

The Food Safety Consortium Newsletter

University of Arkansas, Iowa State University and Kansas State University • Vol. 16, No. 4 • Fall 2006

FSC Hosts Symposium at Annual Meeting

Scientists at the forefront of food safety research gathered at the Food Safety Consortium annual meeting Oct. 2-3 in Fayetteville, Ark., for a symposium that covered a wide range of topics in the field. They focused much of their attention on preventing contamination of meats before they reach the processors, education of consumers and emerging food safety issues in retail, biosecurity and legal concerns.

The Consortium's annual meeting attracted more than 200 researchers, graduate students, industry personnel, government officials and vendors. Researchers from the Consortium's three universities presented their data and exchanged ideas and information during the conference hosted by the University of Arkansas Division of Agriculture. The Consortium includes the U of A, Iowa State University and Kansas State University.

"I'm convinced that collaboration within and among our institutions gives the best bang for the buck for developing science and technology that provide safe food, and for transferring it to the food



Arkansas Agriculture Secretary Richard Bell (left) discusses current issues with Lori Evans of Dimension Food Solutions of Rogers, Ark., during the Food Safety Consortium Symposium in Fayetteville, Ark.

industries," Milo Shult, U of A vice president for agriculture, told the assembled scientists and food industry representatives during the opening session.

"There is also great value in the partnership between research institutions and food industries that work together to supply American consumers with safe and nutritious foods," Shult said.

Each university in the consortium is

primarily performing research associated with a specific animal species: poultry at Arkansas, pork at Iowa State and beef at Kansas State. Research projects are also coordinated with scientists at the University of Arkansas for Medical Sciences and Arkansas Children's Hospital.

Research and issues covered during the meeting included biological studies of foodborne pathogens, intervention

Continued on page 2

Graduate Research Poster Contest Winners Announced

Six graduate students at the Food Safety Consortium's three universities won prizes in the research poster competition during the annual symposium in Fayetteville, Ark., in October. Prizes ranged from \$50 to \$250. The winners and their posters were:

First place — Madhukar Varshney, University of Arkansas, mentored by Yanbin Li, for "Impedance Biosensor

Based on Interdigitated Microelectrode Coupled with Nanoparticle-Antibody Conjugates for Detection of *Escherichia coli* O157:H7."

Second place — Bledar Bisha, Iowa State University, mentored by Byron Brehm-Stecher, for "Rapid Cytometric Detection of *Salmonella* and *Listeria monocytogenes* in Pork Products."

Third place — Fei Liu, University

of Arkansas, mentored by Yanbin Li, for "Detection of *Escherichia coli* O157:H7 Using a QCM Immunosensor with Nanoparticle Amplification."

Fourth place — Mindi Russell, Kansas State University, mentored by Daniel Fung, for "Antibiotic Susceptibility and Resistance Profiles of *Enterobacter* spp. Collected From Lagoon Water of Com-

Continued on page 2

FSC Hosts Symposium...

continued

strategies, technologies for rapid detection of pathogens and emerging issues in food safety.

Steven Ricke, director of the Center for Food Safety at the U of A, said it's important to focus on the biology of foodborne pathogens. "If we know our enemy," he said, "we can fight it."

Ricke's research is focused on being able to predict the behavior of illness-causing bacteria and stay a step ahead of their ability to do harm. "We have to start thinking about preventing those pathogens from ever getting established," he said. "We have to create barriers."

Such research strategies mark the aim of the Food Safety Consortium, said James Denton, retired head of the department of poultry science, speaking at the start of the meeting.

"Continuing research helps us better understand the pathogens themselves, how they work and survive," Denton said. "Then we use what we know to look for novel interventions to protect the U.S. food supply."

James Dickson of Iowa State University, who moderated the opening sessions, pointed out that many graduate students from the member institutions were also attending the meeting. He added, "Food Safety Consortium scientists are also teachers who are training the next generation of food safety professionals."

In addition to the day and a half of presentations by speakers, the conference included bonus sessions on organic food safety and food biosecurity issues. Tyson Foods provided tours of its facilities at its corporate headquarters in Springdale, Ark.

