



Joint Institute for Food Safety and Applied Nutrition News

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JIFSAN Overview

Food safety and nutrition issues are not limited to any one area of science, but include a web of disciplines from the physical to the social sciences. In addition, programs in information technology, communications, professional development, and skills training are necessary to address these complex societal issues.

In 1996, the President of the University of Maryland, College Park (UM) and the Commissioner of the U.S. Food and Drug Administration (FDA) discussed opportunities for cooperative interactions that could be mutually beneficial and positively affect public health. Realizing the two organizations shared some common goals and values, UM and FDA signed a Memorandum of Understanding which combined their expertise and established JIFSAN, a multidisciplinary, multi-institutional organization.

JIFSAN's partnership brings together the University of Maryland and FDA's Center for Food Safety and Applied Nutrition (CFSAN) and Center for Veterinary Medicine (CVM). The FDA Centers provide scientific and regulatory expertise, while UM contributes their facilities and extensive background in research and education. Financial support is furnished primarily by CFSAN. Major instrumentation facilities on campus, such as electron microscopy and nuclear magnetic resonance spectroscopy, house both UM and FDA personnel. The relationship allows both institutions to remain state of the art in areas where duplicated efforts would not be as productive.

In addition to improving their capacity to accomplish common goals, this partnership allows each institution to enhance and broaden intellectual resources available to them. "The interaction with faculty in fields that are important to FDA, but for which they don't have the expertise gives them a major advantage. For the university, there are numerous opportunities for

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Postdoctoral Program

The events of 9/11 broadened the U.S. Food and Drug Administration's (FDA) mission from a primary emphasis on food safety to include increased attention to food security. FDA Center for Food Safety and Applied Nutrition (CFSAN) Supervisory Microbiologist, Eugene LeClerc, explained that within the last three years, his lab has gone from identifying unintentional microbial contamination of food to identifying bacteria that could be used to intentionally contaminate the food supply.

One of JIFSAN's Postdoctoral Research Associates works with CFSAN on these research efforts focused on food security. JIFSAN's postdoctoral program provides FDA laboratories with research scientists for a two year term while allowing recent postdoctoral graduates the opportunity to work in a regulatory environment. The research projects provide additional knowledge and scientific data, as well as improved methods and models.

CFSAN Microbiologist, Dr. Eric Brown, explained that the program not only benefits current research, but also the postdoctoral research fellow. "We thought it [the JIFSAN Postdoctoral Research Program] was a really great enhancement of the relationship between FDA and the University of Maryland (UM). It would give us further support and another scientist in the laboratory to help us with the project. In return, it would provide training to the postdoctoral fellow."

JIFSAN Postdoctoral Research Associate, Dr. Alice Hayford, works with Dr. Brown on the identification of bacteria that may be used to intentionally contaminate the food supply. Using a variety of molecular biology techniques, Dr. Hayford characterizes different strains of bacteria.



Dr. Alice Hayford

Dr. Hayford's role in the project is part of a large effort that will possibly reduce the time and cost associated with identifying suspect terrorism agents. "We're trying to supplant the need for sequencing entire organisms for strain identification," said Dr. Brown. Drs. Brown and Hayford's efforts, along with those of other researchers, to identify, characterize, and trace the lineage of different bacteria strains will allow this research team to create unique profiles of bacteria and reduce the need for repeated sequencing of different strains.

While this collaborative program contributes towards the educational goals of JIFSAN, it also adds to the necessary scientific information needed for FDA to make regulatory decisions. "It's been a very nice marriage of research and training that's unprecedented," said Dr. Brown.

Acrylamide in Foods

In April 2002, Swedish researchers announced the detection of a toxic and possibly carcinogenic compound in starchy foods cooked at high temperatures. This discovery led to questions about the health effects and factors influencing the formation of acrylamide in foods. Industry and governments associated with food science moved quickly to evaluate and respond to acrylamide's existence in foods.

JIFSAN hosted two workshops as part of a global effort to address these acrylamide issues. In October 2002, over 170 invited experts and observers attended JIFSAN's first workshop to determine the existing deficiencies in information about the presence of acrylamide in foods, organize this knowledge, and develop a list of critical research needs. Five working groups individually focused on the formation, exposure and

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bioavailability, analytical methods and detection, toxicological implications, and risk communication about acrylamide in foods.

In April 2004, more than 130 attendees participated in JIFSAN's second acrylamide workshop, "Update: Scientific Issues, Uncertainties, and Research Strategies," to discuss and assess the progress of research on acrylamide in foods since the initial 2002 meeting. Individual working groups, established at the previous acrylamide workshop, again considered existing information voids and subsequent critical research needs for consideration and funding by industry and government. An additional working group was established to address the issue of risk characterization. Each group updated accomplishments, gaps, uncertainties, and research needs related to the specific focus of that group.

