

Council on Food and Agricultural Research (C FAR)
Food Safety Strategic Research Initiative
Final Report 2003

Executive Summary

The constituency groups for the food safety SRI included all those involved with food production, handling, and preparation from the producers on the farm through to the family who consumes food. Other key constituency groups included physicians, who diagnose foodborne illnesses and educators and other researchers who worked to identify the behavior of organisms and educate the consumers about how to avoid foodborne illnesses. Because of this broad scope, the research and outreach efforts of the FS SRI are targeted to specific constituency groups. A complete description of these groups can be found in the *2002 C-FAR Annual Report*.

Promoting food safety in Illinois required a multilevel research and outreach effort. The Food Safety Strategic Research Initiative (SRI) was created as a stand alone Initiative in June 1999. The food safety research agenda did not start with the SRI. The Governor of Illinois convened a Task Force on Food Safety prior to 1999 to study the food safety needs in Illinois. C-FAR participated in this task force as it was beginning to develop its own needs and priorities. About the same time, the President's Council on Food Safety planned for the National Food Safety Initiative (<http://www.foodsafety.gov/~fsg/presidentscouncil.html>). The Centers for Disease Control and Prevention released an infectious disease control report- (<http://www.cdc.gov/ncidod/eid/vol5no5/mead.htm>) "Food-Related Illness and Death in the United States" providing data on the frequency of the human foodborne diseases in the population. Data show that since 1997 there has been an overall decline of 19% in the incidence of the bacterial foodborne infections. Concurrently with this observed decline were implementations of mandated changes in meat and poultry processing plants, increased attention to "good agricultural practices" on farms, and increased consumer awareness of food safety; all areas addressed by this SRI. Data on *Campylobacter*, *Shigella*, *E. coli* 0157 indicate a decrease in rate of infections in 1999, but an increase in rate of *Salmonella* infections. However, *Salmonella* Typhimurium and Enteritidis have either stayed constant or decreased, while other *Salmonella* serotypes were associated with large outbreaks from unpasteurized orange juice, raw sprouts and mangos. Recent data indicate there has been an average 10% per year increase in outbreaks of food borne illnesses in the US among one of the most vulnerable groups, children. The C FAR organization was on target in addressing the food safety issues in Illinois since Illinois has ranked among the top three states in the nation in the number of foodborne outbreaks.

Our overall goal was to focus attention on decreasing foodborne illnesses by promoting food safety strategies from farm to family, directed toward producers

and veterinarians, the food processing industry, and consumers. The initiative has included objectives and outcomes in three components:

1. Pathogen Detection and Epidemiology,
2. Hazard Analysis Critical Control Point (HACCP)
3. Education/Outreach.

The FS SRI has consistently allocated approximately 60% of the funding assets to Pathogen Detection and Epidemiology, and the remainder to HACCP and Education/Outreach.

The FS SRI has worked closely with members of the C FAR Human Nutrition and Food Safety Working Group (Working Group 4) to identify a master list of specific food safety needs and the external consultants approved of the list in January 2000. These needs directed the management of the SRI for the duration of its tenure.

Objectives to meet the overall goal of reducing foodborne illnesses tended to be redefined as the needs and research outcomes became available. The FS SRI was not a static project but a continual process of redefining objectives, implementing the best strategies, evaluating and marketing the results. The evaluation phase once again brought new objectives.

The SRI has had leaders of research teams from the University of Illinois, Southern Illinois University Carbondale, Southern Illinois University Medical School Springfield, Springfield Department of Public Health, Western Illinois University and Illinois Institute of Technology to address the above needs during its tenure. Although the research focus has remained constant, there have been changes. For example, the need to address medical education was determined as CDC data indicated that cases of foodborne illnesses were under reported. However, it can be observed from the section addressing outcomes, highlights and accomplishments that the researchers successfully addressed the needs identified by the constituents during the tenure of this SRI.

Not only did the FS SRI team consult the working group for help in determining consumer and research needs but also formed an Advisory Committee made up of state and Federal agency representatives. These experts included representatives from Illinois Department of Public Health, Illinois Department of Agriculture, USDA Economic Research Service, and National Restaurant Association.

