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INSIDE

Combining Salt With Heat Shows Way to Reduce *Salmonella* in UA Project

Poultry processors who constantly engage in the battle to keep *Salmonella* contamination off their products may have a new procedure at their disposal: add some salt and turn up the heat.

It's more complex than just that, but it's the key point of recent Food Safety Consortium research by Sara Milillo, a postdoctoral research associate in food science at the University of Arkansas Division of Agriculture. Milillo reached her findings with Steven C. Ricke, director of the university's Center for Food Safety, where Milillo is conducting research under a two-year U.S. Department of Agriculture fellowship grant.

"Our goal is to come up with a multiple hurdle treatment where we combine things to help prevent bacterial resistance by using different treatments that attack different functions or parts of the cells simultaneously," Milillo explained.

Milillo's study, which was published in the *Journal of Food Science*, examined the application of heat at 55 degrees Celsius (131 degrees Fahrenheit) plus an acidified organic acid salt solution as a way of reducing *Salmonella* on chicken. The combined treatment resulted in significant reduction of the pathogen, leading Milillo to conclude

Post-doctoral research associate Sara Milillo streaks plates on which cultures of *Salmonella* will be grown.

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ISU Food Safety Website Aims at Consumers, Industry

The information-heavy food safety website maintained by Iowa State University (http://www.iowafoodsafety.org) continues to grow each year with new features added to meet consumer and industry needs. The site, which is supported partly by the Food Safety Consortium funding, recorded more than three million page views last year and over nine million hits.

"I think we have continued with our primary objective, which is to try to reach consumers as well as those working in the food service industry," said Catherine Strohbehn, an ISU hotel, restaurant and institution management extension specialist who supervises the site. "We're trying to develop synergies with other existing work."

Catherine Strohbehn

Among the new additions to the site is a food allergens section including information for consumers eating away from home and retail food services. The links include a PDF version of an extension brochure detailing what restaurant managers need to know to train their staffs for handling situations related to food allergies. The section also contains guidelines developed by other agencies, such as the Centers for Disease Control and the Food Allergy and Anaphylaxis Network, for managing food allergies in schools, and how to accommodate children with food allergies during visits to

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that it may represent an effective method for decontaminating poultry carcasses during processing.

Milillo also tried heat and salt treatments separately and found that neither one was adequate standing alone to do the job. An application of 2.5 percent organic acid salt solution did not reduce *Salmonella* appreciably. "We did heat alone to see if that had an effect by itself, and it didn't, even beyond 55 degrees C," she said.

These experiments were conducted using chicken juice, a raw chicken model medium, rather than chicken carcasses. The results tell enough of a story to draw valid conclusions, but more information will be available by taking the research to another level that uses chicken carcasses.

> ***"Our goal is to come up with a multiple hurdle treatment where we combine things to help prevent bacterial resistance."***

"We can screen treatments much faster in a broth-model type of situation," Milillo said. "We're hoping the chicken juice gets us a step closer to an actual raw poultry system. But by using chicken juice initially we can screen lots of treatments and narrow down what's the most effective before we go into a more costly use of actual carcasses. I view this as using your resources efficiently."

Milillo and industry personnel have reviewed processing procedures that could be adapted to the research findings. Heated washes are used in steps to clean carcasses, so the use of a salt additive in a heated rinse might be one place to implement new methods.

Experiments with carcasses will come later, possibly followed later by tests to determine how the combined heat and organic acid salt treatments would apply to poultry after it has been eviscerated in the processing plant.

"At any point where risk of a carcass being contaminated is higher there is a need for more effective antimicrobials," Milillo said. "So save your most powerful antimicrobial interventions for those processing steps with the ultimate goal of an even safer product." ■

ISU Food Safety Website… *(Continued from page 1)*

restaurants. More material is in development based on information gathered from a survey of National Association of College and University Food Services member institutions about food allergen policies and procedures at the college level.

