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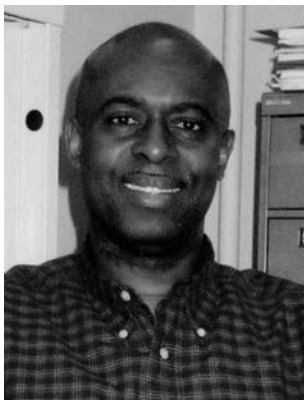
In the Processing Plant, Pathogens Learn to Survive the Stress

There's no doubt that irradiation is effective at eliminating pathogenic bacteria from meat in a processing plant before it's shipped out. But irradiation can be less effective if plant personnel don't use it in sufficient doses and if they don't account for the strength of the bacteria they're trying to kill. Some of the bacteria may be stronger than meat processors realized, and bacteria left for dead may rise up and haunt the processors.

The problem arises because pathogenic bacteria can develop resistance to food processing methods as they grow in a processing plant's environment, explained Aubrey Mendonca, an Iowa State University food science researcher. They can adapt to the stressful conditions they encounter and become hardy enough to survive a dose of irradiation if the dose isn't strong enough.

"Many processors do not use the maximum level of irradiation because of quality reasons," said Mendonca, who is researching the problem for the Food Safety Consortium. "A maximum level of irradiation may detract from the desirable sensory qualities of the meat. What they try to do is find a dose that would still give them good food safety protection against pathogens."


Aubrey Mendonca

When food processors determine at what level they will irradiate meat, they often look for the most effective minimum dose — a level that will kill the pathogens without detracting from the meat's taste, aroma, appearance or other sensory qualities. That determination is usually made by relying on studies that show how much irradiation is needed to kill pathogens such as *E. coli* O157:H7, *Salmonella* Typhimurium or *Listeria monocytogenes*.

Mendonca said the flaw in that approach occurs when processors use studies of pathogens that are cultured under optimal growth conditions in a laboratory. The conditions that those microorganisms face in the laboratory are not as stressful as the situations encountered by the bacteria seeking to survive in a processing plant's environment. In fact, growth conditions in laboratory media rarely produce stress-hardened bacteria.

Mendonca's studies have shown that these starved bacteria that must compete within the more rugged environment of a processing plant develop greater abilities to resist adversity simply because they must adapt to their living conditions or die. So when they are the targets

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New UA Bacterial Culture Reduces Poultry Pathogens; Researcher Aims Higher

Some commercial poultry processors have begun using a bacterial culture developed at the University of Arkansas that can sharply reduce the levels of pathogenic *Salmonella* and *Campylobacter* in live poultry.

This probiotic holds potential economic benefits for the industry as it improves its food safety efforts. And for poultry science researcher Billy Hargis, it's still not enough.

"We have not bothered to patent this specific culture because we don't think this is the best we can do," said Hargis, who is working on the Food Safety Consortium project in the UA Division of Agriculture. "We think we can find better cultures. This is just the best we have found so far. We think we can make it more effective."

The culture is unique because unlike previous cultures that have been tested, this is a "defined culture" — entirely derived from a single defined group of bacteria. "They're known organisms, specific isolates that are well characterized," Hargis said.

The probiotic cultures are applied to the concept of competitive exclusion, in

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continued

of irradiation, these starved bacteria may not die but may merely be injured unless a higher dose of irradiation is administered.

"For example, if I go to the literature right now it says you can eliminate 100,000 *Salmonella* cells in chilled ground beef with about 3 kiloGrays (the measurement unit for irradiation dosages)," Mendonca said. "These data are not based on the highly resistant cells. They're based on cells grown in the laboratory. So the processors might have a false sense of security in using less of an irradiation dose to save quality and believing that they're actually eliminating the pathogen."

The solution would be for processors to base their irradiation levels on what it takes to kill stress-adapted organisms instead of laboratory-grown organisms, he said. Government regulations limit how high a dose of irradiation is allowed, but the rules do not set a minimum level for those processors who choose to irradiate.

