



The Food Safety Consortium Newsletter

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Brush on the Marinade, Hold Off the Cancerous Compounds

With the summer steak season in swing indoors and outdoors, cooks can season the meat on the grill and provide some protection against cancer all at the same time.

All it takes is marinating the steaks with certain herbs and spices. But before heading out to the grill, J. Scott Smith examined some possibilities in the laboratory. Smith, a professor of food chemistry at Kansas State University, investigated for the Food Safety Consortium what effect marinating steaks could have on reducing carcinogenic compounds known as HCAs.

“Heterocyclic amines (HCAs) in foods have been in the spotlight for many years,” Smith said. “They are carcinogenic and mutagenic compounds that are found at parts per billion levels in cooked fish and meats.”



Marinating steaks with certain herbs and spices rich in antioxidants can cut the carcinogenic compounds.

Previous research has shown that grilled beef is a major source of dietary HCAs when cooked at temperatures from 375 degrees F (190.5 degrees C) and above.

Consuming dietary carcinogens has been associated with different cancers

in humans, and one of the HCAs was shown this year to cause prostate cancer in rats. Smith said that’s why it’s necessary to find ways to prevent HCAs from forming in cooked meats.

“Cooking meats with natural antioxidants decreases or eliminates HCAs on meat,” Smith said. Consumers have responded favorably to natural food products in recent years, including natural spices, such as rosemary, which are rich in antioxidants.

Smith’s research group began experimenting with marinades containing herbs and spices, notably those related from the mint family such as basil, mint, rosemary, sage, savory, marjoram, oregano and thyme. Most of these herbs are rich in three compounds — carnosic acid, carnosol and rosmarinic acid —

Continued on page 2

Researchers Take Aim at Pathogen’s Antibiotic Resistance

Some samples of the pathogen *Campylobacter coli* showed resistance to antibiotics that were intended to protect swine from diseases, tests performed at Iowa State University revealed. There’s more to be learned about the situation, which is keeping Qijing Zhang’s research team busy this year.



Qijing Zhang

Wesley, a research microbiologist at the National Animal Disease Center in Ames, Iowa.

Zhang and Wesley are pursuing the research for the Food Safety Consortium. The matter of antibiotic resistance is a major one in scientific research these days. Zhang said although *Campylobacter coli* itself isn’t the main food safety concern, it could serve

as reservoir of resistance for *C. jejuni*, a major foodborne pathogen in the U.S. and other countries.

“In terms of foodborne diseases in humans, *Campylobacter jejuni* is the predominant species,” Zhang said. “*Campylobacter coli* causes some problems, but not as significant as *Campylobacter jejuni*. Also, pork meat is not a main source of human *Campylobacter* infection.”

So, the reason for concern is that *Campylobacter* in swine can be transmitted to other farm animals, where greater potential for infection of humans can begin. “Antibiotic resistance in swine is relevant to food safety, but in a dif-

Continued on page 2

Brush on the Marinade... *continued*

that are potent antioxidants.

“We believe that addition of various substances to the meat before cooking may reduce the carcinogenic HCAs,” Smith said. “Marinating steak before grilling is a practical way to reduce HCA contents of even well-done beef for many consumers.”

Smith’s group measured the HCAs in grilled round steaks and found that after marinating them with a commercial product containing rosemary and thyme, the cooked product’s level of reduced HCAs — an 87 percent decrease

— correlated to the amount of antioxidants present in the marinades.

The marinade containing rosemary and thyme had the greatest effect on reducing HCAs, but two other marinades with different herbs seasonings were tested and found to be almost as effective. The rosemary/thyme marinade also contained pepper, allspice and salt. Another marinade included oregano, thyme, garlic and onion. A third mari-

nade had oregano, garlic, basil, onion and parsley.

The marinades are all available in grocery stores. “These are the ones that are packaged as powders,” Smith said. “There are different brands.