Using gloves in food industry jobs is highlighted in a Flash graphic on the site. The module is targeted to line-level food handlers and is a companion to an extension publication targeted to managers. An in-service guide is featured. This work was jointly created with support from a current USDA funded project in progress at ISU with Strohbehn and Susan Arendt as principal investigators.

"We're trying to help site managers because we know many of the managers know the information, but getting that to their line-level employees is difficult because of turnover or whatever reasons," Strohbehn said. "This is a guide for how to do a quick training session."

Additional copies of the glove publications were printed with a small grant from the Iowa Food Safety Task Force and are delivered to retail food services by health inspectors in Iowa when they conduct site visits. "We're trying a different delivery mechanism because there's a lot of confusion about glove use," Strohbehn explained. "The inspectors are trying to change their image to be a coach and an educator, not just the inspector."

> ***"Many of the managers know the information, but getting that to their line-level employees is difficult because of turnover."***

Another page in the site emphasizes best practices to ensure safety of fresh produce. Extension faculty in hotel, restaurant and institutional management worked with Food Safety Consortium personnel and state regulatory agencies to develop presentations about good agricultural practices and publications on safe handling of fresh produce targeted to producers, consumers and food service operators.

"What we're finding is that many small farmers go to the farmers' markets or they're selling local products to restaurants and retail food services," Strohbehn said. "What's of concern is that many of those smaller producers don't understand the fundamentals about food safety — like having a hand-washing station available, especially for produce items that won't receive any further heat treatment."

Other frequently visited pages in the site include the food safety news section, SafeFood Lessons and the Spanish translation of the Guide to Food Safety for Retail Operations. With support from other grant funding, some of the existing materials on the site will also be translated into Spanish.

The website serves practical needs for consumers and needs frequent updating to respond to contemporary trends. "Over half of meals served are now prepared away from home. Many consumers don't know how to cook any more, and when they do so, often have many questions about proper handling and temperatures," Strohbehn said. ■

ISU Researcher, Local Company Collaborate for New, Faster *Salmonella* Detection

Using technology available through a local company, an Iowa State University researcher is working on a faster method to detect and genetically identify *Salmonella* from contaminated foods.

Byron Brehm-Stecher, an assistant professor of food science and human nutrition, wants to replace the current system of *Salmonella* detection with a new approach that can provide DNA sequencing-like results in hours rather than days.

Brehm-Stecher's collaborator, Advanced Analytical Technologies, Inc., of Ames, Iowa, is providing advanced biomedical instruments and reagents for the research.

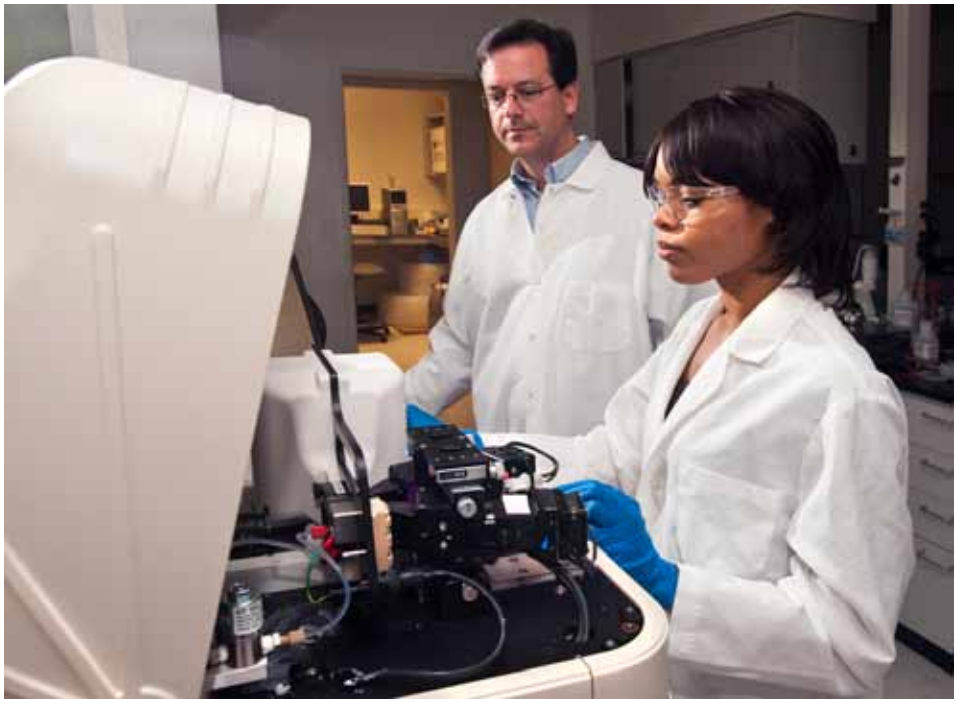
The recent results of the research, funded by the Grow Iowa Values Fund, was presented at the August meeting of the International Association for Food Protection in Anaheim, Calif.

