

# The Food Safety Consortium Newsletter



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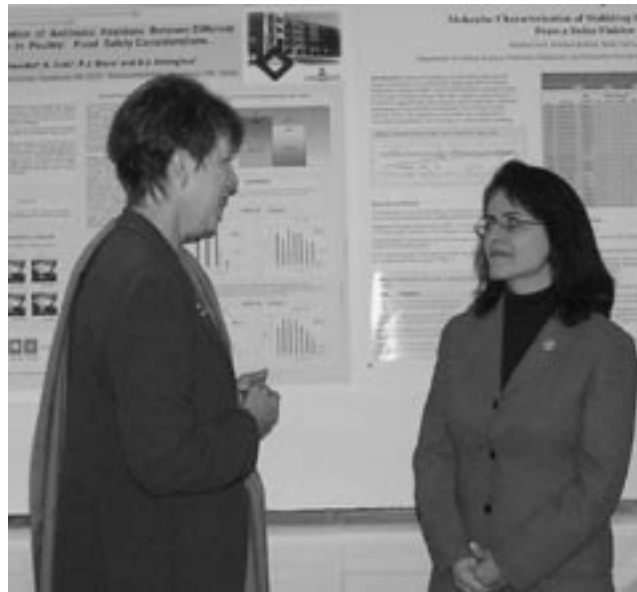
## Murano Addresses Impact of FSC Research

Recalling her earlier days as a Food Safety Consortium researcher, Elsa Murano returned to the FSC's annual meeting in October and reminded its personnel of their potential for affecting national food safety issues.

"I'm here to tell you the work you do does have an impact in real lives," Murano said during the keynote address at the meeting in Ames, Iowa. She is now the U.S. Department of Agriculture undersecretary for food safety. She had been a faculty researcher at Iowa State University in the 1990s.

Murano later went to a research position at Texas A&M University before joining the USDA administration in 2001. She recalled that she went to Washington "to inject science into policymaking on food safety."

Murano credited the late Charles Scifres with encouraging her to take the USDA appointment. Scifres, a former FSC coordinator when he was dean of agricultural, food and life sciences at



Catherine Woteki (left), dean of the Iowa State University College of Agriculture, confers with Elsa Murano, U.S. Department of Agriculture undersecretary for food safety, during the Food Safety Consortium annual meeting in October. Murano was keynote speaker at the meeting hosted by Iowa State and held jointly with the North Central Avian Disease Conference.

the University of Arkansas, later joined the administration at Texas A&M while Murano was there. Scifres emphasized to her the positive impact on food safety she could have at USDA.

Although the USDA Food Safety and Inspection Service — which Murano oversees — does not conduct research, it does use the information

*Continued on page 2*

## KSU Process Protects Ready-to-Eat Beef From Pathogen

The good news for consumers is that there are more ready-to-eat meat products on the market and that vacuum packaging has made it possible to keep them fresh in appearance and taste. The problem is that pathogenic bacteria can grow on the meat in this packaging at both room and refrigeration temperatures.

*Treatments reduced C. perfringens and suppressed its further growth.*

The better news is that Food Safety Consortium researchers at Kansas State University have found that a solution of sodium citrate can inhibit the growth of the bacterium *Clostridium perfringens* on restructured roast beef.

Ready-to-eat meats go through a mild heat treatment, but the treatment stimulates rather than reduces the growth of the bacterium in

vacuum packaging. One way to prevent the problem would be to follow federal guidelines to sharply cool down the meat within five hours. But not all of the current refrigeration technology makes that possible.

So, according to KSU food science professor Daniel Fung, "there is a need for additional secondary safety barriers in vacuum-packaged meat products that will help prevent the growth of anaerobic bacteria such as *C. perfringens* during

*Continued on page 2*



More than 50 research posters submitted by Food Safety Consortium personnel were on display during the FSC annual meeting in Ames, Iowa.

*Murano... continued*

generated by the USDA's Agricultural Research Service. Murano said she has had FSIS develop a proposed research agenda for ARS to follow. That agenda includes research into intervention strategies, sampling and detection, food security and risk assessment methods for evaluating program effectiveness.