Sincere thanks to Shari Barter and Wilma Reese for their assistance in preparing proposals AND keeping things in perspective. To the reviewers who gave advice

and counsel, I thank them. I appreciated the willingness of the FS SRI advisory committee to serve.

Jeannette Endres, Leader
Food Safety Strategic Research Initiative

SRI Primary Needs, Objectives

The SRI team, Advisory Committee, and Working Group 4 helped to translate needs into priorities or focused research efforts.

Master list of food safety research/outreach identified needs:

Pathogen Detection and Epidemiology

- Include other pathogens such as *Campylobacter* and *Listeria* in research.
- Encourage rapid-acting test development.
- Encourage funding of antibiotic residue issues in animals.
- Develop methods to reduce microbial contamination of fresh cut produce, fruits, and juices.
- Determine the safety of products in the market, organically vs. traditionally produced.
- Study GMOs as human food safety issues.

Develop and implement HACCP (Hazard Analysis Critical Control Point)

- Develop HACCP at the retail level
- Develop HACCP for foodservice operators of restaurants and long term care facilities
- Develop HACCP for swine herd management: *Salmonella* detection and control on farm.

Education /Outreach

- Market an educational curriculum for school children on food safety.
- Determine market for certified safe meat products.
- Convene a conference/symposium to determine priorities related to the human safety of alternate production systems to include issues of GMOs, antibiotic residue, and products in the market, organically vs. traditionally produced. This conference publicized the work of the FS SRI.
- Expand educational efforts to include low income/high risk populations such as operators of day care, nursing homes, congregate meal sites serving young children and the elderly.

- Establish kiosks in the area of food safety in selected outlets to determine their future effectiveness. Kiosks could be used to expand educational efforts to the low-income population.
 - Develop public awareness messages: pathogens exist everywhere and efforts to reduce food borne illnesses are a shared responsibility. Promoting a safe food supply should not be achieved through regulations causing small farms or small processors to go out of business.
 - Educate medical students to the under reporting of foodborne illnesses by physicians.
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**Principal Investigators, Institution and role within the SRI
Listing of Products (i.e. web-based tools, patents, published articles)**

The following table provides the names of the principal investigator, the area or component, pathogen detection and epidemiology, HACCP, or education/outreach, the common title identifying their work and products such as tools, patents and published articles, that were developed from the research. The summary of "outcomes and impacts" follows this table.

**Principal Investigator, Institution/Research Entity and Listing of Products
Food Safety SRI**

Principal investigator name	Institution/research entity with which you are connected	The general “name” by which your effort is known	Listing of products (i.e., web-based tools, patents, published articles)
<u>Pathogen Detection and Epidemiology</u>			
William J Banz	Southern Illinois University Carbondale	Using Large-Scale Gene-Expression Analysis to Address Human Food Safety Concerns about the Consumption of GMO Products	<p>Beem J, Iqbal J, Betts M, Davis J, Winters TA, Lightfoot DA, Banz WJ (2002) Human food safety concerns about the consumption of GMO products. 2002: A Food Safety Odyssey, IL Food Safety Symposium, St. Charles, IL</p> <p>Banz WJ, Iqbal J, Betts M, Beem J, Winters TA, Roeder M, Lightfoot DA (2001) Using large-scale gene-expression analysis to address human food safety concerns about the consumption of GMO products. 2001: A Food Safety Odyssey, IL Food Safety Symposium, Sept 6-7 St. Charles, IL</p> <p>JACQUELYN S. BEEM, Master of Science degree in Food and Nutrition, presented on June 09, 2003, at Southern Illinois University at Carbondale. THE EFFECTS OF GENETICALLY MODIFIED CORN ON PHYSIOLOGICAL INDICATORS OF HEALTH IN MALE MICE.</p>
Gay Y. Miller	University of Illinois	The Economic Impact for Producers and Consumers Arising from Feedgrade Antibiotic Use in Pork	1. Barber, D.A., Miller, G.Y., McNamara, P.E.; Modeling Food Safety and Food-Associated Antimicrobial Resistance Risk to Humans;