Relatively small increases in irradiation dose can significantly raise effectiveness of the process.

Processors generally do not want to use the maximum dose when irradiating, but they might not need to do so. Mendonca pointed out that irradiation destroys bacteria exponentially — increasing in powers of 10 — so relatively small increases in irradiation dose can significantly raise effectiveness of the process.

Mendonca's results were gathered from experiments testing the ability of starved cells of *Salmonella* Typhimurium to survive following the irradiation of ground pork. Additional research would be needed to evaluate the resistance capabilities of other stress-adapted foodborne pathogens.

Industry is becoming aware of the need to watch for the resistant bacteria. Mendonca noted that some processors are starting to rotate sanitizers because the constant use of one sanitizer could enable microorganisms to become resistant. "Many processors use two or three different sanitizers and will change every month," he said. ■

New UA Bacterial Culture…
continued

which different species compete to coexist. The plan in poultry production is to introduce the beneficial good bacteria into a live bird to drive out the harmful pathogenic bacteria. The federal Food and Drug Administration does not allow undefined cultures to be used in competitive exclusion, so the defined cultures produced by Hargis' research group fill a need for industry.

"Our cultures are different because they can be truly defined and they can be reproduced from specific isolates that are stored back in the freezer," he said. "Then they can be propagated virtually forever."

At the poultry production farm level, the probiotic culture has been administered to chicks through their drinking water and by spray application. In addition to cutting down on pathogens in the live poultry, the culture has also been found in experiments to be effective in increasing the birds' weight, lowering production costs and reducing environmental contamination in poultry houses.

Emphasis on food safety is mostly concentrated at the processing plants where companies employ numerous techniques to eliminate bacterial contamination in the stages before a poultry product is packaged for sale. Processors can find their work made easier if they receive a supply of live birds at the plant that have already been exposed to pathogen-reducing exercises.

Ph.D. student Lisa Bielke of Houston, Texas, streaks Salmonella *culture on a plate treated with* lactobacilli*, a beneficial bacteria that can be used to treat bacterial infections in poultry gastro-intestinal tracts.*

So producers of live poultry would have significant incentives to use a probiotic culture if it not only reduces pathogens but also provides financial benefits against the usual costs of doing business.

"Our premise has been that if we can do something that provides an economic advantage in addition to reducing foodborne pathogens, then we might see more rapid adoption of the technology," Hargis said. "We've had quite a bit of commercial adoption in the past year. We have several companies that are using the product at least intermittently."

In addition to seeking ways to perfect the probiotic culture, Hargis also wants to pursue more study of its ability to reduce carcass contamination. Some experiments have shown such reductions, but more data are needed.

"*Salmonella* does not occur by spontaneous generation in a processing plant. It comes in with the live animals. I think it's a pretty good bet that reducing *Salmonella* in live animals will end up reducing *Salmonella* in food because that's where it comes from," Hargis explained. "Our focus now is to make the culture better and find other isolates that are more effective." ■

After BSE Found, Consumers Still Demand Beef — Cautiously

Shortly after the first case of BSE (mad cow disease) was discovered in the U.S. in December 2003, a Kansas State University survey asked consumers how the news had affected their beef consumption habits. Seventy-seven percent said their consumption had not changed. Of those whose consumption had changed, the respondents reported they were consuming less ground beef, hot dogs and steaks.

As things turned out, the market data showed that for the first quarter of 2004, just after the discovery of the first U.S. BSE case, there was no weakening of domestic beef demand. Sean Fox, the KSU agricultural economics researcher who conducted the survey for the Food Safety Consortium, wasn't surprised.

"The discrepancy between actual market behavior and survey data may be partly a result of non-response bias, with those who felt most strongly about the issue being more likely to reply," Fox said, "or hypothetical bias in the responses themselves, with individuals responding in the way they felt they ought to and thereby indicating that their consumption had fallen."

