



The Food Safety Consortium Newsletter

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The *Listeria* That Won't Die: How Much Damage They Can Do

Meat processors already know that dangerous *Listeria monocytogenes* bacteria can withstand some major assaults. They sanitize the food processing environment and heat their products to kill the bacteria on cooked and ready-to-eat meats, but a few of the bacteria are merely injured or starved and live to cause trouble another day.

Federal regulations have a zero tolerance standard for *Listeria monocytogenes* in ready-to-eat products, so it's important for processors to find ways to beat back every last bacterium. That leaves research scientists in the position of figuring out how much damage the injured or starved bacteria can do if left unchecked.

They can do quite a bit of damage even after several months in a starved state, according to new research results. Ramakrishna Nannapaneni, a food sci-

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Ramakrishna Nannapaneni, a University of Arkansas food science researcher, examines starved cells of *Listeria monocytogenes* impact on targeted mouse cells

The *Salmonella* That Won't Die: Why They Live

Despite efforts to remove harmful bacteria from food, some bacteria don't die. They persist. Some of them tolerate a number of lethal conditions: they are starved and then grow stronger from the experience, they resist antibiotics, they withstand elevated temperatures.

Finding out why they are surviving

and going after the last stragglers among foodborne pathogens is the mission of Gregory Phillips, a Food Safety Consortium researcher at the Iowa State University College of Veterinary Medicine.

"I think there are questions out there that are still very fundamental in

nature but no one's provided any mecha-

nism or appealing explanation," Phillips said. "One of those was the idea of bacterial persistence."

Phillips examined the pathogen *Salmonella* Typhimurium and its ability to survive the adverse treatments normally used to control it. He tested the pathogen against two antibiotics, ampicillin and ofloxacin, and found that some of the bacteria were able survive by altering their physiological makeup and increasing their tolerance.

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Some cells are founders for the next round of growth once the stress is relieved.

The Listeria That Won't Die...

continued

ence research associate for the University of Arkansas, has been exploring the issue for the Food Safety Consortium with a research team led by professor Mike Johnson.

"There has been a tremendous effort to find out virulence differences within *Listeria monocytogenes* for risk assessment needs," Nannapaneni said, pointing to the bacterium's damaged cells. "The next logical question is how long they remain virulent. That's been the focus of our work."

The situation is relevant for food processing facilities in which *Listeria monocytogenes* cells are depleted of their nutrients but recover sufficiently to become a threat. Good cleaning practices are necessary in food processing environments, but Nannapaneni noted that inadequate chemical sanitizing can leave

some bacteria alive and virulent.

The Arkansas experiments tested *Listeria monocytogenes* cells that had been starved for 196 days and those that had not been starved. The healthy cells were strong enough to kill 90 percent of a target mouse cell population within two hours of release. The starved and injured cells, after more than six months of languishing, still had enough strength to kill 60 percent of their target cell population within six hours, then 90 percent of the target after eight hours.

"Most of the phenomenon is that the starved ones take a

little longer to wake up," Nannapaneni said. "Once they wake up, they have the strength to go forward."

The food processing industry has 99 percent of the cases under control, Nannapaneni said, and is aiming at the rest. "They are very serious about this organism," he continued. "They are taking powerful measures for preventing

cross-contamination or eliminating it." Even with a limited amount of cross-contamination, the virulence of the surviving bacteria makes them targets for elimination.

This project used mouse hybridoma cells to demonstrate the power of starved *Listeria monocytogenes*. The next step is to test the bacteria on human cell models to discover if they are equally susceptible and how quickly they can be infected.

Then it's time to determine what controls are necessary to kill the starved pathogens. It's already known, from Food Safety Consortium research conducted by Aubrey Mendonca of the Iowa State University food science faculty, that starved *Listeria monocytogenes* cells show increasing resistance to stresses such as irradiation.