We followed the marinating instructions according to the label. We cooked it and it tasted fine.”

Consumers can also add the herbs/spices directly to their product, such as ground beef.

Smith intends to investigate other seasonings to determine their potency in reducing HCAs. “I plan on taking a look at a lot of them, probably about 20 of them. The major ones are in the mint family: basil, sage, thyme, oregano and rosemary. They have some similar properties,” he said. Other possibilities for research include parsley, fennel, paprika, nutmeg, cloves and cinnamon.

Smith also wants to look into what possible changes that the antioxidants could cause with regard to taste, texture and nutritional content, if any. Results so far, however, do not indicate any major alterations are taking place. ■

“We believe that addition of various substances to the meat before cooking may reduce the carcinogenic HCAs,”

Researchers Take Aim... *continued*

ferent way,” Zhang explained. “It’s not like *Campylobacter* in poultry that can contaminate a bird or carcass.”

Zhang’s early results showed that *Campylobacter coli* was not resistant to the antibiotic ciprofloxacin (a fluoroquinolone), but he noted that was likely because ciprofloxacin is not used in U.S. swine production. Tests also showed that 56 percent of the *Campylobacter coli* isolates were resistant to the antibiotic doxycycline and 39 percent were resistant to erythromycin, another antibiotic. Fluoroquinolones and erythromycin are used in treating human *Campylobacter* infections.

“That’s why we need to put a lot of attention on ciprofloxacin and erythromycin,” Zhang said, “because these two classes of antibiotics are key weapons for treatment of people with *Campylobacter* infections.”

As the swine grow up and work their way through the production process, it might be expected that rates of

resistance to antibiotics would increase along the way. But Zhang’s research didn’t show that on the one farm that had been researched. More farms are to be examined at which different stages of the production process will continue to be monitored. He wonders if the antibiotic resistance shows up randomly or if it increases over time.

“We’d assume that when you put the pigs in the nursery and eventually the finishing stages, they will probably get more exposed with antibiotics and that selection procedure would promote more resistance,” he said. “But so far we have not seen a progressive increase. That’s something we’re trying to figure out to see if it happens all the time or if it happened just on this farm.”

Campylobacter in swine can be transmitted to other farm animals, where greater potential for infection of humans can begin.

Zhang also seeks to determine if there is a correlation between antibiotic usage rates and resistance to antibiotics. The research hasn’t verified that yet among the swine.

Zhang’s long-term goal, through studying the ecology of antibiotic resistance, is to develop practical management measures that might help farmers reduce pathogens’ resistance to antibiotics.

“We’re going to get some science-based data and hopefully that can be used for design of intervention strategies or modifying practices in the future,” he said. “At this point we still have lots of questions to be answered. We’re also trying to develop a rapid testing technique to detect antibiotic-resistant pathogens not only in life animals but in processed meat.” ■

UA Researchers Develop Portable Biosensor That Rapidly Detects Avian Flu

An interdisciplinary team of researchers led by Yanbin Li, professor of biological engineering in the University of Arkansas Division of Agriculture, has developed a portable biosensor for in-field, rapid screening of avian influenza virus.

The inexpensive device specifically and sensitively detects the avian influenza strain H5N1 from poultry cloacal or tracheal swab samples in less than 30 minutes and could help health officials coordinate a rapid response for the eradication, quarantine and vaccination of animals.

“Rapid detection is the key to controlling the spread of avian influenza,” Li said. “Techniques currently used to detect the disease are either time consuming, too expensive or not specific to subtypes of avian influenza viruses. Our device provides robust and reliable results and introduces the concept of real-time detection to facilitate a coordinated and rapid response.”

The research team, composed of Li; Billy Hargis, professor of poultry science; Steve Tung, associate professor of mechanical engineering; and Luc Berghman, associate professor of immunology at Texas A&M University, combined their expertise in biosensors, virology, immunology, microfluidics,

poultry diseases and micro-electro-mechanical systems to design, build and evaluate a prototype device that is portable and simple and provides rapid, specific and sensitive detection of avian influenza virus.

