



Annual Report 2009-2010

**The Joint Institute for Food Safety and
Applied Nutrition (JIFSAN)**

**University of Maryland
College Park, Maryland 20742**

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Executive Summary

In 1996, the Joint Institute for Food Safety & Applied Nutrition (JIFSAN) at the University of Maryland, College Park was established by the University and the US Food & Drug Administration (FDA) to advance sound strategies that improve public health, food safety, applied nutrition and animal health using risk analysis principles through cooperative research, education and outreach programs. This report summarizes the activities and accomplishments from August 2009- July 2010.

JIFSAN is an internationally recognized source of scientific information and trainings on food safety, applied nutrition and animal health. This recognition continues to grow through the enhancement of its base programs and development of new program initiatives. In April 2010 the University of Maryland signed an agreement with Waters Cooperation to establish an International Food Safety Training Laboratory (IFSTL) at JIFSAN. IFSTL will deliver hands-on, laboratory-based training to foreign scientists in the application of state of the art, “fit-for-purpose” analytical techniques suitable for monitoring compliance with the broadest range of food safety standards.

JIFSAN provided international food safety training programs supported by cooperative partnerships, including the Good Agricultural Practices (GAPs), the Good Aquacultural Practices (GAQPs), and the Commercially Sterile Packaged Foods (CSPF) programs. Three GAPs (Mexico, El Salvador, and Peru), and two GAQPs (Bangladesh and Malaysia) were conducted. One CSPF training is planned to be offered in China in September 2010. The GAPs programs in Mexico and El Salvador were supported by funds from USDA-FAS.

An “Agreement of Cooperation” was also signed on March 22, 2010 between UM and the Bangladesh Shrimp and Fish Foundation to promote cooperation in food safety training and research between JIFSAN and BSFF. Bangladesh Commerce Secretary, Mr. Md Ghulam Hussain, visited the University on April 21.

JIFSAN’s Advisory Council met two times: a business meeting on November 19, 2009, and an annual meeting on March 24-25, 2010. The Council welcomed two new members: 3M (represented by Ms. DeAnn Benesh) and Abbott Nutrition (represented by Dr. David Schmitz), and two new representatives to the Council, Dr. Patrizia Barone (Unilever), and Ms. Courtney Brien (National Consumers League). The annual meeting featured a symposium entitled: "Risk Communication – Communicating Science to the Public included sessions on Consumer/Behavior Research." Brief presentations with updates were also provided by Dr. Jianghong Meng (Director, JIFSAN), Dr. Stephen Sundlof (Director, FDA, Center for Food Safety and Applied Nutrition), and Dr. Tracy Forfa (Executive Director, FDA, Center for Veterinary Medicine).

JIFSAN has made great efforts to enhance its research program. In addition to continued support of research projects on fresh produce safety and risk communications, JIFSAN supported three new projects in 2009: Development and Validation of Nanosensors for

Detecting and Subtyping Foodborne Pathogens; Development of a Risk Assessment Framework for Folate Metabolism and the Identification of Applicable Risk Assessment Models; and Development and Validation of In Vitro Hepatotoxicity Assay(s) for Dietary Supplemental Materials.

The JIFSAN Student Internship Program provides an opportunity for UM undergraduate students to work with FDA laboratory and regulatory scientists on specific projects identified by the FDA scientist involved. During 2009-2010, 34 UM students participated in research at FDA.

The Food Safety Risk Analysis Professional Development Program offered both face-to-face and distance learning online courses with updated course materials. The risk communication and quantitative risk assessment methods were revised to reflect the recent changes in the field. The three-week Summer Integrated Program (SIP) was offered in June 2010, and for the first time SIP was hosted at the new JIFSAN facilities in College Park, MD instead of downtown Washington, D.C. with 28 participants. Four online risk analysis courses had 62 students from eight countries.

FoodRisk.org is the only on-line resource specialized in food safety risk analysis. It is actively managed in order to ensure quality information. The USDA/CSREES awarded in 2009 a three year grant that enables JIFSAN to make significant improvements in how the database is structured and organized. As a result, an updated version of FoodRisk.org, which is more user-friendly and easier to navigate, is being developed. Additionally, the grant is supporting the development and implementation of a thesaurus in partnerships with the National Agriculture Library (NAL) from USDA and the School of Information Studies at the University of Maryland that will make searches more efficient.

JIFSAN sponsored or co-sponsored four workshops/symposia this past year: the 6th International Conference on Predictive Modeling in Food; Fresh Produce Safety in Schools Workshop; Risk Communication – Communicating Science to the Public; and Detection Technologies for Intentionally Added Adulterants/Contaminants.

Organization

Mission and Vision

Founded in 1996 by the University of Maryland and the US Food & Drug Administration (FDA), the Joint Institute for Food Safety & Applied Nutrition (JIFSAN) is a multidisciplinary research, education and outreach program. JIFSAN's mission is to advance sound strategies that improve public health, food safety, applied nutrition and animal health using risk analysis principles through cooperative research, education and outreach programs. JIFSAN's goal is to become an internationally recognized source of scientific information and trainings on food safety, applied nutrition and animal health that will enable the development of sound public health policy, the improvement of human nutrition, and the reduction of the burden of food-borne illness. Achievement of the mission and vision necessitate the active development of program-focused partnerships, with government agencies, industry, academia and public interest groups, including the acquisition of external funding.

New Appointments

Dr. James W. Rushing joined JIFSAN as the Manager for the International Training Programs in March 2010. Prior to joining JIFSAN, Dr. Rushing was the Vice President at a major fruit and vegetable production company and had served as Professor and Director at the Coastal Research and Education Center of Clemson University. He has the rank of Professor Emeritus with Clemson. During his 29 years of University service as a postharvest specialist, he took professional development sabbaticals. He spent three years as a self-employed consultant based in Santiago, Chile. Later he spent one year with FDA as a Visiting Scientist at the Center for Food Safety and Applied Nutrition. He has worked in 35 countries in the fruit and vegetable industries. Jim has been actively involved in fresh produce food safety issues since 1990 when he collaborated with the Centers for Disease Control to investigate outbreaks of Salmonella illness associated with produce from South Carolina. He went on to assist with various grant-funded food safety programs and has conducted training at the international, national, regional, state and county levels. He assisted JIFSAN with the development of a Train-the-Trainer Course for international audiences.