Both workshops provided an opportunity to develop potential research projects relevant to the lists of high priority needs developed by the working groups. JIFSAN, as a result of these meetings, administers five research projects funded by the Industry Acrylamide Coalition.

In addition to its workshops, JIFSAN facilitates efforts to evaluate the issues of acrylamide in foods through the Acrylamide Infonet (<http://www.acrylamide-food.org>) on behalf of the U.N. Food and Agriculture Organization (FAO) and World Health Organization (WHO). The network was created as a result of the FAO/WHO June 2002 Consultation on the Health Risks of Acrylamide in Food. JIFSAN is responsible for the maintenance and operation of the web-based network, which houses a directory of information on acrylamide in foods. The network includes a research database, calls for data, additional acrylamide websites, and publications on acrylamide.

As developments from research on acrylamide in foods become available, JIFSAN continues providing resources to keep the scientific community current on the latest developments. The acrylamide workshops and internet resources provide a neutral environment that facilitates the communication of various scientific disciplines to work together to resolve the issues of acrylamide in foods.

Student Internship Program

It's not hard to figure out that earning a college degree improves the odds of acquiring a job after graduation. But what about experience, the "E-factor", of the equation? How and where to accumulate experience boggles the mind of some undergraduates. The JIFSAN Student Internship Program is designed to help students obtain practical experience.

Over the next eight years, the U.S. Department of Labor estimates a 19% increase in the number of biological scientist positions. University of Maryland (UM) alumnus Deanne Dyer used the "E-factor" to her advantage. She decreased those estimated 14,300 open positions by one—she found a job.

Previously studying ballet in high school, Dyer majored in dance at the University of Maryland. But, after discovering the program focused on modern dance, she re-choreographed her academic career. Having completed a biology course to fulfill a science requirement and earning an A, Dyer soon changed her major to general biology.

Dyer faced a critical career decision the summer before her senior year. Medicine, nursing, and physician assistant careers did not have the same magnetism as biology. "I didn't feel very prepared or know of career options available with my degree," she said. The JIFSAN Internship Program gave her a compass to gauge career possibilities. "I thought it was a good idea to get experience and figure out what I was going to do."

As a JIFSAN intern, Dyer worked under the guidance of research microbiologist Dr. Keith Lampel at the U.S. Food and Drug Administration's (FDA) Center for Food Safety and Applied Nutrition (CFSAN). She said her experience at CFSAN revealed a different aspect of science. "The internship narrowed down the science area and showed me the research side of it ... in the labs at school you do one experiment, turn in

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a lab report and that's it. Here [at the lab] you need to do experiments, understand why you're doing them, and talk about what your results mean and [explain] why they're meaningful."

Dr. Lampel, Dyer's mentor, added that practical experience broadens students' scientific aptitude, "it's a learning experience not only in the lab, but also understanding the science behind the technology used and the principles we apply."

These internships not only support students' ambitions, they also help narrow the gap between FDA's missions and its accomplishments. "They [interns] perform a number of necessary experiments that add to our research projects which address the mission of FDA. Students spend a lot of time on developing [analytical] methods for these projects," said Dr. Lampel.

Dyer's internship experience extended beyond working in the lab. She presented posters about her work with foodborne bacterial pathogens at meetings sponsored by the American Society of Microbiology. She also co-authored "Detection of Bacillus Spores Using PCR and FTA Filters" which appeared in the Journal of Food Protection.

As a result of her internship, CFSAN hired Dyer as a full-time employee in June 2002. She continues to work in Dr. Lampel's lab and also mentors other student interns that work with them. As a mentor, she explains how the lab functions, provides operational instructions on instruments, and teaches one of the routine microbiological procedures used in the lab.

Since 1996, 187 students have worked in FDA laboratories and offices under the guidance of 67 mentors as a part of the JIFSAN Student Internship Program. Some students may be able to fulfill an internship requirement for school while they earn practical experience for the workforce. As Dyer demonstrated, JIFSAN student interns are equipped with the proper tools to secure a job in a competitive job market.

Additional information on JIFSAN's internship program is available online at <http://www.jifsan.umd.edu/internship.htm>.



Internal Competitive Research Program

Veterinary drug research and evaluation to provide data required for drug approval could easily exceed two million dollars per year and take a decade to complete. The exorbitant cost, coupled with a lack of sponsors and funding, impedes aquaculture drug research. By most estimates, aquaculture, or "farming" fish and shellfish, will provide much of the seafood consumed by Americans in the future.