The biosensor is a portable instrument designed for field use. It can

be operated as a stand-alone instrument or connected to a laptop computer for data acquisition, analysis and control.

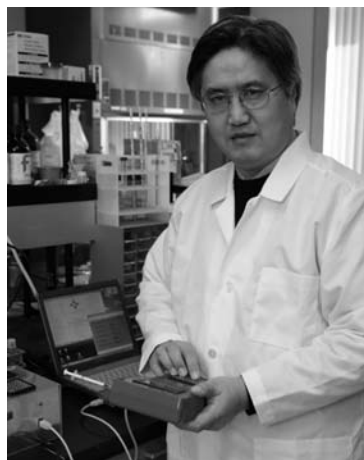
The researchers are currently pursuing funding for further testing and evaluation. Li said he expects the device to be ready for commercial production in one year. As a commercial product, the biosensor would cost less than \$8,000, Li predicted, and testing fees would be less than \$10 per sample.

Based on Li’s previous research on impedance biosensors to detect *Salmonella* and *E. coli*, the new system uses magnetic bio-nanobeads, a specially designed microfluidic biochip and red blood cell complexes to detect the virus. Detection follows a step-by-step process. First, researchers coat the magnetic nanobeads with specific antibodies to

separate and concentrate the target virus within a poultry swab sample.

Acting as bio-labels, red blood cells are then mixed with the captured virus to form a

complex, which is filtered by a specially designed, micro-fluidic biochip. The biochip then delivers the complex to a microelectrode array for measurement. Researchers detect the specific virus by correlating the change in impedance of the complex under high-frequency and alternating currents to the concentration



Yanbin Li

of avian influenza virus in an original sample.

To optimize the research prototype, the research team is currently developing specific monoclonal antibodies to different subtypes of avian influenza viruses. Another UA researcher, Ryan Tian, assistant professor of chemistry, is developing a titanium dioxide nanofiber to modify the micro-electrode for a more sensitive impedance

signal from the target virus.

When Tian’s work is completed, the research team will be ready to conduct field tests for the final evaluation of the technology. Working with specific monoclonal antibodies, Li is also collaborating with researchers at China Agricultural University to develop wireless communication, global positioning systems and imaging for the biosensor’s application to a rapid response to animal disease networks in China.

Avian influenza virus H5N1 was discovered in the late 1990s. Animal cases have been reported in more than 46 countries, and 10 countries have reported human infection. As of Jan. 22, according to the World Health Organization, 269 people have been infected, and 163 have died since 2003 due to avian influenza. Recently, a draft report of the U.S. government’s emergency plan predicts that as many as 200 million Americans could be infected and 200,000 could die within a few months if an avian flu pandemic were to reach the United States.

In the U.S., a 2001 and 2002 out-

Continued on page 7

The portable and simple device provides rapid and specific detection of the avian flu virus.

Food Defense: A New and Changing Field

The food industry is always looking out for new trends that affect food defense and potential bioterrorism. Barbara Rasco, a food science and human nutrition professor at Washington State University, explained that frequently changes in law and outside developments make the subject a moving target.

Rasco, speaking at the 2006 Institute of Food Technologists annual meeting in Orlando, noted that traceability is taking an increasing role in food defense with requirements on the industry. "Effective traceability programs that have been implemented in our food supply chain have been developed by the private sector and are market driven," Rasco said.

A related angle comes from the Sarbanes-Oxley Act of 2002, which was enacted by Congress corporate accounting scandals such as Enron's. "You wouldn't think that would affect food suppliers," Rasco said. "But because of Enron and all the things that came out of that, including the publicity over the convictions of some key Enron people,

we're getting more focused on company accounting oversight."