She urged FSC researchers to work closely with FSIS and Food and Drug Administration personnel and to ask federal agencies what areas of research they need investigated.

Murano also called attention to the FSIS report on "Fulfilling the Vision," which notes the agency's accomplishments in recent years. (An article on that report is published in this edition of *The Food Safety Consortium Newsletter*.) ■

*KSU Process... continued*

cooling procedures."

*C. perfringens* is a common food-borne bacterium that the federal government reported was responsible for more than 6 percent of bacterial foodborne disease outbreaks in 2000. Its significance lies also in its designation by the Centers for Disease Control and Prevention as an organism that can produce toxin that could potentially be used in a bioterrorist attack.

Fung's experiments showed that all sodium citrate treatments reduced *C. perfringens* after the cooking step and before the end of the 18-hour cooling step and suppressed its further growth.

The process would be particularly beneficial to smaller meat processors that may not have the equipment to cool down their meat far enough fast enough. Fung said sodium citrate would create another hurdle to block the growth of *C. perfringens*.

"It's another safety measure in case something goes wrong," Fung said. "The antimicrobials would help control the food to make it safer."

With ground beef, results were similar after heating followed by cooling. "The combination of heat and sodium citrate proved to be an effective preventive method against *C. perfringens* growth by damaging the bacterium's cell structure," Fung said.

Fung said his research team continues to examine the issue by using electron microscope transmissions to study the mechanism of killing the pathogen. "We want to see whether the organisms disintegrate or whether the cell structure changes," he said, noting that industry could likely use such data. ■



Daniel Fung

# UA Law School Launches Journal of Food Law and Policy

The University of Arkansas School of Law is creating a new academic journal, the *Journal of Food Law and Policy*, to address legal issues in the rapidly evolving food industry. It will be the first of its kind in a U.S. law school and a suitable fit for the U of A, which is home to the National Agricultural Law Center, the leading national resource and provider of objective, scholarly and authoritative agricultural and food law research and information.

“Food law and policy is an emerging area of law that continues to grow in significance,” said Michael T. Roberts, research associate professor of law and director of the National Agricultural Law Center. “As the marketplace for food products becomes increasingly globalized, it is more important than ever for a law journal to be created to help develop a basic understanding and analysis of the complex array of laws and regulations that govern the manufacture and marketing of food.

“Plus this journal will be a fit for the university and the Northwest Arkansas economy because the local food industry is big nationally,” Roberts said.

Food law has grown in significance as industries that process, distribute and market food and fiber have rapidly evolved.

Practitioners who specialize in administrative law, international law, products liability, intellectual property, environ-

mental law, business law and many other sectors are frequently faced with cases and questions that require a knowledge of food law.

The articles published in the *Journal of Food Law and Policy* will address legal and policy issues and may include such topics as food safety, biotechnology, obesity litigation, international trade and standards, security and terrorism, food and dietary supplements, labeling and food products liability litigation.

The student-published journal will initially be published twice a year. The first editorial board, under the supervision of a faculty journal committee, chaired by Lonnie Beard, UA professor of law, will be responsible for the new journal. Six second-year students

have been chosen to comprise the first editorial board. They are Margie Alsbrook of Fayetteville, Ark., editor-in-chief; Jason Springman of West Fork, Ark., executive editor; Kelly DeGostin of Little Rock, Ark., articles editor; and Jason Milne of American



Michael T. Roberts

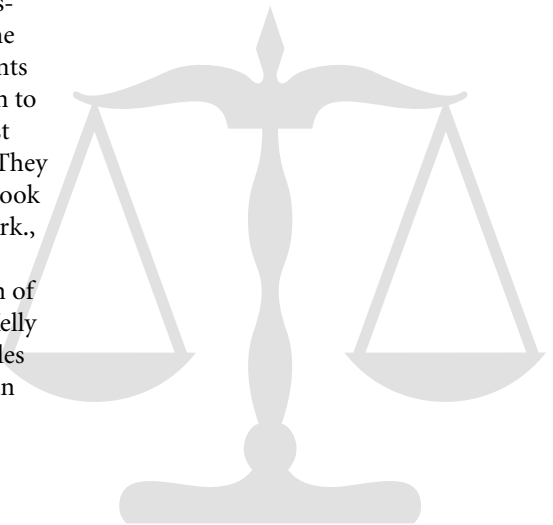
Fork, Utah; Adrienne Kincaid Murphy of Magnolia, Ark.; and Reagan Madison of Bartlesville, Okla., note and comment editors.