Principal investigator name	Institution/research entity with which you are connected	The general “name” by which your effort is known	Listing of products (i.e., web-based tools, patents, published articles)
		Production: A Social Welfare Framework	<p>Journal of Food Protection, 2003, 66, #4: 700-709.</p> <p>2. McNamara, P.E., Miller, G.Y.; Pigs, People, and Pathogens: A Social Welfare Framework for the Analysis of Animal Antibiotic Use Policy; American Journal of Agricultural Economics, 2002, 84:1293-1300.</p> <p>3. Miller, G.Y., Algozin, K., McNamara, P.E., Bush, E.J.; Productivity and Economic Impacts of Feed-grade Antibiotic Use in U.S. Pork Production; To appear in Journal of Agricultural and Applied Economics, December, 2003.</p> <p>4. McNamara, P.E., Liu, X., Miller, G.Y. The Costs of Human Salmonellosis Attributable to Pork: A Stochastic Farm-to-Fork Analysis. Select paper for AAEA summer meetings, Montreal, July 26-30, 2003. Available at: http://agecon.lib.umn.edu/cgi-bin/pdf_view.pl?paperid=9278&ftype=.pdf.</p> <p>5. Miller, G.Y. McNamara, P.E., Liu, X. Preharvest Influence On Salmonella Social Costs And Risks From Pork. Proceedings of the 5th International Symposium on Epidemiology and Control of Salmonella and other Foodborne Pathogens in Pork, Hersonissos, Heraklion, Crete-</p>

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			<p>Greece. October 1-4, 2003.</p> <p>6. Algozin, K.A., Miller, G.Y., McNamara, P.E. Productivity and Economic Impacts of Feedgrade Antimicrobial Use in Pork Production. Proceedings of the 4th International Symposium on Epidemiology and Control of Salmonella and other Foodborne Pathogens in Pork, Leipzig, Germany, September 2-5, 2001, pp. 399-402.</p>
Trish Welch	Southern Illinois University Carbondale	Free Range Pasture and Organic Poultry	<p>MELINDA LUND, TRISH K WELCH*, KEN GRISWOLD, JEANETTE B. ENDRES, and BEN SHEPHERD (2003) Occurrence of <i>Campylobacter</i> and <i>Salmonella</i> in Broiler Chickens Raised in Different Production Systems and Fed Organic and Traditional Feed. Food Protection Trends, March 2003 Vol. 23 No.3 Pages 252-256.</p> <p>FREDANNA A. M’CORMACK, Master of Science degree in Food and Nutrition, presented on May 09, 2003, at Southern Illinois University at Carbondale. PRESENCE OF SALMONELLA AND CAMPLYOBACTER: A COMPARISON OF BROILER POULTRY SOLD IN CONVENTIONAL RETAIL STORES & SPECIALTY RETAIL OUTLETS</p>
James W. Blackburn (and Alan Walters, year 5)	Southern Illinois University Carbondale, Department of Mechanical Engineering and energy Processes and Civil and	Bacterial Pathogen and Antibiotic Content of Food Fertilizer Produced from Aerobic Thermophilic Treatment of Swine Waste	J. W. Blackburn, 2002, Advanced Aerobic Thermophilic Swine Waste Treatment, IPPA Field Day, Illinois State University, July, 2002.

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	Environmental Engineering. (Department of Plant and Soil Science and General Agriculture)		<p>J. W. Blackburn, D.M. Ricca, E.S. Storment, M. Meyer, 2002, Tylosin Removal from Swine Waste Using Aerobic Thermophiic Treatment, IPPA Field Day, Illinois State University, July, 2002.</p> <p>J. W. Blackburn, K. Cadwallader, S. Brewer, 2002, Odor Removal from Swine Waste Using Aerobic Thermophiic Treatment, IPPA Field Day, Illinois State University, July, 2002.</p> <p>J. W. Blackburn, D.M. Ricca, E.S. Storment, M. Meyer, 2002, Tylosin Removal from Swine Waste Using Aerobic Thermophilic Treatment, Third Annual Illinois Food Safety Symposium, August, 2002.</p> <p>J. W. Blackburn, K. Cadwallader, S. Brewer, 2002, Odor Removal from Swine Waste Using Aerobic Thermophiic Treatment, Third Annual Illinois Food Safety Symposium, August, 2002.</p> <p>J.W. Blackburn and D.M. Ricca, Tylosin Removal During the Aerobic-Thermophilic Treatment of Swine Waste, Society for Industrial Microbiology 2002 Annual Meeting, October, 2002.</p> <p>D.M. Ricca, E. Storment, M. Meyers, J.W. Blackburn, 2003, Tylosin Removal During the Aerobic-Thermophilic Treatment of Swine Waste, J. Soc. Ind. Microbiol. Accepted with Required Revisions.</p> <p>J.W. Blackburn, 2002, Pilot-Scale Plant for Treating Swine Waste, C-FAR Day, Southern Illinois</p>

