Asian and Middle Eastern cooking, is a deep orange-yellow powder containing curcumin and is made from the roots of the *Curcuma longa* tropical plant. Curcumin has been thought to have health benefits ranging from fighting cancer to slowing progression of Alzheimer's disease and is available commercially as a food supplement.

What has been done

An OARDC scientist in the College of Education and Human Ecology sought to study dimensions of curcumin absorption and possible health benefits. The body poorly absorbs the supplement curcumin, thus most extracts need to be taken in high doses, some in excess of 1,000 mg, thus defeating the purpose of taking a supplement. Instead, the OARDC study used an extract containing 80 mg of curcumin mixed with small amounts of natural fat compounds intended to help boost absorbability of the spice extract. Unlike previous trials, which focused mainly on people with existing health problems, healthy individuals ages 40-60 were recruited for this study. Blood samples were taken before and after the study period.

Results

A low dose of a curcumin extract from the spice turmeric can have a variety of positive health effects on healthy middle-aged individuals. The curcumin supplement was relatively well absorbed because a low dose produced many good effects on blood and saliva measures. These effects included a reduction in triglyceride levels, which are linked to heart disease. Curcumin also increased plasma levels of nitric oxide, a molecule that can work against high blood pressure. Researchers also observed lower plasma concentrations of sICAM, a molecule linked to atherosclerosis, the process of artery hardening.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety

Outcome #7

1. Outcome Measures

3. Create a growing base of knowledge that supports improving human health as it relates to food, environment, and lifestyle.

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)

People in the United States are consuming up to 24% of their calories from snacks, a significant increase over the last few decades. The increase in food consumption frequency without compensatory energy reduction at each eating occasion may be contributing to the incidence of obesity and Type 2 diabetes. Moreover, current snack food choices tend to lack in nutrition.

What has been done

OARDC scientists proposed that soy incorporation into snack foods could provide nutritional benefits. A human clinical study was conducted involving 51 healthy participants to assess if the addition of 27.2% soy ingredients to a soft pretzel snack food can significantly decrease the glycemic index without affecting consumer acceptability or satiety. In order for a soy product to claim official heart healthy benefits, it must provide 6.25 grams and also be low in fat, saturated fat and cholesterol

Results

The addition of soy to a soft pretzel snack food can significantly decrease the glycemic index without affecting consumer acceptability or satiety. These results show that soy can be used to supplement snack foods in high enough quantities to achieve lower post-meal glycemia while maintaining favorable sensory characteristics. Incorporation of alternate, nutrient dense, sensory acceptable snack foods containing soy in a daily diet may reduce blood sugar levels and curb type 2 diabetes associated with the obesity epidemic. In addition, including soy at >20% levels improved textural properties of microwaved dough products, resulting in a softer and less chewy texture. Microwavable baked goods are used frequently by the food industry but suffer from poor texture upon microwave re-heating. This work has led to a patent and a start-up company.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety

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.)

Brief Explanation

Human health programs are found in multiple departments and colleges at OSU and many directly or indirectly receive financial support, collaborators, and infrastructure support from CFAES. As noted above, a number of factors continue to impact this planned program. The impact is typically situational as to the degree that any particular external factor affects outcome. As noted in other planned programs the greatest challenge is for OSU Extension and OARDC to find adequate resources to respond to growing demand. Likewise given OSU history as a major medical university, having adequate personnel and other resources within CFAES to collaborate widely across the university and take full advantage of the multiple opportunities stresses this program.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Given the breathe of this program across so many departments and colleges within OSU, of which OARDC and OSU Extension participate, we have no specific formal evaluation data for the program as a whole. Publications, research grants garnered, n of stakeholders served, and anecdotal data provide a positive assessment of this planned program. Perhaps our long history of research and extension outputs and impacts in food safety, food and animal health, and in programs such as obesity, provide the a better picture of our long term success, and our contributions to improving human health and wellness.

Key Items of Evaluation

No key item to report.