Roberts explained that they will solicit submissions for articles from scholars and legal experts across the nation. Students also may submit articles. He added that he and the board are currently compiling a list of people who have written in the

past four to five years about the journal’s subject matter.

The UA School of Law plans to host a symposium on campus to discuss food-related issues sometime next year. ■

*‘Food law and policy is an emerging area of law.’*



# Report from the Coordinator



Gregory J. Weidemann

The Food Safety Consortium completed a successful annual meeting in October hosted by Iowa State University. This meeting was beneficial for our personnel because not only did we exchange reports of our researchers' projects, but we also met jointly with the annual meeting of the North Central Avian Disease Conference.

It was a coincidence that worked out well. We realized a year ago that when it would be Iowa State's turn to host the Food Safety Consortium's annual meeting, which rotates among the three campuses, that the same hotel in Ames would also be the site of the NCADC meeting that rotates among several member institutions. The opportunity for the synergy between these two groups was too good to resist.

The result was a conference that was probably a better meeting jointly than either one might have had on its

own. In addition to hearing a keynote address from Elsa Murano, U.S. Department of Agriculture undersecretary for food safety and FSC alumna, (whose speech is covered elsewhere in this edition), the conference participants heard from Gregg Claycamp, scientific support staff director of the Food and Drug Administration's Center for Veterinary Medicine; Gay Miller, professor of veterinary pathobiology at the University of Illinois; Mary Torrence, national program leader for food safety at USDA Cooperative State Research, Education and Extension Service; and Rod Moxley, a veterinary pathologist at the University of Nebraska.

Break time and meal time offered consultation opportunities for about 100 FSC research scientists and graduate students and about 40 NCADC scientists. The two organizations broke into their separate sessions later in the meeting,

but the association clearly opened avenues of discussion.

Next year the FSC will meet Oct. 2-4 at Kansas State University and will likely return to its more traditional format of meeting on its own, spending more time hearing its faculty researchers and graduate students present reports of their findings from the previous months. But a joint session with peer groups such as the NCADC is a refreshing and invigorating way to keep research personnel in tune with changing developments in food safety. The FSC hopes to be able to hold another meeting similar to this one again in the future. ■

## Irradiation Poised Against 'Manufacturing Defects'

What if, asked Ronald Eustice, a Detroit automaker sold vehicles fully aware that three tenths of 1 percent of them had a production defect that each year could potentially lead to thousands of injuries and scores of deaths among its customers?

It probably wouldn't be tolerated. The fact that 0.32 percent of ground beef tested in processing plants in the first eight months of 2003 showed positive for *E. coli* O157:H7 makes a compelling case for the use of irradiation to stamp out that fraction of contamination, said Eustice, the executive director of the Minnesota Beef Council.

"When irradiated ground beef was introduced, consumers gained a reason-

able expectation of buying products that offered much greater food safety and lower risk," Eustice said in July at a meeting of the Institute of Food Technologists in Las Vegas. "The consequence of untreated ground beef acquired the character legally defined as having a built-in defect."

The situation is a potential legal problem. The American Legal Institute (ALI), Eustice said, defines as product as having a manufacturing defect "when the product departs from its intended design, even though all possible care was exercised in the preparation and marketing of that product."

Eustice further quoted the ALI as saying, "The product is defective in design when the foreseeable risks of harm posed

by the product could have been reduced or avoided by the adoption of reasonable alternative design or the omission of the alternative design renders the product not unreasonably safe."