"It's important to understand how these starved cells are waking up and how to suppress them," Nannapaneni said. "The long-term starved cells become smaller and coccoid (spherical shaped), but they still remain viable and virulent." ■

Starved bacterial cells sitting in saline can be alive and virulent for 200 days.

The Salmonella That Won't Die...

continued

"You will very rarely sterilize a culture of bacteria with antibiotics," Phillips explained. "You can knock down large numbers of them and for therapeutic uses that's usually sufficient to allow your body to clear out bacteria. But there's always the subpopulation that we say persists or is tolerant."

These subpopulations pose a mystery because they survive conditions that kill the other bacteria in their larger group. The situation could be an important food safety issue if a particular bacterial population can't be completely eliminated. Although Phillips' use of antibiotics in his experiments is a model, the antibiotics are comparable to the kinds of real-world stress — such as heat — that can injure, but not kill, some foodborne bacteria.

The survivors could spawn greater numbers. Phillips describes the bacteria as colonies with identical clones, each expected to behave identically. "If everybody doesn't behave identically and some cells survive, those cells are founders for the next round of growth once that stress is relieved," he said.

The more that *Salmonella* can tolerate stress from heat or antibiotics, its population can regrow after the stress stops.

Phillips noted a further danger than a mutation could result from gene transfer and lead to the emergence of a newly resistant strain of bacteria.



Gregory Phillips

"Studies are continuing to characterize these persistent mutants," Phillips said. "We have some mutants now and we're looking at them. That's something we can get some numbers on and quantify better." ■

Burgers On; Hold the Onions and Pass the Rosemary

Hamburgers may be a bit safer thanks to a dash of rosemary on the grill.

Extracts of rosemary have been found in recent years to have beneficial effects on food. The latest one is that the spice can reduce the levels of carcinogenic compounds in grilled ground beef patties. The compounds — heterocyclic amines, known generally as HCAs — are found in cooked fish and meats. HCAs are produced in protein-rich muscle foods that have been barbecued, grilled, broiled or fried. They have also been linked in epidemiological studies to various cancers.

“Rosemary is a hot antioxidant right now. It’s real popular,” said J. Scott Smith, a food chemistry professor at Kansas State University, where he is researching the extract for a Food Safety Consortium

project. Antioxidants are often used in food additives to guard against deterioration of food.

Smith’s experiments sought to

find out how much HCAs can be reduced in ground beef patties after the patties are fortified with rosmarinic acid and carnosic acid, two natural antioxidants extracted from rosemary. The results showed that two HCA compounds were reduced at cooking temperatures of 375 and 400 degrees Fahrenheit, but two others were not. More studies are being conducted to determine

if temperature adjustment might make a difference with the compounds that weren’t reduced.

“We’re going to continue this line of research and try to narrow down some of the chemicals in some of the spices because they’re loaded with antioxidants,” Smith said. “Another thing would be to try some

of the things that people put on their foods when they put them on the grill.”

Smith explained that many spices containing antioxidants are now being



J. Scott Smith

used on some meat products for better color stability and flavor stability, particularly in pre-cooked meats.

At KSU, Smith is also evaluating the effects of added spices on the production of acylcyclobutanones (ACBs) in irradiated ground beef. Over the last couple of years there have been concerns raised that ACBs may be carcinogenic.

At some point in the future, Smith expects there to be some increased government concerns about HCAs in meat with a strategy developed to reduce them. Many of the HCAs found in cooked muscle foods were designated as likely carcinogens in the recent 11th *Report on Carcinogens* published by the U.S. National Toxicology Program. ■

‘Rosemary is a hot antioxidant right now. It’s real popular.’

\$7 Million Allocated for BSE, Food Safety Research

Agriculture Secretary Mike Johanns announced in March that almost \$2 million in funding has been redirected to enhance research on bovine spongiform encephalopathy (BSE) and that \$5 million has been awarded to 17 colleges and universities to establish a Food Safety Research and Response Network.