The industry is dealing with new legal standards that drive its approach to food defense. Rasco described one new standard as requiring companies to act if it has credible information or evidence that a threat is imminent to its food supply. It's less strict than earlier standards requiring action only if there is reasonable probability that exposure to a product would cause serious adverse consequences.

Food defense efforts can have far-reaching effects in today's terrorism-conscious world. Rasco told the story of a shipment of citrus, destined for Canada, that was transported from South America to New York in July 2004. The ship was stopped outside New York for several days as 400 of its 1,200 containers were detained.

Although the food wasn't going to be sold in the U.S., federal law said any product crossing the border has to comply with certain requirements, Rasco said. "So the Coast Guard stopped

the shipment and froze the fruit," she explained. "They held the shipment and tested the crew and didn't find any problems. By the end of the investigation 40 U.S. and federal agencies were involved in this. The ship with all of its cargo of all different types sat 11 miles offshore for 11 days."

The fruit product on the way to Canada wasn't removed and lost \$1.3 million in value because of the delay. "This looks to be a bit of an overreaction," Rasco said, "but if you look at the context of what was happening at the time, there were a number of threats." The Republican National Convention was scheduled soon in New York and security alerts were heightened. Law enforcement needed to protect the urban area, "but there wasn't any consideration given at all to the food businesses that were affected by this incident."

Rasco warned that the overall impact of the new emphasis on food defense would be to expect delays at customs checkpoints and detention and testing of more food crossing borders. ■

FSIS Proposes Timeline for Risk-Based Inspection in Processing Plants

The U.S. Department of Agriculture in February announced a timetable for introducing more robust risk-based inspection in processing plants, proposing to begin in April with 30 locations representing about 254 establishments and potentially expanding to approximately 150 locations by the end of 2007.

USDA said the Food Safety and Inspection Service intends to better utilize the information regularly col-

lected by inspection program personnel at processing establishments to improve food safety. By taking into account the relative risk of what each processing plant produces and how each plant is controlling risk in its operations, FSIS seeks to allocate inspection resources more effectively to those processing plants needing it the most, while continuing daily inspection at all processing facilities.

The level of inspection at a process-

ing plant will be based on a number of objective factors such as public health-related inspection non-compliances and FSIS microbiological testing results. The inspection level will be updated each month so that inspection resources can be adjusted as conditions change. USDA said this system will be more proactive in terms of preventing human illness and will yield greater confidence that meat, poultry and egg products are safe.

Continued on page 5

FDA Prepares New Produce Safety Guidelines

The Food and Drug Administration in March published draft guidelines advising processors of fresh-cut produce how to minimize microbial food safety hazards common to the processing of most fresh-cut fruits and vegetables, which are often sold to consumers in a ready-to-eat form.

The document — available online at <http://www.cfsan.fda.gov/~dms/prod-gui3.html> — suggests that fresh-cut processors consider a state-of-the-art food safety program such as the Hazard Analysis and Critical Control Points system, which is designed to prevent, eliminate or reduce to acceptable levels the hazards associated with food production.

“Ensuring the safety of the American food supply is one of this Agency’s top priorities,” said FDA Commissioner Andrew C. von Eschenbach. “Americans are eating more fresh-cut produce, which we encourage as part of a healthy diet. But fresh cut-produce is one area in which we see foodborne illness occur. Offering clearer guidance to industry

should aid in the reduction of health hazards that may be introduced or increased during the fresh-cut produce production process.”

Processing produce into fresh-cut product increases the risk of bacterial contamination and growth by breaking the natural exterior barrier of the produce by peeling, slicing, coring or trimming the produce with or without washing or other treatment before the produce is packaged for consumers. Examples of fresh-cut products are shredded lettuce, sliced tomatoes, salad mixes (raw vegetable salads), peeled baby carrots, broccoli florets, cauliflower florets, cut celery stalks, shredded cabbage, cut melons, sliced pineapple and sectioned grapefruit.