The symposium featured several speakers from outside the FSC. Arkansas Agriculture Secretary Richard Bell delivered the keynote address. Other visiting speakers included Shawn Bearson of the USDA-ARS National Animal Disease Center in Ames, Iowa; Robin Anderson of USDA-ARS in College Station, Texas; Scott Russell of the University of Georgia, Ann Draughon of the University of Tennessee, Christine Bruhn of the University of California-Davis, Joan Menke-Schaezler of Wal-Mart Stores, Jenna Anding of Texas A&M University and Gregory Siragusa of USDA-ARS in Athens, Ga. ■

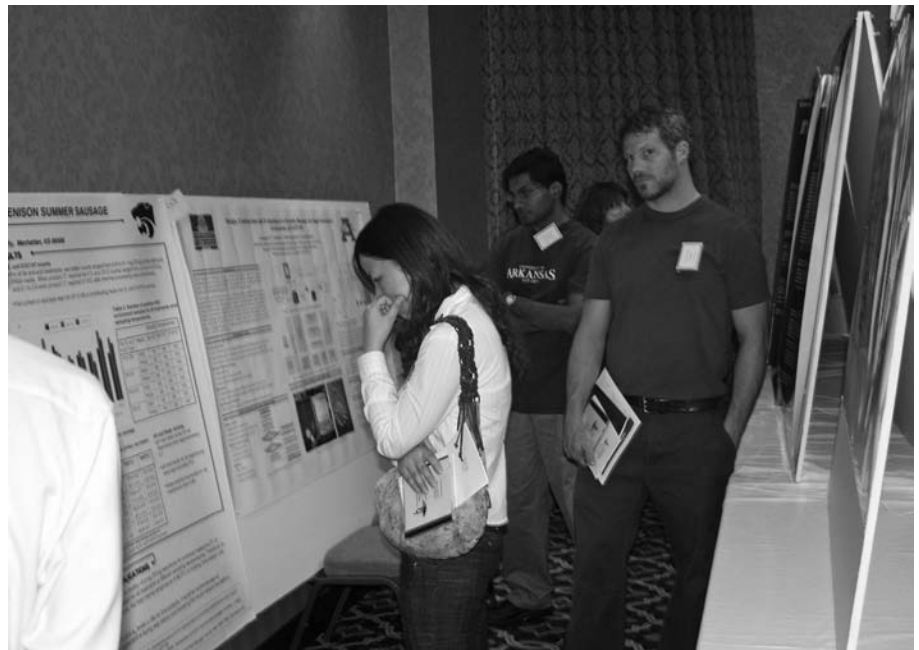
Graduate Research Poster Contest...

continued

mercial and Natural Bovine Feedlots."

Fifth place — Lori Feldman, Iowa State University, mentored by D.L. (Hank) Harris and Jim Dickson, for "Quantitative Real-Time PCR (qPCR) for *Salmonella* in Feces compared to MPN."

Sixth place — Farai Hijaz, Kansas State University, mentored by J. Scott Smith, for "Evaluation of Various Ammonia Assays for Evaluation of Contaminated Muscle Food Products." ■



Students from Food Safety Consortium universities review research posters on display at the FSC Symposium in Fayetteville, Ark.

Lactoferrin Deals Another Blow to Pathogen

Researchers at the University of Arkansas have found another tool for fighting pathogens. By activating lactoferrin, an antimicrobial compound, they were able to reduce *Listeria monocytogenes* to nondetectable levels.

"*Listeria monocytogenes* was the most sensitive to lactoferrin activated by citric, malic and lactic acids in combination with the chelator EDTA," said Navam Hettiarachchy, a food science professor who led the research project for the Food Safety Consortium. Chelators are compounds of metal ion that form rings.

"*E. coli* O157:H7 was less sensitive to lactoferrin compared to *Listeria monocytogenes*," Hettiarachchy said. The activated lactoferrin did not inhibit *Salmonella* Typhimurium.

Although lactoferrin's level of effectiveness against *E. coli* O157:H7 wasn't as great as its ability to reduce



Navam Hettiarachchy

Listeria monocytogenes to nondetectable levels, it still was significantly effective against *E. coli* by eliminating at least 99 percent of the pathogen.

Federal regulators several years ago authorized spraying lactoferrin on beef to control *E. coli*. Microbial growth on meat and meat products occurs primarily at their surfaces, so other researchers had previously

studied the effects of spraying lactoferrin on the surfaces. But the direct application had limited benefits because the active substances would neutralize or would rapidly diffuse into the tissue.

"Interaction of lactoferrin with food components will reduce its antimicrobial effectiveness," Hettiarachchy explained.

Other research, however, had also shown that antimicrobial substances could be successfully incorporated into an edible film covering meat surfaces and would be effective. That prompted Hettiarachchy's team to examine whether using lactoferrin in this manner would be effective.