“In a rapidly changing world marketplace, science is the universal

language that must guide our rules and policies, rather than subjectivity or politics,” said Johanns. “Expanding our research efforts to improve the understanding of BSE and other food-related illness pathogens will strengthen the security of our nation’s food supply. These projects will help improve food safety by enhancing our research partnerships with the academic community and establish another tool to aid our

response to food-related disease outbreaks.”

Johanns made the announcement during keynote remarks at the National Restaurant Association and National Food Processors Association Food Safety Summit. The BSE research funds, redirected by USDA’s Agricultural Research Service, will be used for new BSE projects and facilities and build

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Report from the Coordinator



Gregory J. Weidemann

At the beginning of the research process, it's not always easy to take the long view and think about where it's all going, or how long it will take for any findings to work their way into something that enhances the public good. Food safety is no exception. So it is always heartening when new statistics are handed down that tell us our research took us to a desired goal.

The big news in March was an announcement by the U.S. Department of Agriculture Food Safety and Inspection Service of a 43.3 percent decrease during one year in positive samples of *E. coli* O157:H7 in ground beef. The agency treated 8,010 samples and found 0.17 percent positive for the pathogen in 2004, down from 0.30 percent in 2003 and from as much as 0.86 percent in 2000.

Dom Castaldo, the editor of MeatNews.com, explained it in consumer-oriented terms. "Those are pretty good odds against getting sick from contaminated beef," he said. "It essentially means that if you ate

a hamburger for lunch every day for about three years, you may eat one that contained *E. coli* O157. And if that one contaminated hamburger was handled and cooked properly, it would be unlikely you would have become ill."

The credit, as usual, goes to the role of science and those who practice it. Barbara Masters, FSIS acting administrator, said strong science-based policies aimed at reducing pathogens made the difference.

The sentiment was echoed a few days earlier in a speech by Elsa Murano, the former USDA undersecretary for food safety and currently dean of agriculture and life sciences at Texas A&M University. She told the USDA Agricultural Outlook Forum that government has advanced the use of science in food safety policies by facilitating the development of peer-reviewed risk assessment procedures and approval of food decontamination methods. Murano also said she would like to see small scientific advisory panels established that would be available to

government policymakers.

The bottom line to Murano's remarks is that funding of land-grant agricultural experiment stations — such as the Food Safety Consortium universities, for example — is important because they "provide the needed foundation that allows for sustainable research efforts over the long term."

The progress made in reducing *E. coli* in ground beef in the past few years is just one example of research driving improvements in the safety of the nation's food supply. Research personnel, industry officials and government policymakers did their share to make it that way, with science as their guiding light. ■

\$7 Million... continued

upon President Bush's fiscal year 2006 budget proposal, which would increase BSE research by \$7.3 million or 155 percent over 2005 funding levels.

The newly funded projects include international collaborations with the Veterinary Laboratory Agency in Great Britain to study the biology of the BSE agent, the Italian BSE Reference Labora-

tory to evaluate present diagnostic tools for detecting atypical BSE cases and the University of Santiago de Compostela in Spain to compare North American and European BSE strains.

Expanding food safety research will strengthen the security of the nation's food supply.

About \$750,000 will go toward a biocontainment facility now under construction at the ARS National Animal Disease Center in Ames, Iowa. These facilities will eventually allow

the long-term study of BSE infection in cattle and other large animals, which can take a decade or more.

USDA's Agricultural Research Service has been a leader in research on transmissible spongiform encephalopathies (TSEs) such as scrapie, which affects sheep, and chronic

wasting disease in deer. ARS developed the immunohistochemistry test that is currently used as the gold standard in the United States to confirm a diagnosis of BSE. ARS has an annual budget of

nearly \$10 million for TSE research and 15 scientists involved in the research, primarily in Ames; Pullman, Wash.; and Albany, Calif.