Ms. Stephanie Swartz joined JIFSAN in September 2009 as an Accounting Associate. She assists with pre- and post award management as well as travel, accounts payable and other Business Office functions.

Mr. Timothy Shaffer joined JIFSAN in November 2009 as an IT Support Assistant. He handles all hardware and software issues at JIFSAN, including purchasing, upgrading, and maintenance of JIFSAN equipment.

Ms. Samantha Watters was appointed as the Program Management Specialist for JIFSAN working with Dr. Ruzante on the USDA/CSREES grant. She graduated from the University of Maryland, College Park, with a BS in Biochemistry and a BA in English Language and Literature. Samantha was a JIFSAN student intern working on a project

with the French National Institute for Agricultural Research (INRA) to define a language of uncertainty and develop a hierarchy of terms to use in classification of risk assessment uncertainty in Europe and US.

Facilities and IT Development

Training room and conference room. JIFSAN's Training Room and Conference Room renovations were completed this year. The training room houses an HD projector connected to a touch panel for presentations. There is a room capacity of around 30 people and an allocation of 16 internet-ready laptops for computer training. The Conference room has an HD TV and laptop hookups for smaller presentations and collaborative work. A video conference cart is now available that allows for both professional and web-based video conferencing that can be wheeled into any office for use and can be hooked up to the Training Room and Conference rooms audio and visual equipment.

Online Training Portal. In 2010, JIFSAN launched an online Training Portal at <http://jifsan.umd.edu/portal/>. This training portal will host free non-instructor training material. Currently there are two courses that were done in coordination with Dr. David Lei, NFSC. Funding for this project was provided by a USDA grant. These courses are "Develop Your Food Protection Plan" and "HACCP". Development will continue on the Training Portal to allow for more interactive content such as quizzes and allow for Certificates of Completion at the end of courses.

In 2011, the Training Portal will host two courses funded by CVM about Drug Use in Aquaculture by Foreign Producers: "Use of Approved Drugs and Chemicals" and "Use of Unapproved Drugs and Chemicals." In Early 2011, we will have two additional courses from Dr. David Lei about Food Defense and HACCP.

COE Website and Forum. A website was launched for the four FDA Centers of Excellence at <http://jifsan.umd.edu/coe/> to allow the center to post events that their organization is hosting in one place. A password protected forum was also launched for use by COE members to communicate online.

Servers. JIFSAN purchased 4 Servers to host CFS3 Website, FSCF-PTIN Website, JIFSAN Website and JIFSAN applications, and FoodRisk.org and FoodRisk Applications. Hosting will begin in 2011, and the servers are currently used for testing and building websites.

JIFSAN has been tasked in maintaining a server for FDA's CERES project (a knowledgebase for Chemical Evaluation and Risk Estimation System). This allows the FDA to collaborate with Molecular Networks in Germany on a project, using JIFSAN as a conduit for information sharing.

Presentation recordings. JIFSAN began recording presentations using the new training room. The first recordings were of Dr. Abu Khan from the FDA to be used for

international training in Bangladesh. Future plans include recording interviews for JIFSAN's online training and recording future presentations for publication on the web. The JIFSAN IT department will be trying to obtain funds for new audio and visual equipment in 2011 for higher quality publications.

The JIFSAN Advisory Council

Central to the operation of JIFSAN is the Advisory Council composed of 22 members from private sector businesses, government agencies, academia, and representatives of consumers' interest groups. The Council provides guidance to JIFSAN in developing research, education, and outreach programs to address problems in food safety, nutrition, animal health sciences, and risk analysis.

The JIFSAN Advisory Council met two times. On November 19, 2009, the Council continued the discussion about its role and structure, and JIFSAN's strategic planning and program directions. The Advisory Council held its spring Annual Meeting on March 23-25, 2010, featuring a symposium on "Risk Communication – Communicating Science to the Public." Following the symposium, the Council welcomed two new members: 3M (represented by Ms. DeAnn Benesh) and Abbott Nutrition (represented by Dr. David Schmitz), and two new representatives, Dr. Patrizia Barone (Unilever), and Ms. Courtney Brien (National Consumers League). Annual updates were presented by Dr. Jianghong Meng, Dr. Stephen Sundlof (Director, FDA, Center for Food Safety and Applied Nutrition), and Dr. Tracy Forfa (Executive Director, FDA, Center for Veterinary Medicine).

Program Areas

Research

The JIFSAN research program was established to assist in the generation of new knowledge to support efforts in furthering the scientific basis for public health policy formulation, evaluation, modeling and risk assessment. The applied research includes not only traditional laboratory and field research, but also educational, behavioral or social research, focused on defining the behavioral determinants that promote sound food safety practices.

Extramural Research Awards

An Online Integrated Food Safety Risk Analysis Resource for National and International Information Exchange: JIFSAN received a 3-year grant from USDA CSREES in 2009 to develop an online integrated food safety risk analysis resource to improve global food safety by facilitating the exchange of information and user-friendly tools. In partnership with the National Institute for Public Health and Environment (RIVM) in the Netherlands and the National Food Institute in Denmark, JIFSAN is developing an online integrated catalogue on risk assessment by applying the methods used to build the *Campylobacter* spp. risk assessment framework (CRAF). The project is also redesigning FoodRisk.org

infrastructure to improve the online catalogue and be able to host additional risk ranking tools.