"Incorporation of lactoferrin into film will prevent diffusion of the lactoferrin into the meat and still maintain its antimicrobial activity on the surface," Hettiarachchy said. "This will provide a continuous barrier to contamination by pathogens on foods up to the time of consumption."

Hettiarachchy added that research is still in progress seeking a film matrix suitable to maintain the effectiveness level in the coating.

Lactoferrin is also consumer friendly since it is derived from milk, she added, and consumers are aware of its benefits as a protein. ■

Incorporating lactoferrin into film provides a continuous barrier to contamination by pathogens on food.

Food Defense: Guarding Against Intentional Harm

First, Robert Brackett would like for everyone to get the terms straight.

Basically, food safety has to do with preventing unintentional harm to food. Food security refers to people having enough to eat. Food defense concerns guarding against intentional harm to the food supply.

The latter one is the newest area receiving government and industry attention. Brackett, the director of the Food and Drug Administration Center for Food Safety and Nutrition, called food "a critical infrastructure and essen-

tial to national security" during a speech at the Institute of Food Technologists convention in June in Orlando.

Food defense requires a different approach than food safety. The battle for food safety is an ongoing situation, Brackett explained, because unintentional food contamination is always a threat because of natural conditions, negligence or lack of concern.

Food defense against intentional contamination, however, is in another category. "You don't see it time after time," Brackett said. "When you do see

intentional food contamination, whether it's terrorism related or somebody having a grudge, it's sporadic."

There is generally no specific information indicating that an attack on the food supply is imminent. But intelligence agencies know that terrorists have discussed using components of the food sector as part of an attack, Brackett said. The food industry in particular could be exploited as "a soft target" without guns or guards at food production and processing facilities.

Continued on page 4

Report from the Coordinator



Gregory J. Weidemann

A few weeks ago we wrapped up an expanded and successful annual meeting for the Food Safety Consortium. Our annual meetings, which are hosted on a rotating basis by one of our three FSC universities, have traditionally been an inside affair. The member universities' principal investigators and graduate students would gather to hear presentations summarizing our research projects and to view our research posters. A few people from government and industry would be present, and the entire gathering would number about 100 people.

For this year's meeting hosted by the University of Arkansas, we decided to present a symposium and open it to anyone outside the FSC who would be willing to pay a registration fee. We publicized the event among the nation's food safety community, offered the opportunity for industry vendors to set up booths and provided a program that included presentations from food safety experts outside the FSC. The result was our attendance doubled to more than 200 people.

It takes a worthwhile program to attract people from industry and govern-

ment to take time from their jobs, and our FSC leadership delivered one. Following lead-off addresses by Milo Shult, the U of A vice president for agriculture, and Richard Bell, the Arkansas secretary of agriculture, our guests heard a brief history of the FSC from James Denton, a retired Arkansas poultry science center director and a member of the FSC steering committee.

Our technical presentations throughout the Monday program included sessions on pre-harvest foodborne pathogen ecology and intervention strategies, post-harvest foodborne pathogen ecology, and rapid methods and detection strategies for foodborne pathogens. Tuesday morning's session covered emerging issues in food safety with focus on consumers, retail, public perceptions, biosecurity and legal aspects. The meeting ended with presentations on antibiotics and antimicrobials in food safety. All the sessions included presentations by FSC university research personnel as well as representatives from other universities, industry and government.

Another new twist on the conference this year was the addition of two

Tuesday afternoon bonus sessions after the main meeting concluded. A workshop on organic and natural food safety convened while

down the hall we presented another workshop on food biosecurity. A few dozen people stayed with us into the afternoon to participate in these important sessions.

We also offer our thanks to Tyson Foods, which provided a dinner for our people Monday night at its headquarters in nearby Springdale. Not only did they feed us, but the company personnel offered tours of their food safety laboratory and their new research and development facility.

The FSC meeting next year will be hosted by Iowa State University from Sept. 30 to Oct. 2. We'll be building a program for it in the coming months and hope that once again friends from around the nation will have the opportunity to join us. ■

Food Defense... *continued*

"We do know that the use of biological or chemical weapons in the food supply would cause mass casualties," Brackett said. "This is something that would be catastrophic for public health as well as for the industry that was attacked. Even if it wasn't successful and you had only a few people involved, the very fact that food — which is something that everybody has to have — was used in the attack has a very significant economic and psychological effect on consumers."