Principal investigator name	Institution/research entity with which you are connected	The general “name” by which your effort is known	Listing of products (i.e., web-based tools, patents, published articles)
			University, November, 2002.
Hans Blaschek	University of Illinois	Characterization of <i>Shigella boydii</i> serotype 18 survivability and biofilm formation, including fresh produce	Several popular press articles
<u>Hazard Analysis Critical Control Point (HACCP)</u>			
Hea-Ran Ashraf	Southern Illinois University Carbondale	Food Safety Training in Retail	<ol style="list-style-type: none"> 1. “HACCP: The Way to Food Safety,” A 55-min HACCP based food safety training video for foodservice workers. – English version and Spanish version are available for public. 2. HACCP training manual for foodservice managers. 3. HACCP training kit for foodservice establishments; this kit includes a video, a workbook, 5 posters, a magnet, a thermometer, and a box of disposable gloves. 4. Model HACCP plans for 9 different types of foodservice operations. 5. 5 journal articles are under preparation. These manuscripts will be submitted to the journals in the fields of food safety and environmental health.
Peter Bahnson	University of Illinois	Ensuring the Safety of Food Products (HACCP) subcomponent on the development of farm-level strategies to improve <i>Salmonella</i> pork safety	<p>Developed a document of an example HACCP farm</p> <p>With IDoA, developed a list of farm “candidate control measures” for <i>Salmonella</i> reductions</p> <p>Pre-harvest HACCP website was published</p>

Principal investigator name	Institution/research entity with which you are connected	The general “name” by which your effort is known	Listing of products (i.e., web-based tools, patents, published articles)
			<p>http://www.cvm.uiuc.edu/safepork/index.html. 695 total hits (requests for html pages) on the SafePork web site in the first month of publication</p> <p>Chair, scientific committee for 3rd International Symposium 1999.</p> <p>Four information sheets on pig production food safety have been provided University of Illinois extension educators through an e-mail newsletter (UI Veterinary Enotes)</p> <p>Project results shared with 32,000 readers of the <i>Illinois AgriNews</i> in Extension Notebook (Dec 1, 2000)</p>
Laurian Unnevr	University of Illinois	<i>Salmonella</i> Detection and Control: Ensuring the Safety of Food Products (Economic subcomponent on certifying Pork Products)	
<u>Education and Outreach</u>			
Ray Cooke	Springfield Department Of Public Health	Food Safe Community	<p>Videos for outreach activities listed below: These videos represent a compilation of USDA, State Extension Services, FDA, etc.</p> <p>Power Point presentation of FBI research data.</p>

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David Carpenter	Southern Illinois University School of Medicine Springfield	“Medical School Food Safety Educational Curriculum”	<p>1) “AFTER” video – <i>version 1</i>; 16 minutes (MD/patient interaction in physician’s examination room)</p> <p>2) “AFTER” video – <i>version 2</i>; 16 minutes (MD/patient interaction with integration of community actions in FBI investigation)</p>
Martha Barclay	Food Safety Curriculum DFMH Dept. Western Illinois University Macomb, IL	Food Safety Curriculum K-12	<p>K-3 Curriculum Modules 4-6 Curriculum Modules 7-12 Curriculum Modules</p> <p>16 public service announcements</p> <p>2 refereed articles Journal of Child Nutrition Management</p> <p>1 Website</p> <p>Survey of 100 Youth Employed in Fast Foods</p> <p>Survey of Over 300 Youth in HS in Suburban Chicago</p> <p>4 national presentations</p>
Jeannette Endres	Southern Illinois University Carbondale	Food Safety Kiosk	<p>Endres, J. et al. Use of computerized kiosk in an assessment of food safety knowledge of high school science teachers. <u>J. Nutr. Ed.</u>, 2001; 33(1):37-42.</p> <p>The award-winning educational interactive program was made available for commercial distribution on CD-ROM and shared with Cooperative Extension Service.</p>