INRA-MET@RISK: JIFSAN collaborates with the French National Institute for Agricultural Research (INRA); University of California, San Diego, and the US FDA's Center for Food Safety and Nutrition on a joint research project to analyze the way that food safety risk assessments treat various forms of uncertainty. This four year project has been funded by a French agency and officially started March 2010. It builds upon a prototype database that was developed through a collaborative project between INRA, JIFSAN and FDA/CFSAN. The initial collaborative effort resulted in the development of terminology to describe the way risk assessors express uncertainty in risk assessment documents from the United States and Europe. The project involves testing a computer based tool developed by INRA and UC San Diego using a variety of food safety risk assessments. It will determine how each addresses the different forms of uncertainty (such as data uncertainty and model uncertainty) in the risk models, how these uncertainties are presented in the descriptive technical reports and executive summaries, and whether there are consistent differences between different types of risk assessments (for example, risk ranking assessments and product pathway assessments). This project will further develop a tool that will systematically evaluate risk assessments and other food safety documents.

UM-FDA Collaborative Research Program

With the renewal of the third five year cooperative agreement, several new research initiatives that address public health needs were identified and funded.

Novel molecular typing methods for analyzing Shiga toxin producing *E. coli* (STEC) and *Salmonella*, PI: Jianghong Meng UM, Collaborators: Eric Brown, Jie Zheng, Marc Allard, FDA/CFSAN. The goal was to establish and pinpoint a potential reservoir of infestation for STEC and *Salmonella* using several molecular subtyping methodologies. The information gained from understanding the evolutionary relatedness of these foodborne pathogens is key to unraveling the molecular epidemiological pathways that lead to food contamination by dangerous STEC and *Salmonella*. Several state of the art molecular epidemiological tools are being investigated including PFGE, SNPs analysis (e.g. Bioplex/Luminex), and whole genomes canning for strain variation.

Observational study of food handling practices in retail deli departments, PI: Jianghong Meng, UM, Collaborators: R. Pouillot, and Sherri Dennis, FDA/CFSAN. JIFSAN supported a pilot research project on observational study in retail food environment to address human behaviors that may lead to cross-contamination of *Listeria*. In order to improve the safety of ready-to-eat (RTE) food products prepared at retail deli departments, a better understanding of current practices in these establishments is needed. The study showed that food employees engaged in a large amount of contact between potentially contaminated objects, gloved hands, and RTE food resulting in a high number

of required hand-washing actions. Compliance with these requirements was generally low and varied depending on the store type with independent stores exhibiting lower compliance than chain stores. Compliance with recommendations for the cleaning and sanitizing of food contact surfaces/utensils between uses with raw and RTE food and between uses with raw fruits and vegetables and potentially hazardous food was very high. More research is needed to identify effective risk mitigation measures which would reduce the amount of contact between potentially contaminated objects, gloved hands, and RTE food.

Development of methods for characterizing protein allergens, PI: Catherine Fenselau, UM, Collaborators: Kevin Shefcheck and John Callahan, FDA/CFSAN. The goals of this project were to use new sample preparation methods and analytical technology, recently developed in Dr. Fenselau's laboratory, to enhance CFSAN's ongoing investigations in the area of protein allergens. Research was focused on the application of these methods to characterize the structure of protein allergens; improve these methods to enhance CFSAN's analytical capabilities in the area of protein allergen detection and quantification.

Internal (UMD) Competitive Research Projects (2008-2010; and 2009-2011)

2008-2010 projects

Evaluating Public Health Impacts and Cost-Effectiveness of Implementing GAPs in the Tomato Farm Environment, PI: Amy Sapkota, UM, Collaborators: Sammy Joseph, UM, Andrew Estrin and Cristina F. McLaughlin, FDA/CFSAN. The long-term goals of this study were to understand the impacts of GAPs implementation on levels of on-farm bacterial contamination; and to determine the costs to tomato growers of implementing GAPs and evaluate whether costs present a barrier to implementation. The research findings, to date, provided insights into the prevalence of *Salmonella* and *Enterococcus* in various ecological niches within the tomato farm environment. *Salmonella* was detected on four out of nine farms (44%) evaluated, and hotspots for this organism appeared to be water sources, as well as soil. On the contrary, *Enterococcus*, an indicator of fecal contamination, was found on 100% of tested farms in every type of environmental media. These findings are critical for the development of improved on-farm interventions that have the capacity to reduce bacterial contamination in pre-harvest settings and ultimately reduce the number of human foodborne illnesses associated with the consumption of raw tomatoes.

Developing Phyllosphere Metrics in GAPs to Reduce the Risks of Salmonellosis in Fresh-Market Tomatoes and Other Vegetable Crops, PI: Chris Walsh, UM, Collaborator: Eric Brown, FDA/CFSAN. The objectives of this study were to: 1) Compare the bacterial profile of ground and surface water used for pesticide applications and 2) Assess the impact of contact of that water on the bacterial profile found on the surface of field-grown grape tomato fruit. A significant enrichment in Enterobacteriaceae was observed. To better-understand how these Enterobacteriaceae sequences could be broken down

within this family we then performed a BLASTN analysis. Most of the Enterobacteriaceae sequences from our study corresponded to *Pantoea* and *Enterobacter*. We also noted a spike in the presence of *Escherichia* species in the samples analyzed in 2009. We are currently performing further analyses to elucidate the impact of contact water source on the bacteria present on tomato fruit.

Plant Responses to the Colonization by *Escherichia coli* O157:H7 and *Salmonella*, PI: Jean-Michel Ané, University of Wisconsin, Collaborator: Eric Brown, FDA/CFSAN. The objective of the study was to investigate symbiotic plant-microbe interactions using a model system. Various genetic and genomic tools already available in *Medicago truncatula* make it an ideal system for studying interactions with *E. coli* O157:H7 and *Salmonella*. To identify the physiological factors governing these interactions young seedlings and sprouts of *M. truncatula* grown on soil, growth pouches and agar slants were inoculated with *E. coli* O157:H7 or *Salmonella* strains expressing the Green Fluorescent Protein (GFP). Inoculated roots were fixed and colonization was studied both by plate count and by observation under a confocal microscope. Efforts are on to study whether there is internal colonization of these roots. Expression analysis of inoculated roots is under progress to identify genes regulated during such infections. A comparative genomic approach will be taken to apply the results of this study to other crops.