The Food Safety Research and Response Network, spearheaded by North Carolina State University, will include a team of more than 50 food safety experts from 18 colleges and universities who will investigate several of the most prevalent food-related illness pathogens. Pathogens such as *E. coli*, *Salmonella* and *Campylobacter* will be studied to determine where they are found in the environment, how they are sustained and how they infect herds. This team of researchers brings a broad range of expertise to tackle these persistent research challenges.

The group also will serve as a response team that can be mobilized

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Science on Trial: Scientists Guard Credibility

Scientific research in food safety and other areas is considered to be “on trial” by many people outside the research community who are suspicious of its procedures and results. Academic, industrial and government scientists are targets of the skepticism.

An academic scientist, nutrition professor Kristine Clark of Pennsylvania State University, says the communication of science to the public is on trial because if academicians “have worked for industry as a consultant, they’re considered tainted or biased. If they’ve received industry funding, they are considered partially biased. If they’ve even served on an advisory board, scientists are considered biased.”

It shouldn’t be that way, Clark explained at a panel in July at the Institute of Food Technologists convention in Las Vegas. But the problem persists partly because university scientists are “sometimes sequestered away, doing research but not sharing or communicating the ideas or the results of what we are researching.”

The academic-industry collaboration is helpful for both parties, she said. Industry wants to use outside scientists who have no financial stake in their business and to enhance industry’s credibility. Meanwhile, the academic researcher has the opportunity to work in a different environment and reach a larger audience.

Many critical standards come out of the research performed in industrial and academic laboratories, Clark said. Her own professional organizations — the American Dietetic Association, the Society of Nutrition Education and the National Research Council — “collectively look at hundreds of studies

that have come out of multitudes of laboratories, and that’s how they create guidelines, recommendations and position papers.”

Industry, she continued, evaluates the dietary recommendations that the professional organizations produce while it notes what consumers want. Then it tries to meld the concepts into a product.

“Scientists can assist industry in furthering their quest for understanding the relationship between food, ingredients and health,” Clark said. “Scientists and academics can assist in communicating

public health messages. The two together can be powerful in positively impacting health behaviors.”

The public also has frequent questions about the government’s regulatory efforts and what influences its decisions. Robert

Brackett, the director of the Food and Drug Administration Center for Food Safety and Applied Nutrition, said several developments have prompted people to be suspicious about the food safety regulatory process.

“One is the change in technology over the last 50 or so years,” Brackett said. “You’ve got many new sorts of technology that are in the food industry which the consumer has not really seen before — certainly not our parents or our grandparents. Irradiation of foods, use of modified atmospheric packaging — it goes on and on. So many times people are automatically suspicious of any kind of new technology, so consequently they’ll be suspicious if they don’t understand the science behind it.”

Add to that the matter of consumers becoming more aware of specific hazards even if they don’t know what they mean. Consumers are taking more interest in their health, he said.

Brackett explained that it is in this atmosphere that FDA seeks to safeguard its scientific credibility. It maintains a system of advisory committees that holds public meetings where its scientific discussions are held to explain how particular decisions are reached.

One special panel, the National Advisory Committee on Microbiological Criteria for Foods, is managed by several federal agencies. It focuses only on science, not policy, Brackett said. Policy is left to the advisory committees.

Within FDA is its Science Board that includes experts in food safety, drugs, communicable diseases and bioengineering. “They take a broad view and will look at some of the food issues that we deal with and make public recommendations on the scientific significance of those,” Brackett said.

The FDA Food Advisory Board addresses how and if technology processes work and their impact on public health. If the agency is considering a new regulation, this committee will examine it to see if there is sufficient science in support of the idea.

“It also serves as a forum for consumer input on scientific issues because they are held in public and time is allotted for public comment,” Brackett said. “It allows for some debate or an indication the public may have a different view than scientists. Quite often the consumers or the private comments will bring up aspects the committee hadn’t thought about, a good starting point for further discussion.”

At the end of the process, communication remains vital. Brackett acknowledged that much of the process is invisible to the public.

“Something that I hope to do more of in the future is show a little bit more background of what happens behind the curtain at FDA,” he said. ■

‘Scientists can assist industry in furthering their quest for understanding.’