Or, Fox said, the respondents may have actually reduced their consumption of certain beef products, but only for a short time and not long enough to be reflected in market data.

"Every time you do a survey you face that kind of bias in the responses," Fox explained. "That's the reason we find it so hard to predict what would happen if we had another case."

In early 2004, Fox also asked respondents how they would react if a second BSE case were discovered. They appeared to be less tolerant of BSE the second time around: 44 percent said they would reduce their beef consumption.

Sean Fox

Consumers appeared to be less tolerant of BSE the second time around: 44 percent said they would reduce their beef consumption.

But once again, the respondents may not have put their professed intentions into practice at the marketplace. A second BSE case in the U.S. was confirmed in June 2005. As in the first case, meat from the affected cow did not enter the food supply. And also as in the first case, domestic beef demand did not suffer.

If repeated multiple cases of BSE were found in the U.S., the survey suggests that there would be major trouble for the beef industry. Surveyors asked what consumers would do if 20 cases of BSE were discovered, but the responses varied according to how the question was framed.

When asked only if 20 cases were found, 43 percent said their consumption of beef would fall and another 26 percent said they would stop consuming any beef. But among people who were asked two questions together — one asking their reaction in the event of one BSE case and the next question asking their reaction to 20 cases — 39 percent said their beef consumption would decrease and 45 percent said they would cut out beef completely.

"These results show how responses depend on how the question is framed," Fox said. "It's still very difficult to predict exactly what would happen if we do have multiple cases. The best we can do is put out accurate information about the fact that the risk to consumers is incredibly low." ■

Report *from the* Coordinator

Gregory J. Weidemann

All who make food safety their chief concern would be pleased if a greater emphasis on public education led to a better public awareness of what makes their food safe and what can put it at risk. A more realistic attitude is that food safety advocates could find themselves in for a long wait before public education reaches an arbitrary desired level.

Doug Powell, an associate professor at the University of Guelph (Ontario) and scientific director of the Food Safety Network, had some observations on this matter of risk communication. In September 2000, he wrote in the *Canadian Journal of Animal Science* that many politicians, company executives and academics view better education in scientific matters as a way to overcome public fears about food safety. But the public education model, Powell said, has failed.

"What is known is that levels of perceived trust in technology promoters and regulators is a better predictor of consumer support," Powell said. "People either trust that pesticides and agricultural biotechnology are adequately regulated or they do not. Those with low trust have the highest concern about possible risk. Those with high trust perceive greater benefits from both products."

Research projects cited by Powell conclude that trust is a top factor in risk perception, which "can help explain why consumers are concerned about food safety issues that scientists deem trivial." So even if risk factors remain the same, public perceptions of risk may be high, which forces public policy to deal with the situation.

"Instead of the inherent safety or danger of a particular food product or technology being the influencing factor of risk perception, trust in government and industry is more important," Powell wrote.

Powell noted a research paper by Lynn Frewer of the United Kingdom agriculture ministry 10 years ago that helps tell the story. The respondents whom Frewer interviewed indicated that they trusted scientists and medical sources, but the respondents infrequently cited them as sources of food-related information.

One strategy toward increasing public trust is the producer-led risk management program. Powell pointed to HACCP systems as an example of food producers taking control of food safety that demonstrates their awareness of consumer concerns.

"Producer-led risk management programs are an action, an appropriate risk management strategy, to demonstrate to consumers that producers are cognizant of their new-found concerns about food safety, and to demonstrate that producers and others in the farm-to-fork continuum are working to reduce levels of risk," Powell said. "Because when the next outbreak or crisis of confidence comes — and microorganisms can adapt and evolve to any food production and distribution systems that are created — producers need to demonstrate due diligence to minimize potential losses."