2009-2011 projects

Development and Validation of Nanosensors for Detecting and Subtyping Foodborne Pathogens, PI: Mel Gomes, UM, Collaborator: Eric Brown, FDA/CFSAN. The goal of our project is to develop an alternative method for detecting foodborne pathogens using a label-free, accurate and reliable platform to detect very small amounts of target DNA. We aimed to achieve this by using a field-effect transistor (FET) that is capable of detecting tiny amounts of charges localized on its active region. The fundamental idea of a FET biosensor is that the electrical charge coming from, say, a DNA captured at the gate will introduce an electric field that will change the conduction properties of the transistor. This idea was demonstrated for detecting DNA using silicon-based FETs. The advent of carbon nanotubes (CNTs) has broadened the types of FETs that can be used. Nowadays there have been reports for successful and sensitive detection of DNA and proteins and antibodies. The knowhow to produce devices fabrication with sufficient control over their properties has significantly advanced, and it is feasible to design and build sensors that could complement and even outperform traditional methods.

Development of a Risk Assessment Framework for Folate Metabolism and the Identification of Applicable Risk Assessment Models, PI: Nadine Sahyoun, UM; Collaborator: WenYen Juan, FDA/CFSAN. The objectives of the study are to critically review the literature to determine the key events and control points in the metabolic pathway of folate, and to develop a risk assessment framework for folate. This involves examining folate metabolism from consumption, to absorption, uptake by cells and metabolism by target tissue.

The International Life Sciences Institute's Global Threshold Project has proposed an approach to examine dose-response events within an analytical framework that includes key events in the metabolic pathway of nutrients. This approach was refined and applied to vitamin A. We propose to follow that same approach. This will involve a critical review of the literature to assess the key events in the metabolic pathway of folate. We expect that by the end of that process we will have identified the metabolic pathway of folate and located the control points that will lead us to refine the questions further to meet the next objective.

Development and Validation of In Vitro Hepatotoxicity Assay(s) for Dietary Supplemental Materials, PI: Liangli Yu, UM; Collaborator: Thomas J. Flynn, FDA/CFSAN. The long term goal of our study is to improve the safety, quality, and nutritional value of human diets for optimum health. The specific objectives of this research are to develop high throughput in vitro hepatotoxicity assay(s) to rapidly evaluate potential liver toxicity of dietary supplement materials and to validate the in vitro results using in vivo rat study.

Support of the Center for Risk Communication Research

JIFSAN continues to provide funding in support of the Center for Risk Communication Research (CR²) led by the UM Department of Communication. The Center's mission is to advance understanding about how communication helps control risk, how the public perceives risk communication, and the political, economic and social contexts for risk communication. The Center's goals include helping to establish public and scholarly agendas for risk communication research, collaborating with other institutions and individuals to secure funding for research projects, and providing support for research and fellowships.

The UM CR² is conducting risk communication research projects regarding the effectiveness of the ALERT campaign; retail response to food recalls; and consumer behaviors concerning the 2006 spinach recall.

Food Defense Research Initiative: Evaluation of the ALERT (Assure, Look, Employees, Reports, Threat) campaign. In March of 2010 individual and informal contracts were developed with the trade organizations that agreed to aid in data collection. In each case, the food safety liaison placed an announcement regarding the study in the electronic newsletter. The organizations participating are: U.S. Meat Export Federation, Association of Food Industries, National Association of Flavors and Food-Ingredient Systems, The National Assoc of College and University Food Services, Agricultural and Food Transporters Conference, American Trucking Associations, American Frozen Food Institute, Global Cold Chain Alliance, American Institute of Food Distribution, International Dairy-Deli-Bakery Association, and the Society for Foodservice Management. Announcements were distributed to each organization for placement in their newsletters. In April of 2010 the survey link to the study was opened and data collection has begun. We have collected nearly 100 responses. We are hoping for 10 times this number of responses; which will prove difficult. In May we will re-connect with each organization and attempt to gain aid from those who did not respond to us earlier. And, we hope that participating organizations will re-post our study

announcement in their newsletters. We will stop data collection at the end of June and begin data analysis.

Survey on consumers' emotional and cognitive reactions to food recalls. In February of 2009 the request for a topic change from spinach to peanut butter was approved. We modified the spinach survey to reflect the topic change to peanut butter. The team wrote a CR₂ Statement of Confidentiality for the FDA's IRB submission. At that time the ICR Supporting Statement was revised, we requested name and topic change from UMD IRB office, the name and topic change was approved by the UMD IRB office. In April 2009 we worked with Knowledge Networks on sampling plan and data collection plan. In August of 2009 the FDA IRB office decided that we could not change our topic from spinach to peanuts and mandated that we begin the approval process from the beginning. In September of 2009 the team convened and discussed the limitations of studying a specific food recall. We made the executive decision to study food recalls generally: spinach, peanuts, pet food, tomatoes, and jalapenos. The theoretical vantage point and implications of the study remain the same—but, we removed the time element by decision to study perceptions of past recalls. The University of Maryland team revised the survey to reflect several recalls without making the survey too long. Upon approval we will post to the 60 day register, and gain IRB approval and conduct this research.

JIFSAN Student Internship Program

The JIFSAN Student Internship program is a unique undergraduate research program designed to provide UM undergraduate students with an opportunity to collaborate with FDA scientists on specific research projects related to the CFSAN's mission. In 2009-2010, 34 individual students participated in the program. Efforts continue to be made to extend these research opportunities for internships beyond laboratory experiences. UM Students are encouraged to co-author posters for presentation at FDA Science Forum, UM Bioscience Day and other national meetings.