BSE Security Topics at OFPA Convention

The BSE crisis resulted in the U.S. losing beef markets in 21 nations, which must be regained one at a time. Japan was the market that the U.S. most wanted to recover and did so in October 2004, but not without long and detailed negotiations. More work remains to implement the new agreement, explained Gary Smith of the Colorado State University animal sciences faculty.

Smith, speaking to the Ozark Food Processors Association 99th annual convention on March 30 in Springdale, Ark., discussed his role as a member of technical committees representing the U.S. in the talks with Japan. He currently serves on a U.S. Department of Agriculture team working with Japan to develop a program to implement resumption of the beef trade.

"We're also now working on a national animal identification system after the Japanese wanted to know how we identify them," Smith said. "We haven't (been identifying them), so Japan showed us how they do it. It will use electronic ear tags and global positioning systems. But we're six or seven years away from that."

The U.S. lost the markets after December 2003 when the nation's first BSE case was found. Recovering the markets was vital, Smith said, "because we were selling as our top beef export items lots of things that very few of us eat." Beef tongues, for example, are rarely consumed in the U.S. and sell here for only 22 cents per kilogram. But tongues are popular in China and can sell for \$9.90 a kilogram.

Smith traced the U.S. experience with BSE to 1989, when federal officials sought to guard against the disease by banning the import of cattle and

beef from the European Union. The ban had originally been proposed in 1987 but was held up for two years.

"Unfortunately, we were our own worst enemy," Smith said. "Between 1987 and 1989, Canada and the U.S. brought 449 cattle from the United Kingdom to the U.S., half of which were never found. Almost certainly, the cases that we have here originated from cows that were brought here between 1987 and 1989."

The U.S. also began surveillance programs in the 1990s by testing brain stems of cows that acted odd or were dead on arrival at rendering plants, Smith said. Feeding of meat and bone meal to ruminants was banned. But by May 2003 Canada reported the first North American case of BSE and the first U.S. case occurred nine months later.

While BSE is a naturally occurring food safety problem, processors are also watching out for food security problems that can be prevented. Rod Wheeler, food security head for the Food Products Association (formerly the National Food

Processors Association), told the OFPA that the industry is working with government and law enforcement agencies to stop intentional

contamination before it happens. The FPA has a food security council of about 50 security directors from corporations throughout the nation, Wheeler explained. Its food security alliance includes food safety and quality assurance personnel.

In exercises to determine their level of preparation, Wheeler said, the partici-



Gary Smith

pants have found there is not enough communication between government and industry nor is there enough between government agencies themselves.

In a hypothetical incident, he said, "Public health comes in and says, 'We're in charge,' because it's a food-related incident. So one person dies, so now you have an FBI agent and it's a criminal

investigation. You have an epidemiologist come in. So where does industry come in? We need to talk through these things now, go through these scenarios and establish protocols before an incident occurs."

Nancy Nagle, director of product development for Wal-Mart Stores, said the emphasis on security extends to her company's relations with its suppliers. She said new suppliers are subject to a facility audit.

"We want to know what our quality assurance programs are and what your food safety programs are. We've recently added what are your food security programs. We want to know whether somebody can just walk into a plant and wander around or if you've got perimeter fencing."

The OFPA convention this year attracted 91 exhibitors with 550 people attending. Thirteen University of Arkansas students were awarded scholarships sponsored by OFPA and its members.

OFPA officers elected for 2005-2006 are Steve Crider of Gerber Products Co., president; Justin Morris of the University of Arkansas Institute of Food Science and Engineering (IFSE), executive vice president; Renee Threlfall of the UA IFSE, secretary, and Mike Heilman of the UA IFSE, treasurer. ■

'Unfortunately, we were our own worst enemy.'