Irradiation is a way to prevent "manufacturing defects," otherwise known to scientists as pathogenic bacteria, from forming in beef, but it has yet to become universally available. Its introduction in some of the ground beef sold in supermarkets was a breakthrough but many consumers still don't know about it or are skeptical.

"When irradiated ground beef was introduced, consumers gained a reasonable expectation of buying products that offered much greater food safety and lower risk," Eustice said.

Irradiated ground beef was first marketed in Minnesota in 2000 in 84 stores under the Huisken label. Today,

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*With irradiation, consumers expect greater food safety and lower risk.*

## ISU Reviews, Seeks to Improve Students' Ideas of Food Safety

High school students — who may prepare food at home or as restaurant employees — have their own perceptions about food safety. They're not always right.

According to an Iowa State University Food Safety Consortium survey published in the April 2004 issue of *Food Protection Trends*, students know that processed meat products can be sources of foodborne illness — but their concern was just average at 3.2 on a scale of 7. They also believe that food eaten at home is the least likely to cause illness, although evidence by researchers shows that consumers can make enough mistakes in the kitchen to endanger their food.

“Overall, students are inadequately and inconsistently informed about foodborne illness sources,” said Jason Ellis, a researcher in ISU’s Hotel, Restaurant and Institution Management (HRIM) program. “Students know which food products are most likely to cause foodborne illness, but have little concern about getting sick from these products.”

The survey, completed by 289 high school students, indicated that students believe the food handled at their school cafeterias is less likely to cause illness than food handled in restaurants. However, the students said they had more control over the safety of restaurant food compared to school food.

“I asked these questions multiple ways and it was reported that the home was identified as the safest source of food followed by schools and restaurants,” Ellis said. Students thought they had more control over food served in restaurants compared to schools. Ellis said one hypothesis would be that consumers have some choice over what to order and how it is cooked in restaurants, but schools typically do not serve food to order.

“The results show that there is a need for additional food safety educa-



Dan Henroid (left) and Jason Ellis examine food safety education in Iowa public schools.

tion in that population,” Ellis said. “The 16-18 age group makes up 30 to 32 percent of the food service work force. You want that population to be somewhat knowledgeable of the impact they can have through their work in service establishments.”

This is where ISU’s efforts to make more food safety information available on the World Wide Web fit well into potential food safety education for secondary schools. Dan Henroid, also a Hotel, Restaurant and Institution Management researcher, explained that food safety is already being covered to some extent in high schools with more than 95 percent of Iowa family and consumer science teachers responding to a survey reporting they include food safety topics in their curriculum. They mostly use textbooks, video tapes, and self-developed materials as food safety resources for instruction.

Henroid’s research group is developing other resources that can be plugged

into the secondary schools and other forums. One approach for disseminating food safety information is to visually demonstrate basic food safety concepts. Based on seven key food safety concepts, the ISU research team developed a Food Safety Education Fair (FSEF) in partnership with the Iowa Hospitality Association Educational Foundation.

“We developed many hands-on activities for seven basic food safety concepts, such as how to use a thermometer and hand washing,” Henroid said. “Each of the seven concepts was a booth with an instructor at each booth. Participants were divided into small groups. The students could see how to calibrate a thermometer and how to wash hands properly, and they could ask questions. Each booth had very teachable moments as everybody rotated through all the concepts.”

The ISU group plans to help secondary schools integrate these hands-on activities into their curriculum. FSEF materials and teaching guides can be downloaded at <http://www.extension.iastate.edu/hrim/training/fsef/>. Henroid indicated that food safety trainers could and do use many of the food safety demonstrations in their training programs

such as ServSafe®, a national food safety training program for foodservice workers developed by the National Restaurant Association Educational Foundation.