Principal investigator name	Institution/research entity with which you are connected	The general “name” by which your effort is known	Listing of products (i.e., web-based tools, patents, published articles)
			<p>The Food Safety Kiosk, <i>the Mysterious Food Safety Caper</i>, received recognition by winning a 2001 international Global Award. The Global Awards honor the best in healthcare communications worldwide, attracting 1,361 entries from every corner of the world. The winners were showcased in a comprehensive editorial in <i>Medical Marketing & Media</i> magazine and distributed worldwide.</p>

Summary of Outcomes and Impacts /Outreach Activities

Part of our major objective was to provide education and outreach. We have included these activities within the "Summary of Outcomes and Impacts."

Summary of Outcomes and Impacts

For the producers:

- Six bacterial pathogens were found to be substantially reduced at the swine waste reactor conditions in both lab-scale (3 liter) and pilot-scale (1000 gal) systems. All organisms were reduced from 10^4 - 10^7 cell-forming units per ml to detection levels (1 cell-forming unit/ml), except *Clostridium perfringens*, a spore-forming bacterium, and enterococci. These organisms were reduced from 1000-fold to 100,000-fold, but remained at low levels in the treated product. Upon manufacture of a dry fertilizer product, only *C. perfringens* remains at levels reported to be too low to cause infection.
- 20,000 gal of swine waste has been treated by a thermal process in the first step in preparing a future low risk fertilizer for fruits and vegetables. Four to five vegetables of commercial importance to Illinois were grown in two seasons with varying applications of a dry fertilizer made from reactor product. While this study is still in progress, preliminary results indicate that the dry fertilizer offers similar fertility as a standard fertilizer treatment and may have additional benefits to the swine producer as a saleable product. Except for one sample vegetable in hundreds analyzed, no *E. coli* were found in the vegetable food product and the use of this material as a fertilizer appears to have a low safety risk.
- Over 90% reductions in the measurable antibiotic tylosin added to the swine waste aerobic thermophilic reactor were demonstrated within 24 hours. Additional studies were required by reviewers of this journal publication and work is ongoing.
- The fate of chlorotetracycline and oxytetracycline in the aerobic-thermophilic swine waste reactor are being determined. Researchers are awaiting the results from antibiotic analysis from Mike Meyers of USGS of the treated reactor product. Treating swine waste with aerobic thermophilic treatment may reduce antibiotic levels and lower the risk for spawning antibiotic resistance organisms in swine waste storage and disposal. Researchers continue to work on determination of the reduction of these important antibiotics and have proposed further work with U of I researchers to help assess the second hypothesis, that reduction would lower antibiotic resistance potential.(Ongoing)
- Kim Laboratories within the UI Research Park, Enterprise Works, will be further developing the rapid acting test for detection of *Salmonella* as part of

his new company. C FAR provided some funds to help in the initial work for the rapid acting test.