Brackett recommends that "vulnerability assessments" be performed to determine what countermeasures should

be taken in advance. These assessments focus limited resources on the foods of greatest concern and aim research at ways to mitigate food processing and physical security.

Vulnerability assessments include the CARVER method (analysis of Criticality, Accessibility, Recuperability, Vulnerability, Effect and Recognizability). Using this procedure, Brackett said, analysts can identify foods for evaluation, assemble an evaluation team, develop a farm-to-table flow diagram and develop a profile of who is a threat and what are

the threat's capabilities.

In 2005, several federal agencies announced the Strategic Partnership Program Agroterrorism Initiative (SPPA). Industries, state associations or state governments may volunteer to participate. Participants host visits to their work sites by government agents who spend two to five days delivering briefings on threat possibilities, performing CARVER reviews, assessing vulnerabilities and identifying ways to mitigate the threats.

Continued on page 5

Using food in a terrorist attack has a significant economic and psychological effect on consumers.

ISU Takes Food Safety Web Site to New Levels

More than 321,000 visitors later, the consumer-oriented food safety Web site hosted by Iowa State University has expanded its offerings in the past couple of years.

“Several new projects have been completed, including a site redesign and augmenting past work to distribute food safety information using Really Simple Syndication (RSS) standards,” said Jason Ellis, the project coordinator with ISU Extension who supervised the effort that was funded by the Food Safety Consortium. (Ellis recently left ISU to take a faculty job at the University of Nebraska.)

The site is at <http://iowafoodsafety.org>.

The RSS feature enables Internet users to receive feeds providing the site’s most recent food safety news and events updates without visiting the site. Subscribers can find each day’s additions of news articles and events postings to the site using an Internet content aggregator such as My Yahoo!, Bloglines or a special .xml page.



Jason Ellis

“In essence, it’s the same as if they were coming to the ISU Web site, but they don’t actually have to do it,” Ellis said. It’s a concept similar to switching from buying magazines at the news stand to having them delivered to your home. Previously, Internet users would have to visit the site to find its updated news and information. Now, the news is delivered to

their preferred page, such as My Yahoo!, automatically from the ISU site.”

More than 41,000 additional visits to the site are attributable to the RSS feeds, Ellis said. About 28,000 of them were for the food safety news feed.

To serve growing Hispanic audiences, the site managers have translated into Spanish several of its features, including the food safety lessons, the critical control point kitchen and the 10 steps to a safe kitchen. The Spanish portion of the site, at <http://iowafoodsafety.org/espanol>, is a unit that

stands on its own.

“We identified that a lot of sites with Spanish information were on an English-based site with Spanish fact sheets, posters and materials,” Ellis said. “We made the entire site Spanish including the navigation headers, banners and footers. All supporting documents, such as the policy statements contact information and web forms, have been translated. You can link to it from the English site, but once you get to it, it’s a separate site in terms of the navigation and content.”

The food safety lessons, particularly popular for teachers to use with students in the classroom, are one of several site

features to be considered for revision in the future.

The four online lessons continue to be popular parts of the site.

Ellis reported that

35,000 scores were recorded on the lessons in 2004, bringing the total number of people who have completed the lessons to 180,000. ■

The news is delivered to a preferred page, such as My Yahoo!

Food Defense... *continued*

“This has really increased the awareness of the participants,” Brackett said. “They have a much better understanding of what happens during a threat. In some cases, they went to the vulnerability assessment and saw what the outcome would be and saw how catastrophic this could be to their business. It also helped them identify some of the research and development needs.”

More work remains for the overall

food defense efforts. Brackett said FDA will continue to work with the U.S. Department of Agriculture in training and conducting food vulnerability assessments. He also cited a need for more long-term research in methodology and prevention technologies.

“In some cases it may take years to get to where we want to be,” he said. There also are specific short-term needs that industries have identified concerning their products’ safety.

Brackett listed the key components of a food defense program as identifica-

tion of intervention strategies, ensuring a quick response and integrating food defense into overall food safety efforts.

“To ensure the very maximum level of food defense, the government and the private sector need to work together to increase attention on the security risks and deal with them,” he said. ■

Center Coordinates K-State's Safety and Security Efforts

The National Agricultural Biosecurity Center at Kansas State University is an integrative center looking to create programs and research to protect and defend the nation's agricultural and food infrastructure and economy, said Marty Vanier, the center's associate director.