The lesson about trust comes through loud and clear. Proactive leadership geared toward ensuring a safe food supply is the best form of risk management and risk communication. Whether the efforts are taking place at the academic research level or at the industrial end, consumers will judge for themselves whether adequate progress is being made. Public education about our scientific findings is still a worthwhile pursuit, but the public will decide based on what results are delivered. ■

Raymond Advises to Look Outside the Box for Creativity in Food Safety

These are excerpts of remarks by Under Secretary for Food Safety Dr. Richard Raymond before the National Advisory Committee on Meat and Poultry Inspection, Nov. 15, 2005, in Washington.

… Your work here today and tomorrow on important questions regarding our move toward a more robust risk-based system will have a profound impact on the future of food safety in the United States. NACMPI has been providing the USDA with advice and recommendations regarding meat and poultry inspection programs for nearly 25 years. In the eyes of some, the urgency and necessity of NACMPI's mission has declined in recent years. They say it is because the issues you have been asked to comment on have often not been politically charged. Today that will change.

I did not leave the comfort of Nebraska to serve just as the caretaker of a good system. Both Secretary Johanns and I want to push the envelope in food safety and public health. …

Our current system, while strong, was based, in part, on the world as we knew it in 1906. It is not suited to the future realities of food safety and public health. I was recently talking to Dennis

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Food Safety Is 'Cornerstone' of Food Defense

Food defense is not the same as food safety, warned Robert L. Buchanan, a Food and Drug Administration official. The two are closely linked, but food defense "requires a different thought process in terms of the agent, the site contamination and the intentions that are involved."

Buchanan, director of the Office of Science at FDA's Center for Food Safety and Applied Nutrition, delivered his remarks in July at the Institute of Food Technologists convention in New Orleans.

"Food defense typically enhances food safety," Buchanan said. "Food safety is the cornerstone of food defense."

Food safety is generally regarded as a way to deal with unintentional problems in the food supply as an ongoing activity. Food defense deals with terrorism against food by an intentional agent that is sporadic in nature and directed toward an unknown threat.

Organizations that practice food defense must consider potential threats, the food of concern, the purpose of the terroristic act, the terrorist's skill and the terrorist's access to the food supply.

"You have to make some informed decisions about what the agents (of terrorism) are likely to do," he said. "Is it a purpose of the terrorism you're trying to anticipate to kill, to incapacitate or to simply disrupt the economy? We have to have some realistic estimates of what the availability of the agents are and the knowledge base of the terrorists, and finally the suitability of the specific food as a means of dissemination."

A vulnerability assessment consists of the factors that determine the likelihood that a foe will succeed.

FDA has conducted assessments of threats and vulnerability, he said. Buchanan defined a threat assessment as the evaluation of a foe's intentions and capabilities. A vulnerability assessment consists of the factors that determine the likelihood that a foe will succeed.

"We have used the vulnerability assessments in developing a variety of programs related to defense including training and priorities for our emergency response plan," Buchanan said. "We plan to use this to develop our research priorities both internally and externally."

Another approach to food defense is operational risk management, which Buchanan said was similar to HACCP. "It's a systematic process where you identify hazards and assess risks, analyze risk control measures, make some decisions about the measures you're going to put in place, supervise and review it. It's a farm-to-table type of approach."

Buchanan described the CARVER model as another technique of food defense. CARVER (Criticality, Acccessibility, Recuperability, Vulnerability, Effect and Recognizability) serves a shock model and a measure of the psychological and economic impact of an event.

"You break down the food system into its smallest pieces," he said. "You identify the critical nodes all the way from farm to fork, identifying which would be the most likely target if you were a terrorist. Then you develop means of hardening the sites so you avoid the problem." ■

KSU Plans 26th Rapid Methods Workshop in July

The 26th International Workshop/Symposium on Rapid Methods and Automation in Microbiology is set for July 14-21 at the Holiday Inn of Manhattan, Kan. Daniel Fung, food science professor and Food Safety Consortium researcher at Kansas State University, is the conference director.