The JIFSAN Internship Program is managed by Dr. Kaci Thompson, Director of Undergraduate Research and Internship Programs for the College of Chemical and Life Sciences and is open to undergraduate students across campus. Students, faculty, and staff awareness of the Program is achieved through web postings, brochures, seminar series, campus list serves and the annual Internship Day. Current projects may be accessed at:

http://jifsan.umd.edu/internshipdatabase/internship_db.php

Education/Training

Working with partner organizations, education/outreach efforts include international food safety training programs to address the contamination problem at the source; a comprehensive online food safety risk analysis database (FoodRisk.org) and sponsorship of workshops and symposia.

Food Safety Risk Analysis Training Program:

This program provides trainings in the key components of risk analysis. Courses in the program are available in face-to-face as a summer integrated program [SIP], online and as individual customized programs tailored for specific audiences.

The Society of Risk Analysis keeps supporting the JIFSAN courses and again in 2010 has posted the upcoming courses in their website. An international FAO list-serv also constantly announces both online and face-to-face courses in their monthly newsletter.

In the beginning of 2010, a “long term” satisfaction survey was sent out to all past participants, excluding the most recent year (2009). Most of the respondents were from government (77% - US or non-US government) and 58% were within the U.S. Most past participants have taken the SIP courses (61%). Overall 94% reported they benefited from the courses, 83% mentioned they were able to apply what they learned in the courses, and 88% said they were either satisfied or very satisfied with the courses they took. The response rate was 14%.

Summer Integrated Program (SIP):

Four Core courses including Overview of Risk Analysis; Food Safety Risk Management; Food Safety Risk Assessment; and Food Safety Risk Communication and one intermediate course in Quantitative Risk Assessment, were taught during SIP. Historically, the quantitative risk assessment course used to be divided into two courses, part 1 and 2 (or probabilistic and model building), but for SIP 2010 the two courses were merged into a single one to provide more comprehensive training in this complex area.

The 2010 SIP program was held in June 2010 and for the first time was offered at JIFSAN premises, where a new state-of-the art training room was outfitted. SIP 2010 was also the first time that JIFSAN offered a fellowship for one food safety professional from a developing country to attend the training. JIFSAN paid for the course tuition and the candidate paid for the travel expenses. The candidate was selected from a pool of applicants that submitted an application to JIFSAN. Dr. Daniela B.C. Gomes, from the Brazilian Ministry of Health, was awarded the SIP fellowship and successfully completed the quantitative track courses in June. In addition, 28 individuals enrolled and attended the courses, for 81 class seats. Half of the participants were from countries other than the U.S. The international participants were from Brazil, Canada, Jamaica, Hong Kong, South Korea, New Zealand, Saudi Arabia and U.K. The quantitative risk assessment class reached its maximum capacity with 16 participants.

Online Food Safety Risk Analysis Program:

Four JIFSAN Food Safety Risk Analysis courses were offered in distance learning mode: Overview of Risk Analysis; Food Safety Risk Management; Food Safety Risk Assessment; and the newly revised Qualitative and Quantitative Risk assessment, developed and taught by Greg Paoli, from Risk Sciences International. In addition, Overview of Risk Analysis and Risk Communication were updated for both technical content and design. JIFSAN continues to work on revising the online course material as

well as marketing strategies to publicize the availability of these courses to the national and international food safety community.

In this fiscal year, there were 65 class registrations for the online program, of which 41 (63%) were international. A total of 62 individuals from eight countries participated in the program (Australia, Canada, Italy, Japan, Hong Kong, Switzerland, U.K and U.S.). The enrollment in the course Overview of Risk Analysis was a record high. Thirty four participants registered for the course. Among those, 15 were from Hong Kong and 13 from Japan, they were all from governmental bodies.

In 2009 JIFSAN also started the course evaluations for all online courses. Surveys are developed using an online survey program, called Survey Share. The link to an electronic survey is sent to all participants at the end of the course. The evaluation is voluntary and the feedback is evaluated by the Risk Analysis Program Manager and used to improve the program.

Train-the-Trainer International Training Programs:

The international train-the-trainer programs are conducted with co-sponsors in the host country. They are designed to provide trainees with an adaptable framework of best practices necessary for the production of safe, wholesome food products. The first international training program developed by JIFSAN was Good Agricultural Practices (GAP). It has served as a model for the development and implementation of subsequent programs. The success of these programs has allowed JIFSAN to leverage resources by developing collaborations with other agencies to identify and fund additional programs and offerings. As awareness for global education and outreach increases, JIFSAN continues to build partnerships to address current issues.

Good Agricultural Practices (GAP) Training Programs:

This program focuses on fresh fruits and vegetables. During the period of August, 2009 to August, 2010, three GAP training programs were offered. The first (August 24-29, 2009) was conducted in Mexico at the University of Colima for 30 participants and was sponsored in part by USDA-FAS. The teaching cadre had the opportunity to speak at the Mexican Melon Producers Conference in the days prior to the training program. The second (December 7-11, 2009) was held in San Salvador, El Salvador for approximately 40 participants. The third (April 12-16, 2010) program of the period was held in Ica, Peru and there were 52 registrants. Three additional programs are scheduled from September-December, 2010.

A number of significant improvements were made to the GAP program in 2010. The training manual has been completely revised and re-published on the JIFSAN website. PowerPoint presentations have been upgraded and several new ones added, including one on pesticides and chemical hazards and another on traceback. New case studies relevant to each training location have been developed for classroom exercises and a web-based follow-up evaluation strategy has been successfully implemented. The evaluation questionnaire was first utilized following the program in Peru, where respondents

reported having trained 572 persons as a result of the JIFSAN program offering. These results suggest that the desired multiplier effect of the Train-the-Trainer strategy is being achieved.