Consumers can reduce their risk of illness from fresh-cut produce by following safe handling practices such as refrigerating the product after purchase; using only clean hands, utensils or dishes in preparing the product; and discarding the product when the “use by” date has expired.

The guide complements FDA’s Current Good Manufacturing Practice regulations for food and provides a framework for identifying and implementing appropriate measures to minimize the risk of microbial contamination during the processing of fresh-cut produce. Specifically, it discusses the production and harvesting of fresh produce and provides recommendations for fresh-cut processing regarding several elements: personnel health and hygiene, training, building and equipment, sanitation operations and production and processing controls. The guide also provides recommendations on record-keeping and on recalls and tracebacks.

The guide also recommends that processors encourage the adoption of safe practices by their partners throughout the supply chain, including produce growers, packers, distributors, transporters, importers, exporters, retailers, food service operators and consumers. ■

FSIS Proposes Timeline... continued

Risk-based inspection in processing establishments has benefited from the input and expertise of all stakeholders during its development.

“To continue to prevent foodborne illness, we have to improve our prevention capabilities, not just respond quickly after an outbreak occurs,” USDA Under Secretary for Food Safety Richard Raymond said. “Our inspectors visit every one of these plants every day, and that won’t change. What will change is we will no longer be treating every plant like every other plant in terms of its adverse public health potential, and we will start

using the information and the inspection expertise we already have in ways that better protect consumers.”

Raymond noted that incorporating risk prevention more thoroughly into inspection activities has been an ongoing process at FSIS, from the implementation of the Hazard Analysis and Critical Control Points system in 1998 to the 2006 *Salmonella* reduction initiative.

Raymond said that gradually implementing risk-based inspection will ensure that all aspects of the program can be thoroughly evaluated and revised as needed before it is expanded

nationwide. He added that the open and transparent process that has characterized the initiative will continue with the scheduling of a series of technical briefings to discuss the use of production volume, industry data, non-compliance records, expert elicitations and foodborne disease attribution data as part of a more robust risk-based inspection system. ■

K-State Ramps Up Its Role in Livestock ID Effort

With interest in the origins of their food growing among U.S. consumers and overseas buyers, Kansas State University researchers are taking a lead role in evaluating electronic technologies that track livestock movements.

A technology that shows promise in tracking an animal's life from birth to death is the Radio Frequency Identification (RFID) system, which involves the use of tags on cattle. An RFID tag is a small object that can be attached to or incorporated into an animal — in the case of cattle, on the animal's ear. The tag contains a silicon chip and an antenna that enables it to receive and respond to radio-frequency queries from an RFID transceiver.

K-State's efforts were bolstered by a \$441,430 USDA Animal and Plant Health Inspection Service cooperative agreement announced in 2006. The agreement allows K-State professor of animal science Dale Blasi and other K-State researchers to work with the Kansas Animal Health Department (KAHD), the Kansas Department of Commerce (KDC) and other agencies and companies to study factors that compromise electronic technologies designed to track cattle movements.

The KDC provided an additional \$30,000 to help the collaborators determine what the technology and cost requirements will be for cattle auction markets to comply with a cattle identification system.

"The opportunity to conduct this research in both laboratory and practical cattle-working environments will enhance our understanding of the application and provide realistic expectations of what this technology can provide for U.S. beef producers," said Blasi, who leads the KSU Animal Identification Knowledge Laboratory.

Other K-State researchers working with Blasi on the project are professors of agricultural economics Ted Schroeder and Kevin Dhuyvetter and professor of

statistics Jim Higgins. Other collaborators include Cargill Meat Solutions, National Beef Packers, Tyson Foods, the Livestock Marketing Association and several companies that manufacture animal identification technology.

The project has three main objectives, Blasi said:

- To characterize the incidence and extent of ambient environmental interference affecting radio frequency tag and reader function in commercial cattle auction market sites, cattle abattoirs (packing plants) and commercial feedlot processing facilities

- To determine the extent of variation of read-range performance by numerous electronic tag and reader manufacturers' products, as affected by the location where the tag is applied to the animal's ear.