Yanbin Li, Arkansas, published two articles in refereed journals recently:

- Yang, L., and Y. Li. 2005. AFM and impedance spectroscopy characterization of the immobilization of antibodies on indium-tin oxide electrodes and their capture of *E. coli* O157:H7. *Biosensors & Bioelectronics*, 20 (7): 1407-1416.

- Su, X.L., and Y. Li. 2005. Surface plasmon resonance and quartz crystal microbalance immunosensors for detection of *Escherichia coli* O157:H7. *Transactions of the American Society of Agricultural Engineers*, 48 (1): 405-413.

Li also presented these papers at professional meetings:

- Li, Y., Q. Sun, M. Varshney and X. Su. 2005. Immuno-nanobeads based QCM biosensor for rapid, sensitive and specific detection of *Escherichia coli* O157:H7. IBE 2005 Annual Meeting, March 4-6, 2005, Athens, Ga.

- Su, X., and Y. Li. 2005. A quartz crystal microbalance immunosensor for detection of *Salmonella* Typhimurium based on simultaneous measurements of resonant frequency and resistance. PITTCON 2005 Annual Meeting, Feb. 27-March 4, 2005, Orlando, Fla.

- Varshney, M., and Y. Li. 2005. Magnetic nanoparticle-antibody conjugates for highly efficient separation of *Escherichia coli* O157:H7 from food samples. IBE 2005 Annual Meeting, March 4-6, 2005, Athens, Ga.

- Yang, L., X. Su and Y. Li. 2005. Quantum dot bioconjugates for simultaneous detection of *Escherichia coli* O157:H7 and *Salmonella* Typhimurium. PITTCON 2005 Annual Meeting, Feb. 27-March 4, 2005, Orlando, Fla.

Li reported the issuance of a patent:

- Compadre, C.M., P.J. Breen, H. Salari, E.K. Fifer, D.L. Lattin, M.F. Slavik, Y. Li, T. O'Brien, A. Waldroup and T. Berg. 2005. Concentrated, non-foaming solution of quaternary ammonium compounds and methods of use. U.S. Patent No. 6,864,269, March 8, 2005.

Li was also interviewed for a busi-

ness section article in the Feb. 13, 2005, edition of *The Morning News of Northwest Arkansas*.

Evelyn Dean-Nystrom, National Animal Disease Center, published the following refereed journal articles:

- Pohlenz, J.F., K.R. Winter and E.A. Dean-Nystrom. 2005. Shiga-toxigenic *Escherichia coli*-inoculated neonatal piglets develop kidney lesions that are comparable to those in humans with hemolytic-uremic syndrome. *Infections and Immunology*, 73: 612-616.

- Jordan, D.M., V. Sperandio, J.B. Kaper, E.A. Dean-Nystrom and H.W. Moon. 2005. Colonization of gnotobiotic piglets by a *luxS* mutant strain of *Escherichia coli* O157:H7. *Infections and Immunology*, 73: 1214-1216.

- Winter, K.R.K., W.C. Stoffregen and E.A. Dean-Nystrom. 2004. Shiga toxin binding to isolated porcine tissues and peripheral blood leukocytes. *Infections and Immunology*, 72:6680-6684.

- Stoffregen, W.C., J.F.L. Pohlenz and E.A. Dean-Nystrom. 2004. *Escherichia coli* O157:H7 in the gallbladders of experimentally infected calves. *Journal of Veterinary Diagnostic Investigation*, 16: 79-83.

- Pohlenz, J.F., and E.A. Dean-Nystrom. 2004. Colonization of *Escherichia coli* O157:H7 on squamous epithelial cells at the rectal anal junction, (letter to editor). *Veterinary Record*, 155: 248.

- Jordan, D., N. Cornick, A.G. Torres, E.A. Dean-Nystrom, J.B. Kaper and H.W. Moon. 2004. Long polar fimbriae contribute to colonization by *Escherichia coli* O157:H7 in vivo. *Infections and Immunology*. 72: 6168-6171.