The Good Aquacultural Practices (GAqP) International Training Program:

GAqP training provides on-farm education for the safety and quality of raw aquacultural commodities. Two training programs, Bangladesh (November, 2009) and Malaysia (March 2010), were conducted during this reporting period.

The University of Maryland signed an “Agreement of Cooperation” with the Bangladesh Shrimp and Fish Foundation (BSFF) on March 22, 2010. The Agreement promotes cooperation in food safety training and research between JIFSAN and BSFF. JIFSAN conducted its first GAqP training program in Bangladesh in November 2009, and is planning additional trainings and developing a JIFSAN/BSFF/FDA internship program to train food safety professionals for Bangladesh. On April 21, 2010, the Bangladesh Commerce Secretary, Mr. Md Ghulam Hussain, and a delegation of government officials visited the University for discussion on collaborations.

The Commercially Sterilized Package Foods (CSPF) International Training Program:

JIFSAN and industry experts developed a training program in commercially sterile packaged foods (CSPF). The first (pilot) CSPF training program was offered in Casablanca, Morocco in January 2009. Based on that pilot, the manual and training material was modified. This course is intended to provide trainers with some advanced understanding of the underlying concepts for the Better Process Control School materials taught to retort operators. The next program is scheduled to be offered in China in September, 2010.

International Food Safety Laboratory Capacity Training. In April 2010 the University of Maryland signed an agreement with Waters Cooperation to establish an International Food Safety Training Laboratory (IFSTL) at JIFSAN. IFSTL will deliver hands-on, laboratory-based training to foreign scientists in the application of state of the art, “fit-for-purpose” analytical techniques suitable for monitoring compliance with the broadest range of food safety standards. This will improve exporters’ compliance, improve food safety assurances and thereby, ease the burden on U.S. regulators. Major support for the development of the IFSTL will be provided by Waters Corporation. It is anticipated that, once established, the IFSTL will be self-supporting from training tuition income. The first training program will be offered in summer 2011.

Training Module on Aquaculture Drug Use. CVM, and JIFSAN have initiated a project to develop a Training Module on Aquaculture Drug Use for foreign producers. The project will result in an interactive, web-based educational module using existing materials from CVM and can be used by FDA personnel in international outreach efforts. JIFSAN had several planning meetings and the IT Department developed a website for the project.

APEC Partnership Training Institute Network (PTIN):

JIFSAN participated in the Asia-Pacific Economic Cooperation (APEC) Food Safety Cooperation Forum (FSCF) meeting hosted by co-chairs Australia and China, in Singapore on July 30, 2009, and the first APEC Partnership Training Institute Network (PTIN) Workshop Examination of Hot Issues in Risk Analysis, August 1-2, 2009. Drs. Jianghong Meng and Juliana Ruzante gave presentations on JIFSAN programs and introduction of risk analysis. As the US academia representative, Dr. Meng serves on the Steering Group and attended its first face-to-face meeting in Singapore on July 29, 2009.

JIFSAN helped develop the PTIN Website. A mini-site was launched for the FSCF-PTIN group at <http://jifsan.umd.edu/ptin/>. The website, designed and maintained by JIFSAN, will be launched January 2011.

Codex Capacity Building Workshops:

In collaboration with USDA/FAS, JIFSAN offered several workshops worldwide. JIFSAN's expert consultants, Dr. Catherine Carnevale and Mr. Patrick J. Clerkin, assisted to identify key functional capacity building needs, determine Codex work that is of high priority to each country, and identify their respective important stakeholders. The status of each country's acceptance of Codex standards was also explored.

"APEC National Trends and Regional Approaches to Export Certification Workshop," Australia February 2010

"Assistance to Build Codex Capacity in Three African Countries," Senegal, Mozambique and Zambia June 2010

"Assistance to Build Codex Capacity in SouthEast Asia," Cambodia, Laos and Vietnam, September 2010

Outreach

FoodRisk.org an On-line Database:

JIFSAN's FoodRisk.org is the only online resource specialized in food safety risk analysis, including risk assessment, risk management, and risk communication. FoodRisk.org provides exclusive access to a number of unique data sets, tools, and resources, and is used by food safety experts to support risk assessment model building and data analysis.

FoodRisk.org continues to improve its database infrastructure to enhance the integrity of previously entered data. Additionally, a link checker has been developed to monitor urls that change over time.

Records, data and other relevant resources are continuously entered into FoodRisk.org, so the database is current and useful. The most recent exclusives are highlighted below and

were all based on strong collaborations with professionals from several institutions worldwide.

- FDA's Fresh Produce Risk Ranking Tool: collaboration with CFSAN (<http://foodrisk.org/exclusives/RRT/>)
- A swift Quantitative Microbiological Risk Assessment (sQMRA) tool: collaboration with Dr. Evers from RIVM (<http://foodrisk.org/exclusives/sQMRA/>)

FoodRisk.org will host iRisk¹, a tool that is designed to simplify the process of comparing different types of risks in foods, upon completion of an external peer-review. The infrastructure to host iRisk as well as the development of an online tutorial to use the tool was funded through our USDA CSREES grant.

In addition to iRisk, the USDA/CSREES grant is helping fund the development of an online risk assessment catalogue (ICRA) in partnership with Food DTU in Denmark and RIVM in the Netherlands. The funded project will also support a searchable risk assessment inventory in food safety, will improve the overall organization and infrastructure of FoodRisk.org making it more user-friendly and is funding the development and implementation of a thesaurus that will greatly improve the “searchability” of the FoodRisk.org database. The thesaurus is a collaborative project between JIFSAN, the School of Information Studies at UMD and the National Agriculture Library (NAL) from USDA.

During 2009-2010, there were several opportunities nationally and internationally to present the work that JIFSAN and FoodRisk.org are doing, including the Annual meeting for the Society of Risk Analysis, held in Baltimore Dec. 2009. These talks generate interest from the audience increasing FoodRisk.org’s viability as highlighted below.