K-State and the center are working to prepare diagnosticians, livestock and plant producers, law enforcement and emergency response personnel and leaders to deal with naturally or intentionally introduced disease.

"Kansas State University has long been a leader in animal health and food security," said David Franz, center director. "Endemic and emerging plant and animal disease and the safe movement of food animal and crop products to the tables of America have long been a priority on campus. So the scientists and clinicians across campus are superbly equipped to make a difference in the new smaller, faster world where the next outbreak of disease may be just a 'malicious intention' away."

The center was established in 2002,

evolving from the ongoing Food Safety and Security Program at the university.

The center was in part a response to Sept. 11, 2001, but had been in the minds of many at K-State for years. In October 1999, K-State President Jon Wefald presented testimony to the U.S. Senate's Emerging Threats Subcommittee on the topic.

National Agricultural Biosecurity Center initiatives include planning, training, outreach and research activities related to threat and risk analyses, incident response and detection/prevention technologies. The center coordinates agricultural biosecurity activities with federal, state and local agencies as well as other universities and strategic partners; and works with the U.S. Department of Agriculture, Department of Defense, the Department of Justice and other federal,

state and local agencies to facilitate an effective strategy for rapid response to emerging agricultural threats.

The center coordinates emergency preparedness exercises to test and strengthen state- and county-level readi-

ness to respond to a significant agricultural disease event. The exercises involve many departments and agencies in Kansas and nationally.

Vanier said although the exercises they have performed with the various agencies are extremely important, what also

is vital is the work they do before and after these "tests." Much planning happens before the exercise, and afterwards the entities involved see what went right and wrong; see what worked and what didn't.

"The goal is to replicate how such an event would actually be managed if it were to occur," said Jerry Jaax, associate

The center coordinates agricultural biosecurity activities with federal, state and local agencies as well as other universities and strategic partners.



The Biosecurity Research Institute at Kansas State University.

vice provost for research compliance and the principal investigator on the grant that established the National Agricultural Biosecurity Center. “We are testing the response plans — are they adequate, can we identify shortcomings, gaps, or disconnects between the plans of participants at different levels of government?”

These exercises help create emergency response plans, Jaax said. The center also is developing a CD-based training program to help Kansas counties draw up and evaluate written emergency response plans.

Another initiative of the center also aims to help emergency management personnel respond more effectively to an agricultural or zoonotic bioterrorist event. The project, “Situational Competency, Simulations and Lessons Learned for Food/Agricultural Bioterrorism,” is funded by the Department of Defense. K-State is working with subcontractors to scour the nation’s emergency response community for examples of significant lessons learned from agrosecurity response efforts, adapt existing software and technologies to handle agrosecurity issues, and create an integrated system accessible via the Internet. Users will have access to a lessons-learned database and a continuing education Web site.

K-State’s Biosecurity Research Institute, scheduled to be completed this fall, will be an asset of the National Agricultural Biosecurity Center, Vanier said. The institute will offer unique research capabilities not seen anywhere else in the nation.

“K-State has a record of national leadership in the areas of food safety and security,” said Jim Stack, director of the Biosecurity Research Institute. “The establishment of the National Agricultural Biosecurity Center is a statement of K-State’s commitment to maintaining that leadership, both nationally and internationally. The BRI is a significant step in creating the research and training infrastructure necessary to achieve agricultural biosecurity. Within this facility, important food safety and security

questions can be addressed and practical solutions developed and validated.”

Vanier said the Biosecurity Research Institute, a biosecurity level-3 laboratory building, can even serve as a back-up, or surge-capacity, laboratory in the wake of a disaster that might overload front-line laboratories.

“There is a new appreciation in this country and internationally regarding the threat of epidemic, or even pandemic, disease affecting us all,” Franz said. “In that past, we might have said, let the human health-care professionals take care of that problem. West Nile Encephalitis, SARS, Monkey Pox and highly pathogenic avian flu have changed all that. Each of those diseases — significant threats to humans — had their origin in animals. We can no longer afford to be content with our role as doctors to the animals and plants. We must develop in our students and our professionals a culture of looking for disease wherever it is found, not just when it affects humans directly.” ■

Papers & Presentations

Yanbin Li, Arkansas, delivered invited presentations in September on portable biosensors for rapid screening of avian influenza viruses of China at China Agricultural University in Beijing and South China Agricultural University in Guangzhou.