A mini-conference will be offered July 14 and 15 for those who do not want to attend the full week-long conference.

The conference format will include morning lectures by several prominent microbiologists and afternoon laboratories. Topics to be covered include the use of rapid methods in the food industry, an update on rapid methods in the Pacific Rim, market trends, analysis of diagnostic kits, molecular food detection, emerging pathogens, competitive exclusion and microbial toxins.

Registration information is available by contacting Debbie Hagenmaier at debbieh@ksu.edu. A detailed program description will be posted online at http://www.dce.ksu.edu/dce/cl/rapidmethods/. To inquire about scientific content, contact Fung at dfung@ksu.edu. ■

Raymond Advises …
continued

Greening, who is the district manager in Des Moines, Iowa.

I asked him to give me an example of how some plant inspectors are deployed among multiple plants and the significant amount of time spent driving between each of the plants in rural Nebraska, since I knew the turf and some of these very small plants.

Currently, these trips have to be made every day, because the Federal Meat Inspection Act requires that an inspector be at a plant every day that production takes place. Mr. Greening told me about three plants and in which towns they were located. I made a mental map, and I was concerned by the amount of driving required to visit only three plants. This is in-site inspection time that is being lost.

I am from that area of Nebraska and I know those roads well. Let me show you the route the inspector has to drive every day to inspect these three small plants. The first leg of the trip is a 50.4 mile drive to Franklin. Then after visiting that plant the inspector has to drive 13.1 miles to the next plant in Gibbon. Then the inspector gets back into the car and drives an additional 65 miles to arrive at the last plant in Beaver City.

I can tell you that on a good day, without snow or ice, that is at least two-hours of driving. I don't see how two hours of driving is the very best way to improve food safety, or public health.

We need to get outside the box, outside the routine, and think creatively, while being sure to use science as our basis for ideas, and for changes that will improve food safety. We need to find a way to increase our inspectors' time in the plants, where they could, for example, spend time at a plant that is having concerns with *Listeria*, allowing them to go over the FSIS compliance guidelines with the plant's management, review plant records, and even conduct environmental swabbing if appropriate. These are activities that directly relate to improving food safety. …

Employees — Risk-based inspection provides our employees an opportunity to focus more of their work day toward activities that directly impact food safety and public health.

We understand that it will require a large investment in our employees to ensure that they have the training and skills they need to be successful in a risk-based environment. But it is an investment that I know will continue to provide food safety dividends well into the future. If they succeed, then we all succeed.

Increased training and a wider range of opportunities to make a real difference in public health will also open new avenues of career advancement to our employees. I hope that will lead to improved job satisfaction and increased employee retention and recruitment.

It will be important to keep an open dialogue between ourselves and our employees. They need to be confident that their concerns are being heard.

I want to reiterate that a risk-based system is not about making reductions to our workforce or saving money. A risk-based system is about finding a way to produce a safer product that will benefit every consumer by maximizing the effective use of our work force.

Consumers — This leads me to the importance of maintaining the public's confidence in our food safety system as we work to create a more robust risk-based system. We must have safe products from plants of all sizes no matter what they produce.

Our experiences with HACCP and the *Listeria monocytogenes* interim final rule prove that we can further public health protection by using sound science to mitigate risk. We have seen that dramatic declines in foodborne illnesses can occur.

But as a doctor I also understand that a simple statistical decline does not fully express the human toll of those illnesses that do occur. For those affected by a foodborne illness, the statistic is 100 percent. We cannot be content with our present success.

However, we will also ensure that changes made to our system to reduce foodborne illnesses will be based on science. We will not make changes that will result in a product no safer than what we have currently.

Industry — To continue making needed food safety improvements, the way that inspection is currently conducted will change. However, change does not have to mean increased regulation. Industry's cooperation is key in implementing an enhanced risk-based system.