- Dean-Nystrom, E.A. 2004. Neonatal piglets as EHEC infection models. *FeedInfo: Scientific Reviews*, Aug. 2, 2004.

Nystrom's work was featured in an article by Luis Pons, "Targeting *E. coli* Infections at Their Source" in the August 2004 edition of USDA's *Agricultural Research* magazine, 52 (8): 14-15.

Curtis Kastner and Justin Kast-

ner, Kansas State University, and **Jan Sargeant**, McMaster University, published a commentary posted online by KSU's Food Science Institute, "Food Safety and Security: More Discipline(s) Required" at <http://fss.k-state.edu/research/commentary>. ■

\$7 Million... continued

to conduct focused research to control major episodes of food-related illnesses. Episodes could include investigation of health problems associated with agricultural bioterrorism and the deliberate contamination of agricultural commodities. USDA's Cooperative State Research, Education, and Extension Service (CSREES) provided funding for the award.

The 17 other institutions in the project are: Cornell University, Iowa State University, McMasters University, Mississippi State University, North Dakota State University, The Ohio State University, Tuskegee University, University of Arizona, University of California at Davis, University of California at Berkeley, University of Florida, University of Illinois, University of Kentucky, University of Minnesota, University of Montreal, Washington State University, and West Texas A&M University. ■

Food Safety Digest

by Dave Edmark

The federal government is working to establish a Food Emergency Response Network Division that would manage more than 90 laboratories across the nation to detect and identify biological, chemical and radiological agents in food. FERN will have components in the U.S. Department of Agriculture Food Safety and Inspection Service and the Food and Drug Administration. The network of laboratories will be able to respond quickly to emergencies.

“Developing a network of laboratories that can communicate effectively and work together applying consistent laboratory practices will increase our ability to prevent and respond to possible attacks or emergencies involving food,” said Merle Pierson, acting undersecretary of food safety. “FERN not only allows us to strengthen our national laboratory system, it also improves cooperation and communication between public health officials at the national, state and local levels.”

FERN laboratories will analyze surveillance samples, validate new methods used to detect threat agents in food product and ensure the security and safety of facilities and employees.

■ ■ ■
The subject of establishing a single food safety agency comes up from time to time. The latest instance is the release of a report from the Government Accountability Office in February that said consolidation of the various federal agencies involved in food safety would result in more efficient and better-targeted inspections, according to the Associated Press. The report stopped short of recommending such consolidation.

The GAO studies regulatory procedures in seven countries that have a single food safety agency — Canada, Denmark, Germany, Ireland, the Netherlands, New Zealand and the United Kingdom. Improvements in those countries included “less overlap in inspections, greater clarity in responsibilities and more consistent or timely enforcement of food safety laws and regulations,” the report said.

The AP quoted Sen. Dick Durbin of Illinois as saying the report shows that a single agency “with clear and independent authority will ensure that food safety is driven by science, not politics.” Durbin is sponsoring legislation to create a single food safety agency.

■ ■ ■
And what ever happened to Jack in the Box, the San Diego-based fast food chain that became nationally infamous in 1993 when the deaths of three Seattle children were blamed on *E. coli* O157:H7 in its hamburgers and 400 people in

three Western states became sick from infection?

The December-January edition of *Food Quality* magazine says the crisis was “perhaps the dawn of modern food quality and safety.” The chain of 1,950 restaurants rolled out a HACCP program that became a model. Last June, the International Association for Food Protection presented its Black Pearl award to the company for “its efforts in advancing food safety and quality through consumer programs, employee relations, educational activities, adherence to standards and support of the goals and objectives of the association.”

Darren Blass, director of quality assurance and product safety for the company, told the magazine that Jack in the Box seeks to share its HACCP system with the entire industry. “We go out and speak at industry gatherings,” he said. “We visit various aspects of the food chain — restaurant companies, processing companies and raw material manufacturers. We’ve even had many folks come in, and we tell them the story. It has been very well accepted and very much embraced. We enforce it. We teach it. We preach it.” ■

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