- Applied risk assessment methodology to the use of feedgrade antibiotics in pork production. Components of that risk assessment have been integrated into a descriptive model of human side pork consumption risks. Researchers are operationalizing a descriptive model into a functioning model using @Risk software, allowing researchers to further characterize the qualitative risks, and the quantitative risks in the farm-to-fork pork production chain.
 - ✓ Eliminating the use of subtherapeutic antibiotics in the grower/finisher unit pigs may have a relatively small impact on productivity. However, it still improves profits to use antibiotics for growth promotion.
 - ✓ Feed use efficiency (FCR) and average daily gain (ADG) is generally improved by increasing the number of different rations fed in the grower/finisher unit pigs; however, antibiotics reduce FCR when the number of rations is increased.
 - ✓ FCR and ADG improve as the average number of days of growth promoting antibiotics increased.
 - ✓ A quantitative biological model for antimicrobial-resistant *Salmonella* beginning with on-farm swine production, continuing through transport, lairage, slaughter, processing, retail distribution, consumption and human illness has been developed.
 - ✓ A model that implements the best available science-based information is serving as a tool for conceptualizing the pathway of risk from farm-to-fork.
- Poultry producers using alternative methods of production have no more, or significantly less, salmonella infestation compared with traditionally raised poultry.
- The on farm strategies for detection and control of *Salmonella* are in the final stage of development with cooperation between veterinary clinical medicine researchers and producers showing the uniqueness of C-FAR philosophy in practice.
 - ✓ 950 Illinois pork producers and 350 veterinarians have contributed to a survey on pig production food safety.
 - ✓ Interventions have been developed for on-farm food safety in 6 areas: pest control, biosecurity, production system management, herd health, feed and feeding, and transportation of animals.
 - ✓ Six examples of pork food safety certification programs have been described and information shared with pork producers through the SafePork web site. <http://www.cvm.uiuc.edu/safepork/index.html>
 - ✓ A pre-harvest HACCP web site was published; including science-based tools to be used by farms and consultants developing HACCP based food safety systems for individual farms and farm systems.
- The search for a non-thermal microbial inactivation technique was found in high pressure processing. The first 2 high-pressure processed products (guacamole and oysters) are now available commercially in the U.S. market.

For Consumers:

- Commercial produce wash or water is equally effective in the reduction in *S. boydii* 18 on parsley; however, neither product completely removes pathogens. Study demonstrated need for vegetables and fruit to be washed and refrigerated promptly. (Ongoing)
- Consumers of varying age groups will receive meals from the food service establishments that are participating in the implementation of the model HACCP project. These food service establishments include day care centers, school meal programs, university-dining services, long-term care facilities, hospitals, restaurants, catering, deli operations and correctional systems.
- Illinois residents are using the award-winning educational interactive program now available for commercial distribution on CD-ROM through programs made available to Cooperative Extension Service.
- The Food Safety Kiosk, *the Mysterious Food Safety Caper*, received recognition by winning a 2001 international Global Award. The Global Awards honor the best in healthcare communications worldwide, attracting 1,361 entries from every corner of the world. The winners were showcased in a comprehensive editorial in *Medical Marketing & Media* magazine and distributed worldwide.
- 1200 individuals took the Home Food Safe Kitchen Quiz on the Food Safety Kiosk at the "Home Food Safe Kitchen" featured at the Illinois State Fair 2001 and returned to the State Fair again in 2002.
- The Food Safety SRI was featured along with the directors of 2 state agencies at a press conference in August 2001 and 2002 to kick off National Food Safety Month.
- Using five varieties of genetically engineered corn: Round-up Ready, Liberty-Link, Bacillus thuringiensis, Glutamate dehydrogenase positive, and Glutamate dehydrogenase negative, results indicate differences in biological effects in male mice of diets containing both GM and non-GM corn. There were differences between and within study and non-study groups using the parameters of body weight, liver weight, testes weight, and glucose level. Research is needed to expand upon many areas that were not investigated or well controlled.
- Most Illinois consumers are willing to pay some price premium for a certified safer pork product and consumers had more confidence in USDA certification of pork safety than in industry certification.
- Food safety certification through industry wide or producer cooperative efforts is becoming more common in the major pork producing and exporting countries. Such certification is easier and cheaper to implement for drug residues than for microbial pathogens, which require greater monitoring throughout the food supply chain.