Under an optimal system, the type and intensity of inspection at an establishment will be based on performance and product.

I believe that a plant that has a spotless food safety record, science-based policies whose effectiveness has been validated, and is in full compliance with FSIS' regulations should benefit from that track record.

Our goal is to anticipate problems and to correct them before a regulatory enforcement action is ever needed. I am interested in preventing and not simply reacting to a problem. I did not make this move to recall product — I came to prevent human illness.

These changes will require the bar for plants to be raised, but I am confident that the industry will meet this challenge. I believe our resources need to be focused on those areas of most concern.

This will allow FSIS to better focus its inspection efforts on the product, processes, and establishments most likely to pose a public health risk. …

Push the food safety envelope. We need advice and recommendations that are not routine. Ideas that are based on creatively applied science.

Do not focus on what has worked in the past for us. Focus instead on what will work in the future for every stakeholder in this important process.

This is a crucial test, but one I am confident we will pass. We have to begin work on enhancing our risk-based systems so that we can meet the food safety challenges of the next 100 years. The state of public health is constantly evolving, and we cannot afford the risk of not evolving along with it.

In 1900, out of the top 10 causes of death, nine were infectious diseases. They included enteritis, dysentery, cholera and typhoid. Now over 100 years later, the top 10 diseases are largely those that we have brought upon ourselves. ■

FSIS Announces 2006 Food Safety Education Conference

USDA's Food Safety and Inspection Service (FSIS) and the non-profit public health organization, NSF International, have announced their joint sponsorship of a conference titled, "Reaching At-Risk Audiences and Today's Other Food Safety Challenges." The conference will be held Sept. 27-29 at the Adam's Mark Hotel in Denver.

"The goal of the conference is to share the latest science-based food safety findings, principles, practices and communication strategies with public health officials and others in the food community," said Richard Raymond, USDA undersecretary for food safety. "I am confident that this conference will create long-lasting partnerships and a strong, collaborative network among all parties who have an interest in promoting public health through food safety."

"Reaching At-Risk Audiences" will provide educators, communicators, medical and public health professionals and food industry representatives with information, research and insights on reducing foodborne illness. The conference is expected to attract approximately 600 participants including media, trade, consumer and health associations as well as food safety, public health, medical and cooperative extension professionals.

At-risk populations include older adults, young children, pregnant woman and their unborn children, organ transplant recipients and others with immunocompromised conditions. In addition to addressing the specific food safety needs of at-risk populations, the conference will also benefit those who work to educate other groups such as healthy adults and young children.

Presentations will focus on surveillance and epidemiological insights about foodborne illness; food safety behavioral and attitudinal research; social marketing, educational interventions, and program research; the role of foodservice and food industries; and new technologies. Information will be provided in plenary sessions, panel discussions, poster presentations and exhibits. To submit abstracts, or for more information, visit www.fsis.usda.gov/Denver2006.

Foodborne illness, a preventable and underreported disease, continues to be a public health and economic challenge in the United States affecting general and at-risk populations. On an annual basis, this disease is estimated to cause 76 million illnesses, 325,000 hospitalizations and 5,000 deaths. Foodborne illness has an annual estimated economic impact estimated as high as $83 billion in the U.S.

Other sponsors of the 2006 Food Safety Education Conference are the Centers for Disease Control and Prevention, Food and Drug Administration, NSF/WHO Collaborating Center for Food Safety and USDA's Cooperative State Research, Education and Extension Service. ■

Papers & Presentations

Yanbin Li, Arkansas, published the following articles:

- Mao, X., L. Yang, X. Su and Y. Li. 2006. Nanoparticles amplification based quartz crystal microbalance DNA sensor for detection of *E. coli* O157:H7. Biosensors and Bioelectronics, 21 (7): 1178-1185.
- Yang, L., and Y. Li. 2006. Detection of viable *Salmonella* using microelectrode-based capacitance measurement coupled with immunomagnetic separation. Journal of Microbiological Methods, 64 (1): 9-16.