- To determine the amount of new investment in technology and the additional variable costs in equipment, facilities and management that cattle auction markets would need to incur to comply with a cattle identification system.

While the research will yield information that will benefit the U.S. livestock industry and beef consumers, there is another beneficial component, Blasi said. K-State students who assist in the research effort will take away invaluable experience that they can carry into their careers once they leave the university.

In addition to the research, university faculty have held and participated in educational sessions for producers and others who are interested in livestock identification. ■

Survey Reports Decline in Consumers' Confidence in Food Safety

Foodborne illness outbreaks and high energy costs are significantly changing consumer shopping behavior and attitudes, according to "U.S. Grocery Shopper Trends, 2007," a study released in May by the Food Marketing Institute. The number of consumers "completely" or "somewhat confident" in the safety of supermarket food declined from 82 percent in 2006 to 66 percent — the lowest point since 1989 when the issues of pesticides in apples and contaminated grapes were widely reported. Consumer confidence in restaurant food is even lower at 43 percent.

"These findings send a strong message to the entire food industry," said FMI President and CEO Tim Hammonds. "All of us need to work together to be sure our consumers continue to receive the high quality, affordable food they have every right to expect."

The survey found that safety concerns prompted 38 percent of consumers

to stop purchasing certain foods in the past 12 months — up from 9 percent in 2006. Among those who stopped buying products, the items most often mentioned were spinach (71 percent), lettuce (16 percent), bagged salad (9 percent) and beef (8 percent). The survey was conducted in January 2007, when the outbreak linked to spinach was still in the news and illnesses associated with other foods were starting to make headlines.

Data for "U.S. Grocery Shopper Trends, 2007" were collected through surveys conducted by Harris Poll Online among a nationally representative sample of 2,307 U.S. shoppers. Respondents must have met the following requirements to participate in the survey: a minimum of 15 years of age, primary or equally shared responsibility for food shopping, and they must have shopped for groceries in the past two weeks. ■

Johnson Honored for Service



Dr. Michael Johnson (right), a University of Arkansas professor of food science, accepts a plaque from Dr. Neal Apple (center), Tyson Foods vice president for food safety and laboratory services, expressing the company's appreciation to Johnson for more than 20 years of "invaluable service to Tyson Foods, Inc. and the food industry." Jacqueline Adams (left), senior microbiologist and head of the research team in the Tyson Food Safety and Research Laboratory in Springdale, holds a framed display of a newspaper article showing Johnson attending the 2001 ground-breaking of Tyson's food safety laboratories. Johnson, a member of the UA food science faculty since 1984, has worked closely with Tyson personnel on food safety issues and research projects. He also served from 1997 to 2005 as the research

program coordinator of the UA component of the federally funded tri-state Food Safety Consortium. "The true legacy of your career in food science is a network of food safety professionals who consider you professionally and personally as a mentor, role model and friend," the plaque states. Johnson was presented the honor at the end of a department faculty meeting.

UA Researchers Develop... continued

break of low pathogenic avian influenza, which poses no threat to humans, resulted in the loss of more than 4.5 million chickens and turkeys and is estimated to have cost the poultry industry approximately \$125 million. According to a World Bank report, by mid-2005 more than 140 million birds had died or been destroyed worldwide, and losses to the poultry industry are estimated to be more than \$10 billion.

The research is supported by the University of Arkansas System's Division of Agriculture, the Division's Center of Excellence for Poultry Science and the Arkansas Biosciences Institute. ■

Papers & Presentations

Curtis Kastner, Kansas State, spoke in March on farm safety awareness at the KSU Agricultural Center in Hays, Kan. In February, he spoke on "Agriculture Research and Education Serving the Nation: Protecting the Homeland" at the National Association of State Universities and Land-Grant Colleges in Washington.