For foodservice and retailers:

- Completion of model HACCP plans for 22 food service facilities (Ongoing)

- ✓ Monitoring for HACCP plan implementation is complete. The extent of implementation varied depending upon the type of facility and commitment of staff, especially the manager in charge, or the owner.
- Eighty-six university food service employees participated in HACCP training at SIU Dining Services. The results indicated that the workers satisfied with the training retained more than the workers not satisfied with the training. HACCP training programs have been implemented for Illinois's food service industry and the demand for kits throughout the state, nation and overseas continues.
- Produced food safety training videos for front-line foodservice workers. This video entitled, "HACCP: The Way to Food Safety," received two first place awards in educational instruction and instructional design categories at the Annual Broadcast Educators Conference in 1998. The original English version was converted to Spanish with substantial remaking in 2003.
- Produced a HACCP training kit for foodservice establishments. This kit included above mentioned video, a workbook accompanying the video, and several job aids (5 posters, a magnet, cooling stickers, a thermometer, and sample disposable gloves.) Approximately 800 sets were distributed throughout the state.
- Trained approximately 1,000 foodservice professionals on HACCP throughout the state. Trainees included front-line food handlers, foodservice managers, grocery store managers, local public health department inspectors, food safety instructor, and college students.
- Developed and implemented model HACCP plans for 22 foodservice establishments representing 9 different foodservice operations in 3 regions in the state.
- Trained 86 SIUC foodservice employees in conjunction with a research project to investigate the effect of job satisfaction on sanitation training.
- Trained 60 new foodservice workers in 3 counties in southern Illinois to investigate the efficacy of HACCP training method.

For educators, physicians and consumers:

- Two versions of a foodborne illness education video have been completed for medical students to reinforce knowledge acquisition during year 2 basic sciences education. The mnemonic slogan "*Suspect a foodborne illness? It's what you do AFTER that counts!*" has been incorporated to reinforce the main educational points. The medical students Class of 2005 were tested on the relative educational effectiveness of the two versions, with one-half of the class viewing each of the versions. Statistical evaluation of students' test results are ongoing and will be concluded by December, 2003.
- Foodborne illness (FBI) subject material has been incorporated into the 2nd year medical student curriculum. Most recent post-test data indicate that the students' overall concepts regarding diagnosis, treatment and reporting requirements for FBI have improved markedly when these test data are compared to earlier classes.

- Food safety school curriculum developed for K-6 grades and recommended by Illinois State Board of Education, available through the ISBE clearinghouse.
- Food safety curriculum materials developed for grades 7-12 using data gathered from 100 youth employed in fast food and over 300 students from the Chicago suburbs. (Ongoing)
 - ✓ Six public service announcements viewed by over 10,000,000 on Dish Network channel 9406 were developed to coordinate with the curriculum materials.
- Food safety school curriculum modules developed for K-3, 4-6, and 7-12th grades and recommended by Illinois State Board of Education, available through the ISBE Curriculum Publishing Clearinghouse. (Over 150 curriculum modules distributed.) (National Environmental Health Association; and Wisconsin, Minnesota, and California Public Health Departments reviewing curriculum modules for endorsement)
- 1 Website identifying curriculum resources, links, and future site for other curriculum information(Ongoing)
- Second State Food Safety Symposium featured C-FAR FS SRI research, jointly sponsored IDPH, IDOA, Illinois Restaurant Association and the Food Safety SRI

- Data acquisition on the diagnostic and treatment behavior of physicians treating foodborne illness in emergency rooms and urgent care centers in Springfield has been completed. Statistical data are now being compiled. Manuscript is in preparation. Manuscript submission is planned for October-December, 2003. Data have been incorporated into the medical school curriculum.
- From over 2000 emergency room and urgent care centers records that were reviewed from Springfield hospitals and acute care centers, (via the use of select ICD-9 codes) preliminary data assessment indicate that a food product had been implicated in the illness. This is in concert with the earlier data, where approximately one-half of the patients indicated that a food might have been the cause of the illness. Again, as in the earlier study, the chart data indicated that less than 10% of the physicians offered foodborne illness prevention education to the patient. Springfield Public Health Department's plan for a food safe community achieved an additional degree of maturity, in that a total of 8 meetings (2002-2003) have been held with the Springfield Stakeholder Advisory Committee to define the outreach activities to benefit community groups *i.e.* daycare providers, school-age children, senior citizens and other high-risk groups to implement a food safe community.
- PSAs and television segments shown in City of Springfield during FY 03 featured food safety. Additional television segments are currently being scheduled.