Curtis Kastner, Kansas State, delivered a presentation on "Emerging Industries — Focus on Food Science" at the Urban Agricultural Education Forum of the National Association of Agricultural Educators Convention in December in Kansas City.

Kastner also published:

- Retzlaff, D., R. Phebus, C. Kastner and J. Marsden. 2005. Establishment of minimal operational parameters for a high-volume static chamber steam pasteurization system (SPS-400 SC ™) for beef carcasses to support HACCP programs. Journal of Foodborne Pathogens and Disease, Vol. 2, No. 2, 1890-1893.

J. Scott Smith, Kansas State, delivered a presentation on "Irradiation and Food Safety — Current Status" on Oct. 21 to the Mid-Continental Association of Food and Drug Officials annual regional meeting in Liberty, Mo.

Smith also published this article:

- P. Gadgil, J.S. Smith. 2005. 2-Dodecylcyclobutanone as a dose indicator in fresh irradiated ground beef. FeedInfo News Service, Nov. 12, 2005. ■

Food Safety Digest

by Dave Edmark

The Bax system — a trademarked procedure for detecting low levels of pathogens in beef — is now being used by the U.S. Department of Agriculture Food Safety and Inspection Service to look for *E. coli* O157:H7 in raw beef. FSIS announced in November it would use the system as an initial screening test for all raw beef samples being analyzed for *E. coli* O1576:H7. Samples found to be positive are then subjected to more analysis. The advantage of Bax is that it is expected to reduce the number of samples that are first found to be positive for the pathogen during the screening but then found to be negative upon further analysis. The Bax system was already being used by FSIS to detect *Salmonella* and *Listeria monocytogenes*.

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The United Kingdom's food safety regulatory agency issued guidelines in November for food safety inspectors to follow that would be in harmony with the European Union's hygiene regulations that took effect in January. Foodproductiondaily.com reported that the UK Food Standards Agency "sets out general requirements for enforcement authorities that are responsible for checking that businesses comply with the feed and food legislation. … In the UK the responsibility for official feed and food controls is held centrally. In practice, the execution of the responsibility is divided between central and local authorities."

The EU regulations cover production, processing and distribution of food. The report said the EU's new laws would "merge, harmonize and simplify complex hygiene requirements currently scattered over 17 EU directives."

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Two meat industry executives called for greater emphasis on food safety through traceability of products for the benefit of consumers. *Feedstuffs* reported in September that at the World Pork Congress meeting in Washington, Paul Clayton said animal identification and traceability is necessary for producers who want to sell in markets across the world. Clayton, vice president for export services at the U.S. Meat Export Federation, cited Japan as a market that demands such information. He said that "breadth, depth, precision and verification capabilities determine how robust your system is."

Daan van Doom, chair and chief executive officer of Sovion N.V. in the Netherlands, said food safety must be addressed from the consumer's perspective. Such a perspective requires an intelligent traceability system, process and source verification and a passion for quality, he said.

■ ■ ■

For most of the past decade, the government has mandated the adoption of HACCP systems in the food processing industry after years of study, testing and deliberation. It's time to move beyond that milestone to the next level, says Alice Johnson, president of the National Turkey Federation. Writing in *WATT Poultry USA* magazine, Johnson pointed to the Food Safety and Inspection Service's 2004 report, *Fulfilling the Vision: Initiatives in Protecting Public Health* in which the concept of risk-based inspection is introduced. It would have the agency focus on the greatest risks to public health.

"Risk-based inspection is truly the correct, next step for FSIS and the meat and poultry industry to meet public health objectives," Johnson said. "We look forward to the agency aggressively moving in the direction of risk-based inspection. This move should be done in an open, transparent manner, however, with all stakeholders understanding, commenting and sharing data in its development and implementation." ■

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