David Larson, Arach Wilson and Irene Wesley, Iowa State, co-authored an invited presentation, "Clinical Aspects of Veterinary Listeriosis," delivered to the International Symposium on Problems of Listeriosis in March in Savannah, Ga.

Wesley also presented a seminar describing the introduction of *Salmonella* and *Campylobacter* into the turkey brooder house. The pre-

sentation was delivered in March at the annual meeting of the North Central Association of Avian Pathologists in St. Paul, Minn.

Wesley was invited to give a presentation on "Foodborne Pathogens of Public Health Significance" to faculty and veterinary students in February at Tuskegee (Ala.) University. Wesley also presented a summary of her *Campylobacter* and *Salmonella* research at the annual meeting of the Agricultural Research Service-Food Safety Inspection Service (ARS-FSIS) Research Planning Workshop in February in Shepherdstown, W.Va. She also reported this publication:

Wesley, I.V. 2007. Listeriosis. E. Ryser and E. Marth, eds. Francis and Taylor. Third edition. ■

Food Safety Digest

by Dave Edmark

When the Food and Drug Administration spoke last fall about spinach, consumers listened. But the results of a survey showed that some of them should have listened more closely.

The Food Policy Institute at Rutgers University examined consumers' reactions to the FDA's warnings in September that bagged fresh spinach had been contaminated by *E. coli*. The survey — conducted in November by interviewing 1,200 people by telephone — found that 87 percent of respondents knew about the contamination and 84 percent knew that the spinach had been recalled from the stores.

Among those who knew about the recall, 95 percent knew that fresh bagged spinach was the target. But among those aware of the recall, only 68 percent knew that loose fresh spinach was also recalled. Fifty-seven percent knew that the recall did not affect frozen spinach and 71 percent knew that it didn't affect canned spinach.

Despite the high rate of awareness of the situation, not everyone heeded the advice. Thirteen percent of those who ate spinach before the recall said they

ate fresh spinach during the recall, with 74 percent of that group reporting they knew about the recall.

Another 18 percent of those who knew about the recall of bagged spinach said they also stopped buying other types of bagged produce that weren't implicated in the recall.

Although the main goal of the recall was met, said FPI director William Hallman, "fewer Americans were aware of important details related to the recall. Many were confused about the type of spinach affected, where it was grown, the organism that caused the contamination, the symptoms of the resulting illness, and perhaps most significantly, whether or not the recall had ended."

Ninety-one percent of the spinach eaters said they had already resumed eating spinach or planned to do so within several months. Five percent said they would never eat spinach again.

■ ■ ■

The Center for Food Integrity has been established as a non-profit organization supported by 20 organizations from the food industry, government and education. A statement on the center's Web site announced that it was formed "to serve as a resource where consumers and other stakeholders can find accurate, balanced information about the food system and engage in constructive dialogue on important issues affecting the production and supply of food in the U.S." It also said the center's mis-

sion would be "to build consumer trust and confidence in the contemporary U.S. food system by sharing accurate, balanced information, correcting misinformation, modeling best practices and engaging stakeholders to address key issues."

The center will establish leadership teams to address the issues of health and nutrition, food safety, worker care, environment and animal well being.

The center's Web site is at www.foodintegrity.org.

■ ■ ■

Recent research by the U.S. Department of Agriculture has found that low-dose irradiation is sufficient to kill pathogens in ground beef. Scientists at the USDA Agricultural Research Service in Clay Center, Neb., realized that ground beef can be a difficult target for eliminating pathogens as the bacteria become mixed into the meat. It was already known that high-level irradiation can easily kill the pathogens, but it would also alter the odor and flavor of the beef.

So researchers tried low-dose, low-penetration electron beam irradiation that only penetrates 15 millimeters below the surface on the carcass before the meat was cut and made into ground beef. The experiments showed that the low dosage could kill the pathogens and not alter the smell or taste of the meat after it was turned into ground beef. ■

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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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