Li reported the following publication:

Liu, A., B.L. Swem, Y. Cheng and Y. Li. 2006. Disinfection of recirculated bacon chilling brine using flow-through electrolyzing treatment chambers. *Trans. ASABE* 22 (5): 737-745.

Abani Phadhan, Arkansas, won the 2006 Student Merit Award of the Society for Risk Analysis for his paper titled, “Exposure Assessment Simulation for Microbial Behavior of *Salmonella* During the Poultry Processing.”

Curtis Kastner, Kansas State, delivered the introduction in September for the Conference on Further Defining and Validating an Interdisciplinary Model for University Food Safety and Security Initiatives held Sept. 22 at KSU. The conference was funded by the U.S. Department of Agriculture Cooperative

Science, Research, Education and Extension Service. In November, Kastner also spoke on food safety and security at a KSU readiness conference.

Joseph Sebranek, Iowa State, delivered a presentation on “Prioritizing Research Needs for Ingredients, Processing and Packaging” in October at the Meat Industry Research Conference in Hollywood, Fla. In September, Sebranek also spoke on “Needle-free Injections for Improving the Safety and Reducing Defects of Pork Carcasses” at the Allen D. Leman Swine Conference in St. Paul, Minn.

Sebranek also received a USDA grant of \$539,962 for the National Integrated Food Safety Initiative project “Improving the Control of Bacterial Pathogens on Ready-to-Eat Processed Meats Manufactured to Simulate Traditionally Cured Meats but Without Direct Addition of Nitrite or Nitrate.”

Sebranek was also interviewed by KCCI-TV in Des Moines on food safety practices as a result of the spinach recall following the *E. coli* outbreak. ■

Food Safety Digest

by Dave Edmark

It's been more than a century since food safety became a matter of law in the U.S. During the summer, the U.S. Department of Agriculture Food Safety and Inspection Service led observances of the 100th anniversary of Federal Meat Inspection Act. President Theodore Roosevelt signed the measure into law on June 30, 1906. It required that meat products be inspected and mandated sanitary conditions for processing plants.

Anthony Arthur was among the speakers at the FSIS observance. He is the author of a recent biography of Upton Sinclair, the writer whose early 20th Century book *The Jungle* exposed conditions in the meat packing plants of the day and inspired the activism that led to the 1906 law.

"In 1906, early childhood mortality in America was high from maladies now largely overcome and rare because of laws like the FMIA," said Richard Raymond, USDA undersecretary for

food safety. "By incorporating science to an unprecedented degree, we are more effectively anticipating and eliminating threats to public health today and in the future."

Raymond was busy elsewhere last July. In a speech to the National Turkey Federation in Washington, he said USDA inspectors had begun sampling turkey carcasses for *Salmonella*, according to *Watt Poultry USA* magazine.

Raymond reported that 400 tests had been performed on turkeys in 34 plants by then, and that there had been a rate of 8 percent positive for *Salmonella*. He told the turkey processors that the figures were "a heads-up that you guys focusing in on your plants are doing well."

The effort represents part of the FSIS "war on *Salmonella*" announced in 2005. The agency is pursuing an 11-point plan to reduce the nation's salmonellosis rate from the 2005 level of 14.8 cases per 100,000 people to 6.8 cases per 100,000 people.

Raymond also noted that *Salmonella* testing on broiler carcasses in the first quarter of 2006 showed a 12 percent positive rate, down from 18.3 percent a year earlier.

The war on pathogens also continues overseas. The Dutch company EBI Food Safety has established the Phage Technology Center, reported by *Food Quality* magazine to be the West's "first facility for industrial scale production of bacteriophages and will serve as the company's research and development headquarters." The company says it is the first to have commercial bacteria-eating phage product on the market. Its Listex P100 fights against contamination by *Listeria monocytogenes*. ■

The Food Safety Consortium Newsletter

is a production of the three member schools of the consortium:
University of Arkansas,
Iowa State University and
Kansas State University.
Your comments are welcome.

David Edmark, Editor
110 Agriculture Building
University of Arkansas
Fayetteville, AR 72701-1201
Voice: 479-575-5647
FAX: 479-575-7531
E-mail: fsc@cavern.uark.edu
World Wide Web:
<http://www.fsconsortium.net>

The Food Safety Consortium

110 Agriculture Building
University of Arkansas
Fayetteville, AR 72701-1201

ADDRESS SERVICE REQUESTED

NON-PROFIT ORGANIZATION
U.S. POSTAGE
PAID
PERMIT NO. 278
FAYETTEVILLE, AR 72701-1201