Objectives and/or goals not accomplished

In general we have been successful in completing the objectives set forth by the working group and advisors. Individual researchers may have had to attack a pathogen detection issue from more than one direction when an initial attempt was not successful. The search for a microbial inactivation technique that is non thermal – doesn't require heat- is important to the food industry, since heat changes food flavors. We learned that the pulse electric field processing is not a viable option at this time but the use of electrical impulse techniques was successfully explored.

Educational materials may have not been accepted during the first try but redirected to meet the needs of subsequent groups. Researchers in this SRI were creative and determined to use resources effectively and efficiently.

SRI components with a brief description for continuation with C FAR and other funds including leveraged funding

To my knowledge no C FAR funds are now supporting any of the research efforts we identified. However, researchers have sought external funding as follows.

Pathogen Detection and Epidemiology

Encourage rapid-acting test development.

- Myung Kim (formally UIUC) is developing processes that can quickly identify the presence of salmonella and is leasing space in Enterprise Works at the U of I. He has established a company based upon his work, part of which was originally funded by C FAR. Amount of private investor support unknown.

Encourage funding of antibiotic residue issues in animals

- Gay Miller received funds for "Productivity and Economic Impacts of Feedgrade Antibiotic Use in Pork Production"; Co-Principal Investigator Paul McNamara; 2002-2003 funding of \$36,502 from National Pork Board.
- Publications that have summarized or made use of NAHMS antibiotic data will be used by the General Accounting Office for a review of antibiotic issues per request by Senators Harkin, Snow, and Kennedy. The publications provide information regarding available data on antibiotic use in swine, feedlot, and broilers.

Develop methods to reduce microbial contamination of fresh cut produce, fruits, and juices.

- Work at IIT is continuing through funds made available by USDA and FDA to the Illinois Institute of Technology. The principal investigator, V. M. Balasubramaniam has taken some of the work started at IIT to another University. One of the methods, electrical impulse techniques, is being used by industry. Accounting of investor dollars not available.

- James Blackburn has been successful in acquiring \$250,000 from IL Attorney General, \$219,186 from IEPA and EPA with matching funds from IDA of \$31,762; DCCA and USDOE provided \$80,000 in related funding for Heat Production from Air-Therm Treatment of Swine Waste.
- No additional funding; however, Hans Blaschek will be directing the Institute of Food Technologists Biofilm Symposium in November 2003 that is a direct result of CFAR funding. The intended audience is Food Industry Professionals involved in the manufacture of fresh cut produce, dairy products, poultry, meat and others concerned about the role of biofilms in the food industry.

Study GMOs as human food safety issues.

- William Banz received funds for "Using large-scale gene-expression analysis to address human food safety concerns about the consumption of GMO products". Sample Analysis, Monsanto. ~\$35,000

Education /Outreach

Established kiosks in the area of food safety in selected outlets to determine their future effectiveness. Kiosks were used to expand educational efforts to the low-income population.

- U of I extension has used the food safety kiosk programs for educational purposes without additional C FAR funding; likewise the kiosks have been at both DuQuoin and Springfield State Fairs in '03 at the expense of sponsoring agencies.

Educated medical students to the under reporting of foodborne illnesses by physicians.

- David Carpenter has submitted a grant proposal submitted: Applied Food Safety Education for Medical Students, Health Care Professionals and Consumers USDA Cooperative State Research, Education and Extension Service, Washington, DC Awards notification pending.

Developed and implemented HACCP (Hazard Analysis Critical Control Point)

Developed HACCP at the retail level

- No additional funding; however, Hea Ran Ashraf collaborated with the faculty members of Seoul National University, Korea to organize and conduct a 3-day HACCP workshop for food service professionals in 2001. She also provided leadership in developing a model HACCP plan and sanitation management strategies for small scale soymilk producers in India in 2000, and 2002. Future collaboration may be possible utilizing the HACCP training

materials and experience in running the Train-the-Trainer program and other training programs.

Developed HACCP for swine herd management: *Salmonella* detection and control on farm.

- The following coop agreement grew out of the work on certification in the CFAR FS SRI. “Role of New Information Technologies in Food Safety Management”, Cooperative Agreement with Economic Research Service, USDA, \$24, 000, Laurian Unnevehr, cooperator, 8/01-9/03.
- Peter Bahnson continues his work at the University of Wisconsin