“Students represent a third of the foodservice work force. In secondary schools, many students are getting food safety training and other skills that are marketable to potential employers,” Henroid said. “We hope they will make better decisions about how they handle food in the food service operation because they have additional training.” ■

*There is a need for additional food safety education in the 16-18 age group.*

# FSIS Cites Progress in Food Safety Issues

The U.S. Department of Agriculture in July released “*Fulfilling the Vision: Initiatives in Protecting Public Health*,” a document that reviews recent successes and builds on the course laid out last year to improve the prediction and response to food safety challenges to further reduce the incidence of foodborne illness.

In 2003, Agriculture Secretary Ann M. Veneman challenged the Food Safety and Inspection Service (FSIS) to find creative and effective ways to continue to improve the safety of U.S. meat, poultry and egg products to better protect public health.

*Fulfilling the Vision* presents a list of accomplishments for 2003, which included enhancement to BSE safeguards, the development of new FSIS employee training programs, strengthened food security measures and modernization of enforcement activities. The document also introduces a number of new initiatives to continue FSIS’ mission of ensuring food safety.

“We must use science to identify our greatest challenges and meet them head-on,” said Elsa Murano, USDA undersecretary for food safety, during a news conference at the Institute of Food Technologists convention in Las Vegas. “Ensuring the safety of our food supply will require the active participation of everyone who produces, processes and prepares meat, poultry and egg products.”

Murano noted that FSIS initiatives to combat *E. coli* O157:H7 and *Salmonella* have resulted in significant reductions in illnesses from those organisms, as reported by the Centers for Disease Control and Prevention (CDC). For example, the CDC recently reported that illnesses from *E. coli* O157:H7 dropped by 36 percent from 2002 to 2003. CDC’s reported trends are also

reflected in regulatory sampling for the pathogens done by the Agency.

In *Fulfilling the Vision*, Murano lays out an agenda for the future improvement of food safety. These initiatives include:

- **Enhanced Data Integration** — FSIS is developing innovative ways to anticipate and predict food safety risks to protect public health. To do this, FSIS is examining ways to secure and analyze a wealth of data obtained from industry and other sources so that trends can be recognized and problems quickly identified and corrected.

- **Apply Risk into Regulatory and Enforcement Activities** — FSIS is beginning to field-test the Hazard Control Coefficient (HCC), a measurement of the effectiveness of pathogen controls used by individual establishments. The HCC establishes the level of plant compliance through an

analysis of in-plant and Agency verification testing, as well as inspection data. The HCC will help the Agency better understand the frequency and

types of food safety failures so that better responses can be designed and implemented.

- **Associate Program Outcomes to Public Health Surveillance Data** — FSIS is working with the Department of Health and Human Services’ Centers for Disease Control (CDC) and the Food and Drug Administration on public health trends. Data that links foodborne illness outbreaks with specific foods needs to be connected with prevalence data of specific pathogens in specific foods. The Foodborne Diseases Active Surveillance Network, or FoodNet, allows the Agency and its partners to work toward this end by determining the burden of foodborne disease, monitoring foodborne disease trends and determining the extent of foodborne

diseases attributable to specific foods. A critical component of this goal is the development of a mathematical model to help estimate illnesses caused by various food commodities.

- **Improving Food Safety Beyond Our Borders** — FSIS is working to establish a Food Safety Institute of the Americas to merge the region’s resources and provide a focal point for the exchange of food safety information throughout North America. FSIS wants to assist in the development of common food safety standards and harmonize food safety education, information and communication throughout the region.

The past two years mark the first time that FSIS has been able to perform in-depth, scientifically thorough audits of HACCP plans in meat and poultry plants, Murano said, “as a result of our being able to elevate the scientific proficiency of our inspection force, having consumer safety officers and other professionals. It’s not your father’s FSIS any more.”

Murano noted that the scientists at FSIS rely on epidemiological data generated by the CDC. “Whenever there are people getting sick from something that they ate, what are the organisms that they identify?” she asked. “We keep close tabs on that.”

FSIS has a staff person in residence at CDC’s Atlanta headquarters who participates in the CDC’s weekly discussions on infectious diseases. Murano called the procedure a strengthening of FSIS’ connection with CDC.