Currently, definitive genetic identification of foodborne pathogens is done using traditional DNA sequencing methods first developed in the 1980s.

"If you want (DNA) sequence information now, you first need to run a polymerase chain reaction (PCR) on total DNA extracted from a sample of contaminated food," said Brehm-Stecher. "This amplifies DNA from the pathogen you're looking for and will let you know if *Salmonella* is present or not.

"However, further details about the pathogen are lacking, like what strain is present. To dig deeper, you need to run a cycle sequencing reaction — similar to a long PCR reaction — and send the output from this to a DNA sequencing core facility. Results are available about two days later," said Brehm-Stecher.

"This is not fast enough to keep up with the pace of today's food production and distribution networks. We are able to get foods from the farm to the table — really any table around the globe — in a remarkably short period of time," he added.



Byron Brehm-Stecher, assistant professor of food science and human nutrition, and master's student Brittany Porter work on a new process that can give fast, DNA-based information when *Salmonella* outbreaks occur. (ISU photo by Bob Elbert)

Faster detection of specific strains can mean recognizing an outbreak sooner and stopping tainted food from being delivered and consumed.

Faster detection of specific strains can mean recognizing an outbreak sooner and stopping tainted food from being delivered and consumed. The new method might be helpful for investigative agencies, Brehm-Stecher said.

"Especially for the type of investigation where things are still in motion. The food has been shipped and you may not know where it is. It may be in a truck, on a shelf or in some consumer's pantry, so time really is of the essence," he said.

"Next-generation sequencing tools are available, but these are still too complex and expensive for routine use in the food industry," Brehm-Stecher explained. "New approaches that are able to bridge the gap between the limitations of traditional PCR and next-generation sequencing could enhance food safety efforts by providing both rapid presence/absence testing and detailed genetic characterization of isolates."

You don't have to go further than the local newspaper to see the depth of the problem. Recent national outbreaks of *Salmonella* in foods include peanut butter (2007 and 2009), alfalfa sprouts (2009), black pepper and hydrolyzed vegetable protein (HVP) (2010). Adding to the problem is the fact that peanut butter, black pepper and HVP are all base ingredients used in many other food products.

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ISU Researcher, Local Company Collaborate…
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Salmonella in these ingredients has led to thousands of product recalls, hundreds of illnesses and several deaths, Brehm-Stecher said.

The method being developed at Iowa State starts with a rapid PCR reaction that amplifies a *Salmonella*-specific gene, generating millions of fluorescently labeled copies of this DNA in about 20 minutes.

Next, instead of cycle sequencing, the PCR product is purified for five minutes, SNAP71 (a reagent developed by Advanced Analytical) is added, and the DNA is heated for 10 minutes at 100 degrees Celsius.

This reaction chemically cuts the labeled salmonella DNA at all adenine and guanine sites (A's and G's) in the DNA chain.

The result is a complex soup of fluorescently labeled DNA fragments of all sizes. These fragments are then separated in a high-voltage electric field by sieving them through a polymer matrix (a gel) contained in glass capillaries that are 50 microns – not much thicker than a human hair. This process separates the DNA fragments according to their size, from smallest to largest, and each piece is detected as it passes in front of an intense light source. For a PCR product that's 300 bases long, this separation and detection process takes approximately 90 minutes.