Acrylamide Infonet: At the request of the United Nations World Health Organization and Food and Agricultural Organization, JIFSAN is operating the Acrylamide Infonet (www.acrylamide-food.org), the WHO/FAO Acrylamide in Food Network, through FoodRisk.org. This Network was established as a result of the June 2002 FAO/WHO Consultation on the Health Implications of Acrylamide in Food. JIFSAN is in the process of evaluating the transfer of Acrylamide Infonet to the Pan-American Health Organization (PAHO), since the infonet is currently out of date and JIFSAN is no longer a WHO collaborative center.

Workshops and Symposia:

¹ iRISK is a risk-ranking tool developed by the US Food and Drug Administration, the Institute of Food Technology (IFT), and Risk Sciences International Inc (RSI). It is a web-based comparative risk tool which can be used to compare relative food safety risks across a wide variety of chemical and microbial hazards, foods, and processes from farm-to-fork.

JIFSAN successfully sponsored or co-sponsored the following workshops and symposia between August 09 and August 2010:

The 6th International Conference on Predictive Modeling in Foods

JIFSAN co-sponsored the 6th International Conference on Predictive Modeling in Foods that was held on September 8-12 in Washington DC. Topics discussed included not only aspects relevant to predictive microbiology models but, neural networks, non-thermal and thermal inactivation, cross-contamination, quantitative risk assessment, microbial competition modeling and integrated modeling approaches that combined models originating from food engineering and predictive microbiology.

Fresh Produce Safety in Schools Workshop

JIFSAN, along with the US Department of Agriculture's Food and Nutrition Service (USDA, FNS), sponsored the "Produce Safety in Schools" Workshop on October 28, 2009. This one-day workshop brought together distinguished members of the scientific and educational communities in an open forum to discuss proper management of food in schools, specifically fresh fruit and vegetables. Discussions consisted of current practices related to fresh fruits and vegetables in child nutrition programs, and food safety issues that should be addressed in school food service, as well as educational materials and strategies to tackle the issues that were identified. A written report and action plan was developed to summarize the proceedings of the workshop, which is accessible at jifsan.umd.edu.

2010 AC Annual Symposium

The JIFSAN Advisory Council sponsored its 2nd annual spring symposium on March 24, 2010. The symposium entitled Risk Communication – Communicating Science to the Public included sessions on Consumer/Behavior Research, Laboratory Testing Methodologies, and Risk Communication. Over 100 participants from the government, industry and academia attended the symposium.

11th Annual Fera/JIFSAN Symposium:

The symposium focused on Detection Technologies for Intentionally Added Adulterants/Contaminants, and was held on June 16th-18th, 2010 in Sand Hutton, York, North Yorkshire, UK. There were three sessions: Detection Technologies for Intentionally Added Adulterants/Contaminants, Analytical Detection Methods, and Challenges and Other Approaches. More information on the symposium is available at <http://www.fera.defra.gov.uk/events/jifsanSymposiumPresentations.cfm>

Future Plans (2010-2011)

The financial support of the FDA cooperative agreement provides JIFSAN resources to strengthen and expand its multidisciplinary programs, and enhance external partnerships. JIFSAN has demonstrated a success in its efforts in obtaining external funding for program support from other governmental agencies, and the industry to leverage funding from FDA's Cooperative Agreement.

JIFSAN will continue to work on new initiatives which include partnerships with: Waters Cooperation in establishing the International Food Safety Training Laboratory; the Asia-Pacific Economic Cooperation's (APEC) Partnership Training Institute Network (PTIN) for Food Safety; and Bangladesh Shrimp and Fish Foundation in establishing Bangladesh Shrimp and Fish Research and Training Center.

Administrative

- JIFSAN will recruit a professional to manage the newly established International Food Safety Training Laboratory (IFSTL).
- JIFSAN is planning to hire a business manager to support its expanded programs.
- Two meetings of the JIFSAN Advisory Council will be held in November 2010 and March 2011. These meetings will concentrate on the role and structure of the Advisory Council and strategic planning, and program directions. The Annual meeting will include a symposium on April 27-28, 2011. JIFSAN is also planning its 15th anniversary celebration on April 28, 2011.

Research Initiatives

- JIFSAN supports strong research collaborations between UM faculty and CFSAN scientists, and will provide funding to the following research projects/areas:

Comparative genomic and genetic analysis of *Salmonella* sequences for SNP discovery. JIFSAN supports a graduate student to work with FDA scientists in investigating DNA sequence-based genetic structures of several of the most common *Salmonella* strains associated with human illness. These data will facilitate the design of specific diagnostic tests for effective detection, identification, and differentiation of foodborne outbreak strains of *Salmonella*.

Molecular typing methods of foodborne pathogens: The goal is to establish and pinpoint a potential reservoir of infestation for Shiga toxin-producing *E. coli* (STEC) and *Salmonella* using several molecular subtyping methodologies. These include several state of the art molecular epidemiological tools such as PFGE, SNPs analysis (e.g. Bioplex/Luminex), and whole genome scanning for strain variation.

Development and Validation of Isotope Methods for Distinguishing Between Naturally Occurring and Synthetic Phthalates in Food. “Phthalates” (1,2-benzenedicarboxylic acid esters, herein PAE) are used as plasticizers, as a solvent for oil-soluble dyes and nitrocellulose lacquers, as an antifoaming agent, a fiber lubricant in the textile industry, a fragrance fixative, and an alcohol denaturant. The acute toxicities of phthalate esters are low. Evidence for carcinogenicity in animal models has been reported. The objective of this study is to develop a method to accurately determine the natural and industrially derived phthalate ester contributions in food matrices.