“Bacteria are very interesting things,” she said. “They change, they adapt, new strains come out. We want to be on the upside of that curve. These initiatives are designed basically to ensure that we discover these things before there is an outbreak and a need for us to recall products.”

The complete document can be found at <http://www.fsis.usda.gov>. ■

*FSIS has been able to perform in-depth, scientifically thorough audits of HACCP plans.*

## Irradiation... continued

Eustice noted, the product is in stores nationwide in 2,500 to 3,500 supermarkets. It is also available on the Internet from Omaha Steaks or Schwan's. Several hundred stores, mostly in the Southeast, also sell irradiated poultry, he said.

Opening the market to irradiated meat has required support from beef producers and education of consumers. The Minnesota Beef Council began in 1999 by serving more than 1 million samples at fairs and other events around the state. Surveys before consumers received samples at the state fair showed that 61 percent said they wouldn't buy irradiated meat. After sampling the product, 86 percent said they would buy it.

"This is our education program: identify the opinion leaders, educate the opinion leaders, manage the issues and then educate the consumers," Eustice explained. "We put on about 200 workshops in 30 states. We talk about history and the use of food irradiation, food safety, science and technology, consumer acceptance. We serve irradiated ground beef for lunch every time."

More studies indicate growing public acceptance. Eustice cited a Dairy Queen survey showing 97 percent approval of irradiated beef among 6,000 participating customers.

But many people still don't know enough to be sure. The National Cattlemen's Beef Association found that 41 percent of beef purchasers said they were not knowledgeable about irradiated beef, while 68 percent of retailers said they were slightly knowledgeable.

"What messages did they suggest?" Eustice asked. "How irradiation works, explanations of the process, why it's not a health risk, why it's safe."

Public schools are also picking up on irradiation. The 2002 Farm Bill offered school districts the option of serving irradiated ground beef in their cafeterias. This fall, 200 school cafeterias were planning to serve irradiated ground beef.

"We wish it was 2,000, but this is a darn good start, and it's in several states," Eustice said. ■

## Rapid Methods Workshop Plans 25th Anniversary at KSU

The annual rapid methods workshop hosted each summer at Kansas State University and directed by Daniel Fung of the Food Safety Consortium will hold its 25th session in 2005. The nine-day event will include a special day of celebration recognizing the milestone.

The XXV Quarter Century Gala International Workshop/Symposium on Rapid Methods and Automation in Microbiology will run from June 16 to 24 at the Holiday Inn Holidome in Manhattan, Kan. The celebration day will begin the workshop on June 16 with a series of afternoon lectures and evening festivities.

For those who do not plan to attend the full nine days, a mini-symposium is included within the workshop from June 16 to 18. Registration fees for only the mini-symposium is \$615. The cost for the complete nine-day workshop is \$1,995. Room rates at the hotel are \$72 a night plus tax.

Since the first workshop in 1980, the conference has attracted more than 3,500 participants from 46 states and 58 countries.

The full agenda is available online at <http://www.dce.ksu.edu/dce/cl/rapidmethods/2005>. For registration information, contact Debbie Hagenmeier at [debbieh@ksu.edu](mailto:debbieh@ksu.edu) or at 800-432-8222 within the U.S. or at 785-532-5575 from outside the U.S.

## Papers & Presentations

**Daniel Fung**, Kansas State, delivered a presentation on "Ethnic Food Safety and Control" at the Safe Food 2010 Conference in July in Phoenix. Also in July, Fung received the Distinguished Service Award from the Institute of Food Technologists Food Microbiology Division during the IFT convention in Las Vegas. In June, Fung directed the 24th International Workshop on Rapid Methods and Automation in Microbiology at KSU.

**Erdogan Ceylan**, Kansas State, and **Fung** published "Antimicrobial Activity of Spices — A Comprehensive Review" in the *Journal of Rapid Methods and Automation in Microbiology*, 12 (1): 1-55. **Vivian Wu**, **Vineet Gill**, **Robert Oberst**, **Randall Phebus** and **Fung**, all of Kansas State, published "Rapid Protocol (5.25 hr.) for the Detection of *E. coli* O157:H7 in Raw Ground Beef by an Immuno-Capture System (Pathatrix) in Combination with Colortrix and CT-SMAC" in the *Journal of Rapid Methods and Automation in Microbiology*, 12 (1): 67-68.