Adding to the challenge is the complexity of the drug approval process. U.S. Food and Drug Administration (FDA) Research Biologist, Dr. Renate Reimschuessel, explained that the current approval process necessitates approving one drug for use in one species, for one disease. Currently, there are only six drugs approved for therapeutic use in fish.

As a means to circumvent some of these drug research costs in aquaculture, Dr. Andrew Kane, Associate Research Scientist at the University of Maryland (UM) and Dr. Reimschuessel, Director, FDA Center for Veterinary Medicine (CVM) Aquaculture Research, are collaborating on a project funded through JIFSAN's Internal Competitive Research Program. This project could lead to the expansion of therapeutic drugs available for fish production.

JIFSAN created the Internal Competitive Research Program in 1998 to augment the scientific information essential for addressing regulatory and public health policy issues. The program generates this knowledge by pairing UM principle investigators with FDA collaborators on projects of mutual interest that parallel FDA's research needs and JIFSAN's mission. Thirty research projects have been funded through this program.

Using local species, such as channel catfish, largemouth bass, and rainbow trout, Drs. Kane and Reimschuessel are examining the metabolic and drug profiles of fish. They are looking for commonalities between different species in order to group them. This effort should facilitate the drug approval process. CVM's part of the project is primarily concerned with drug residues in fish and the safety of humans consuming them,

Internal Competitive Research continued on next page

while Dr. Kane is focused on identifying similarities in the way fish metabolize and excrete drugs.



Dr. Andrew Kane

Dr. Kane reports that classifying these fish by metabolic and drug profiles could reduce the amount of information required to be submitted for drug approval and lower the cost of developing drug usage profiles. “All costs and effort don’t need to be repeated for each species,” said Dr. Kane. However, Dr. Reimschuessel explained, the project is laying the foundation to determine if this approach to the drug evaluation is feasible.

This foundation could be a step towards improving the drug approval process. “I know that we don’t have enough information to change the way regulations are developed or the way drugs are approved yet. But it’s hoped that if we develop predictors of how the metabolism occurs, it would be factored into the decision making process,” she said.

Although Drs. Kane and Reimschuessel work collaboratively on separate aspects of this research, Dr. Kane describes the study as an interdependent project. “We’re both able to hold onto the fish and get different answers ... together. We’re able to do something that neither of us could do on our own.”



5th Annual Joint CSL/JIFSAN Symposium

In June 2004, more than 100 attendees with interests in food safety, convened at the Central Science Laboratory (CSL) in Sand Hutton (York), U.K. for the Fifth Annual Joint CSL/JIFSAN Symposium on Food Safety and Nutrition: Analytical Innovations in Food Safety. These professionals discussed new and alternative applications of analytical methods used in food safety.

JIFSAN and CSL, an Executive Agency of the UK Government Department for Environment, Food, and Rural Affairs (Defra), collaborate to advance their mutual interests by co-hosting an annual symposium on a specific topic in food safety and nutrition. The symposium alternates annually between the two countries.

The 2004 symposium opened with a segment on European and American perspectives on current conditions and future concerns in food safety. The European perspective focused on the challenges, needs, and future priorities of food safety risk analysis in Europe, and new approaches for authenticating and tracing foods. The Food and Drug Administration’s (FDA) research efforts to characterize, detect and eradicate hazardous agents, given by Dr. Arthur Miller, provided the American perspective on issues in food safety.

In addition to US/European perspectives on food safety, the symposium also examined unique and alternative rapid screening techniques. Technologies presented included the use of sniffer technology for routinely screening chemical and biological contamination of foods, the use of cysteine-brevetoxin conjugates as a liquid chromatography/mass spectroscopy (LC/MS) indicator of brevetoxins in shellfish, and integrated methods for screening antibiotics in foods of animal origin.

The symposium also focused on other instrumental techniques used for the rapid analysis, detection, and identification of residues and contaminants. Topics discussed included improvements in nuclear magnetic resonance (NMR) spectroscopy that result in faster detection of contaminants in foods. New techniques using mass spectrometry (MS) to identify bacteria and food allergens were presented. Attendees also discussed technologies that combine the use of MS and gas chromatography (GC) or liquid chromatography (LC) to quickly analyze pesticides in foods (GC-MS and LC-MS), identify unknown residues and food allergens using quadrupole time of flight mass spectrometry (QTOF/MS), and survey drug residues in foods (LC/MS/MS).

The Sixth Annual Joint CSL/JIFSAN Symposium on Food Safety and Nutrition: Bioactive Food Components will be held in College Park, MD June 28-30, 2005.