JIFSAN will continue supporting research and operations of the **Center for Risk Communication Research**. In addition to continuing research activities on produce safety risk communications and ALERT, the Center will initiate a new project on “Branding the Be Food Safe Campaign” that aims to raise awareness of the Be Food Safe brand; to change the target audience members’ attitudes about their own food safety behaviors; to increase knowledge about Be Food Safe behaviors; and to increase and maintain food safety behaviors among the target audience.

- JIFSAN will continue its efforts in seeking extramural funding to support its research program. We plan to submit additional research proposals to various funding agencies in collaboration with researchers on campus, at FDA and other institutions.
- Operation of the JIFSAN Internship Program will continue. Dr. Kaci Thomson will continue working closely with undergraduate coordinators of different colleges, particularly AGNR and CLFS, in recruiting most talented students to the program.

Education and Outreach Efforts

- JIFSAN will continue to explore opportunities for partnerships with federal agencies, the industry and international organizations to develop a sustainable international training program by establishing partnerships with foreign governments, academia, and industry and provide an effective tool to prevent food safety problems from occurring.

To create regional network of institutions that could provide extension-like training to improve food safety globally, including assisting Bangladesh to establish a Shrimp and Fish Research and Training Center.

To participate in APEC Partnership Training Institute Network,

Partnering with the US Grocery Manufacturers' Association (GMA) and the US government, JIFSAN will continue to participate in PTIN activities, including as a member of its Steering Group and workshops planned in China and other APEC economies in 2010 and 2011.

JIFSAN's IT Department will be working with the Steering Group to ensure that the PTIN website meets PTIN's specifications. JIFSAN will be responsible for designing and coding the website as well as creating a backend for content to be added and dynamically displayed on the website.

To complete the construction of the laboratory training facility and develop International Food Safety Laboratory Training curriculum. JIFSAN plans to offer two pilot programs prior to the completion of the laboratory facility:

Microscopic Examination of Plant Materials: This course will be offered in March 2011 and would assist CFSAN in its implementation of the Botanical Dietary Supplement cGMPs by providing industry with training in methods that could be used to authenticate the botanical dietary ingredients used in botanical dietary supplements sold in the United States.

Pesticide Residue Laboratory Methods Training: to offer a training program in May/June 2011 for food scientists on how to use FDA's pesticide residue methods, from the following countries, Guatemala, Costa Rica, Nicaragua, Honduras, El Salvador, and Dominican Republic. After taking this course, foreign analysts will be able to analyze fresh fruit and produce [or other commodity depending on countries participating] for pesticides using the same methods as the FDA.

To develop training program on Regulatory Inspection of Food Facilities: JIFSAN will work with CFSAN to develop a 2-week course on Regulatory Inspection of Food Facilities with the intended audience being primarily inspectors and possibly regulators from foreign countries. Modifying an existing domestic inspection training course conducted by FDA/ORA will be considered. JIFSAN will pilot the course in China.

Additionally, JIFSAN will continue offering trainings in GAPs, GAQPs, CSPF, and Food Safety Risk Analysis.

- JIFSAN will complete the development of the a Training Module on Aquaculture Drug Use by foreign producers in collaboration with CVM. The training program will be n interactive, web-based educational module using existing materials from CVM and to be used by FDA personnel in international outreach initiatives.

- The Risk Analysis Program at JIFSAN is positioning itself to move to the next level of international recognition by exploring partnerships with national and international organizations. We plan:

To revise the Risk Assessment online courses;

To identify partners to help support JIFSAN fellowship program on Risk Analysis that is offered to one professional in the area of food safety and risk analysis to attend the SIP program;

To improve marketing strategies in increasing both domestic and international enrollment;

To continue to offer a one day course on Risk Communication;

To expand instructor cadre for SIP and online courses; and

To obtain funds to develop a “long term” risk analysis training that would involve in-class training followed by execution of an “in-situ” risk analysis project. Interested parties would identify in advance critical issues to be addressed in the project and team members that would be responsible for conducting the project. JIFSAN staff and instructors would serve as mentors of the project, providing technical guidance that will enhance learning and result in an end product that can be used by the parties.

- JIFSAN will continue its efforts to improve and update FoodRisk.org and leverage funds to support its activities. JIFSAN will launch a new version of Foodrisk.org in 2011.
- JIFSAN will continue to partner with INRA on the development of a risk analysis tool/database that will improve understanding of how risk assessors (US/EU) address uncertainty throughout the food risk analysis process (risk assessment, risk management and risk communication). Findings will help improve all aspects of the risk analysis process.
- JIFSAN will continue its co-sponsorship of symposia, workshops, conferences and other types of meetings, including the following:

Role of “omics” in Food Choice (November 19, 2010)

The objectives of this workshop are to: (1) provide an overview of what has been done in this area. Nutrigenomics encompasses genomics, proteomics, metabolomics and bioinformatics; (2) identify research gaps; and (3) recommend and prioritize research needs. This workshop will bring together leading experts from academia, industry and government to look at current status of this research

area and to identify research needs. Participants will be invited experts in nutrition, “nutrigenomics” and social scientists (behaviorists).

The 3rd Annual JIFSAN Advisory Council Spring Symposium: When Things Don't Go as Planned (April 27-28, 2011). The focus of the symposium is mitigating consequences of an outbreak/adverse event. The symposium will provide an overview of lessons learning from past events; the use of risk analysis tools to focus resources on preventing future occurrences; and understanding how the consumer interprets and reacts to information.

The 12th Annual Fera/JIFSAN Joint Symposium on Food Safety and Nutrition: “Dealing with uncertainty in risk-based decision making and response” June 15-17, 2011, Greenbelt, MD. The symposium will include four sessions: Sources of uncertainty in Food Safety Risk Assessment – current practice, Improving data collection to quantify and/or reduce uncertainty, Tools used for characterizing uncertainty and Role of Science and Uncertainty and Risk Perception in making informed decisions. In addition two case studies (microbial and chemical) will be presented to illustrate how uncertainty played a role in decision making.