In a collaborative study with the University of Hawaii, **Fung** determined that the Fung Double Tube can detect and enumerate *Clostridium perfringens* from a water sample of 1 to 100 milliliters in six to eight hours.

**Curtis Kastner**, Kansas State, delivered presentations on "Response to Terrorism and Emerging Infections for Agribusiness" at the University of Kansas Medical Center in September in Garden City and Hays and in October in Emporia.

**Deanna Retzlaff**, **Randall Phebus**, **Abbey Nutsch**, **James Riemann**, **Curtis Kastner** and **James Marsden**, Kansas State, published "Effectiveness of a Laboratory-Scale Vertical Tower Static Chamber Steam Pasteurization Unit Against *Escherichia coli* O157:H7, *Salmonella* Typhimurium and *Listeria innocua* on Prerigor Beef Tissue" in the *Journal of Food Protection*, 67 (8): 1630-1633. ■

# Food Safety Digest

by Dave Edmark

The National Academy of Sciences (NAS) recommends that federal agencies assess the safety of genetically altered foods on a case-by-case basis to determine if there are any adverse effects on consumers' health. The report by an NAS panel was issued in July.

"All evidence to date indicates that any breeding technique that alters a plant or animal — whether by genetic engineering or other methods — has the potential to create unintended changes in the quality or amount of food components that could harm health, said Bettie Sue Masters, a University of Texas Health Science Center chemistry professor who chaired the NAS committee. "The possible impact of such compositional changes should be examined on a case-by-case basis to determine whether and how much further evaluation is needed."

The report noted that genetic engineering — defined by NAS as a specific type of alteration that uses molecular biology techniques to delete or transfer genes from one species to another — has not been documented to cause any adverse health effects among human. It is also not considered by NAS to be an inherently hazardous process, but the

report says the resulting food should be examined to determine if the inserted genes produce toxins or allergens. Any technique of genetic modification — including simple selection of plants with desired traits or cross breeding — carries some potential to result in unintended changes in food composition, NAS said.

The 256-page report, *Safety of Genetically Engineered Foods: Approaches to Assessing Unintended Health Effects*, is available through the National Academies Press at [www.nap.edu](http://www.nap.edu) in the Food and Nutrition link.

The benefits of lactate against foodborne pathogens were explained by Purac's Bert de Vegt and Hayley Walls in the June-July issue of *Food Quality* magazine. Lactate ingredients inhibit the growth of pathogens and extend shelf life by interfering with bacteria's metabolism. But the writers emphasized that lactate merely inhibits pathogens' growth and does not kill them.

"Sodium and potassium lactate are widely used to extend the shelf life and increase the safety of meat and poultry products," de Vegt and Walls wrote. "Universities and other institutions have extensively researched the antimicrobial effect of sodium and potassium lactate, and have demonstrated that lactate inhibits the growth of a wide range of gram positive and gram negative bacteria, spoilage organisms and pathogenic bacteria."

Managers of broiler plants told surveyors for *Watt Poultry USA* magazine that their biggest challenge is recruiting and retaining employees. Turkey plant managers said corporate pressure to reduce costs was their biggest challenge. But after those concerns, managers cited several food safety issues as their top problems: meeting zero tolerance for fecal contamination, meeting HACCP requirements, food safety of the finished product and meeting *Salmonella* performance standards.

The survey, which appeared in the August issue of the magazine, also noted that broiler managers are considering using new interventions on ready-to-eat products, such as antimicrobial product rinses, ozone, thermal treatment, ultraviolet light and ultra-high pressure.

Twenty-two of the 33 plants responding to the survey indicated they use a pre-chill antimicrobial rinse besides chlorine on their carcasses. The most popular rinse is chlorinated water, used by 17 plants, followed by 13 plants using trisodium phosphate. ■

## 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.

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