Good Agricultural Practices

New dietary recommendations include consuming nine servings of fruits and vegetables per day. U.S. Food and Drug Administration (FDA) Food Technologist, Dr. Michelle Smith, attributes the increase in foodborne illness associated with fresh produce to the increase in consumer consumption of these commodities.

Resulting from this increase in foodborne illness outbreaks, the Food Quality Protection Act directed FDA to provide international growers, packers, and shippers with guidelines for reducing microbial contamination in food. The guidelines, “Guidance for Industry – Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables,” were jointly developed and published by the FDA and the USDA.

The JIFSAN Good Agricultural Practices (GAPs) “Train-the-Trainer” Program assists the FDA in implementing these guidelines internationally.



The GAPs program focuses on minimizing risks in fresh produce beginning with the farm. Dr. Chris Walsh, JIFSAN International Training Program Coordinator at the University of Maryland, explained that education is crucial to preventing foodborne contamination. “Since it is difficult enough to detect pests or other contaminants on the plant, and treating the produce after contamination is impossible ... prevention is the key,” he said.

The GAPs program targets individuals located in countries that are U.S. trading partners. These trainees have experience in agriculture and pest management, but lack training related to microbiological safety in fresh produce production; yet, they interact with exporters and farmers. “We get people who can make the local connections. We teach them as much as we can in a short period of time, then they go out and multiply that affect,”

said Dr. Walsh. Since 2000, these principles of GAPs have been taught in ten countries selected by the FDA including Chile, Trinidad, Brazil, Puerto Rico, Dominican Republic, Mexico (three programs), Peru, Guatemala, Honduras and Korea. Locations scheduled for the GAPs Training Program in 2005 are Brazil, Mexico, and Thailand.

The week-long program uses practical and classroom instruction to teach individuals the principles of good agricultural practices. Trainees are taught by a team of instructors from the University of Maryland, Clemson University, Mississippi State University, and FDA staff. In addition to classroom instruction, trainees spend part of their training visiting agricultural operations such as field and packing houses. They utilize skills acquired in classroom instruction to develop case studies on these agricultural operations. These case studies include an analysis of potential risks, resolutions for future risks, and standard operating procedures for the agricultural operation.

The JIFSAN GAPs International Program is contributing to keeping produce imports safe and preventing barriers to international trade. Educating international trading partners may help decrease microbial contamination of produce through the use of preventative practices employing GAPs, which will help improve public health in the US.

GAPs Training Programs

2004	Antigua, Guatemala
2004	Tegucigalpa, Honduras
2004	Seoul, Korea
2003	Culiacan, Mexico
2003	Veracruz, Mexico
2003	Lima, Peru
2002	Mayaguez, Puerto Rico
2002	Bocachica, Dominican Republic
2002	Puebla, Mexico
2001	Petrolina, Brazil
2000	Port of Spain, Trinidad and Tobago

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its faculty to get involved in new programs that it wouldn't have been involved in before," said Dr. Paul Mazzocchi, Associate Director of JIFSAN.

Dr. David Lineback, Director of JIFSAN, said the nature of the organization prompted his joining the Institute in 1998. "The JIFSAN model is the organizational model for the future. Programs addressing food safety and nutrition will need to be multidisciplinary and multi-institutional ... issues cross disciplines," he said. As a virtual institution JIFSAN collaborates with UM faculty, FDA scientists, academia and other domestic and international organizations to extend the scope of its reach and increase the effectiveness of its research, education and outreach programs.

JIFSAN interacts with the global food safety and nutrition community through its Good Agricultural Practices (GAPs) Train-the-Trainer Program; Food Safety Risk Analysis Professional Development Program; Food Safety Risk Analysis Clearinghouse, workshops, research programs, and symposia.

The GAPS Train-the-Trainer Program teaches international trainees how to reduce the microbial contamination of fresh produce. Through this program FDA reaches out to producers and packers in countries exporting fresh fruits and vegetables to the U.S. After completion of the one-week program, trainees assume the role of trainers by teaching the GAPs principles to farmers, packers, exporters and others involved with fresh produce production in their country.

The Food Safety Risk Analysis Professional Development Training Program teaches food safety professionals the language, tools, and techniques of risk analysis. The program's nine courses cover fundamentals of food safety risk analysis as well as examine the methods and disciplines of quantitative risk assessment, economics, epidemiology, and food toxicology.

The Food Safety Risk Analysis Clearinghouse (<http://www.foodrisk.org/>) is a repository of data and methodologies on food safety risk analysis. Covering all sectors of risk

analysis, the Clearinghouse collects information from government, academia and industry. The Acrylamide Infonet (the FAO/WHO Acrylamide in Food Network) is operated by the Clearinghouse and furnishes visitors with a database of researchers, a discussion forum, studies in development, research publications, and other pertinent information. JIFSAN administers this network at the request of the World Health Organization (WHO) and the Food and Agriculture Organization (FAO).

JIFSAN interacts with the UM and FDA community through the JIFSAN Student Internship Program, Competitive Internal Research Grants Program and the Post-Doctoral Research Associates Program.

A highly successful component of the Institute's education and outreach efforts is the JIFSAN Student Internship Program. This program provides UM undergraduate students with educational and practical experience, while working on projects with FDA public health officials. Dr. Elizabeth Calvey, JIFSAN Deputy Associate Director, indicated that "these internships not only provide the students with experience in a scientific regulatory environment, but also contribute to the agency wide scientific efforts and increase the employment potential of the students within the agency and the food safety community."

JIFSAN is involved in a variety of research activities. The JIFSAN Internal Competitive Research Program promotes direct interactions between UM faculty and FDA scientists. These projects contribute to the scientific knowledge used to make regulatory decisions. JIFSAN also provides opportunities for postdoctoral research associates through the JIFSAN Postdoctoral Research Program. These fellows work directly with FDA scientists, conducting research to provide the scientific basis for public health policy. Both programs are designed to expand scientific information available to food safety and nutrition research investigators and policy makers. JIFSAN has research collaborations with foreign institutions to further its goals and provide broad perspectives to food safety and nutrition issues, which are typically global in nature.

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As a cooperative program to support decision making by addressing food safety risks, JIFSAN combines the best of two highly respected institutions and provides a neutral environment for the food safety and nutrition community to interact and exchange information. The goals of the Institute are consistent with the need to address some of the challenges facing this community, as well as, the common goal of JIFSAN's parent institutions to improve public health. Through its various programs, JIFSAN equips current and future food safety professionals with the tools and information to maintain and improve the safety of our food supply.

Food Safety Risk Analysis Program

Risk analysis has developed into a necessary tool for decision making. International trade agreements, the U.N.'s Food and Agriculture Organizations and World Health Organization, and the Presidential/Congressional Commission on Risk Assessment and Risk Management all encourage the use of risk analysis in decision making, explained Dr. Daniel Trachewsky, JIFSAN Education and Outreach Liaison. The JIFSAN Food Safety Risk Analysis Professional Development Training Program recognizes this growing global need to more accurately assess and manage human health risks associated with food.

Currently, as the only comprehensive training program addressing food safety from a risk analysis perspective, JIFSAN's program introduces participants to the language, skills, and techniques of risk analysis—the tools of risk analysis. “What it really comes down to is giving people tools to make better decisions. That's what risk analysis is about,” said Dr. Wesley Long, JIFSAN Risk Analysis and Extramural Liaison.

The courses in the program assist food safety professionals in acquiring the tools to contribute and participate in risk management decisions. By combining practical and traditional training in a classroom setting, the risk analysis program trainees not only learn the principles of risk analysis, they also apply them. “Food safety professionals need to understand the risk analysis paradigm,” said program instructor Dr. Charles Yoe, “they need to know the language, the concepts and the best practices of risk analysis as part of a modern and effective science-based food

safety system.”

JIFSAN's Food Safety Risk Analysis program offers a range of courses to fulfill the training needs of those who are new to the risk analysis field. There are courses as well for professionals proficient in the basics of risk analysis but who are looking for additional training or specialized knowledge in a particular area. Core courses cover the fundamentals of food safety risk analysis, whereas intermediate courses examine methods and disciplines of quantitative risk assessment, economics, epidemiology and food toxicology.

Training approaches offer flexibility for food safety professionals. Primarily, courses are held on the University of Maryland College Park campus. However, select courses are available through the on-line distance learning option. Also, organizations can request customized courses for on-site training to meet their specific risk analysis training needs. Initiated during 2004, the Summer Integrated Program provides an opportunity for trainees to complete one course or up to seven of the nine courses in a single on-site session. Attendees interested in completing one of the two extended tracks, which include the four core courses plus three intermediate courses, take classes back-to-back in a concentrated three week time frame.

The JIFSAN Food Safety Risk Analysis Program is designed for the needs of food safety professionals. The program allows food safety professionals to customize their risk analysis training. The range of courses, along with the array of training options, coincide with a variety of skill levels and training needs while providing the knowledge and proficiency essential to the increasing global application of risk analysis.

The 2005 Risk Analysis Training Program schedule is available on the JIFSAN website at <http://www.jifsan.umd.edu>

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