Because the SNAP71 reagent cleaves the *Salmonella* DNA only at adenine and guanine, and not at thymine and cytosine sites (T's and C's), the method is not a direct replacement for DNA sequencing. Instead, the process rapidly generates a reproducible pattern of DNA fragments, Brehm-Stecher said.

Salmonella strains having slightly different DNA sequences within a given gene will yield different patterns of fragments, allowing discrimination of different strains of *Salmonella*.

From "food to finish," the whole process can be accomplished in about two and a half hours.

"We're very excited about this approach and about the rapid progress we've made since the project began," said Brehm-Stecher. "The funding for this project has enabled us to work very closely with Advanced Analytical and accelerate application of their instruments to solving important food safety problems."

The team at Iowa State University includes post-doctoral researcher Hyun Jung Kim and master's student Brittany Porter. The group is also working with Cleveland Clinic in Ohio.

The ultimate goal of the project is faster detection and characterization of human pathogens from "farm to fork to physician."

Advanced Analytical's instruments are based on technology originally developed at Iowa State University in the lab of Ed Yeung, the Robert Allen Wright Professor and Distinguished Professor in Liberal Arts and Sciences and professor at the U.S. Department of Energy's Ames Lab. ■

Arkansas Association for Food Protection Sets Annual Meeting

The Arkansas Association for Food Protection — an affiliate of the International Association for Food Protection — will hold its second annual educational conference and meeting Sept. 28-29 at Tyson Foods general offices in Springdale, Ark. This year's theme is "Enhancing Food Protection From Farm to Fork."

The conference hours will be 1-5 p.m. Sept. 28 with an awards dinner that evening followed by sessions from 8 a.m. to 3 p.m. Sept. 29.

The agenda is still being arranged but confirmed speakers so far include Katie Swanson of Ecolab, Frank Yiannas of Walmart Stores and Joan Menke-Schaenzer of ConAgra.

The conference fee is $30 per person. Registration may be done online at http://arkafp.org/conferences.aspx. Hotel rooms are being held for the conference at the Holiday Inn of Springdale and may be booked at http://tinyurl.com/2f4ejyj. Questions about the conference may be directed to Mike Sostrin at Michael.Sostrin@wal-mart.com.

Papers & Presentations

Catherine Strohbehn, Iowa State, was a co-author of two ISU Extension publications, "School Health Environment: What Administrators Need to Know" and "Starting a Home-Based Food Business." She also co-authored "School Foodservice Directors' Perceptions of Required and/or Desired Organizational Inputs to Implement a HACCP-based Food Safety Plan" for the School Nutrition Services Dietary Practice Group.

USDA Official Calls for Food Policy Rooted in Science, Measured for Impact

Remarks prepared for delivery by Jerold Mande, U.S. Department of Agriculture deputy undersecretary for food safety, at the joint FDA, CDC, and FSIS public workshop, "Measuring Progress on Food Safety: Current Status and Future Directions," March 30, 2010, in Washington, D.C.

There are those here today who have fought on behalf of consumers for years. There are the family members who have lived the horror of our system when it fails. There are industry professionals who have made producing safe food the core of their business. And there are government officials who have been entrusted by the American people to keep our food safe.

We all work toward a common goal: safe food. I want to begin my remarks from that shared premise.

Sometimes we have different ideas of how to get there — what the best policies may be to get us there — but our bottom line is the same. We want the assurance that food won't make our families sick.

Yet providing that assurance requires constant vigilance, and it cannot be done alone. We must work together along the farm-to-table continuum to ensure safe food. The president and Secretaries Vilsack and Sebelius understand this, and the administration has sought unprecedented collaboration among its food safety agencies through the Food Safety Working Group and meetings like this one.

The importance of today's meeting can be described in one sentence: *What doesn't get measured doesn't get done.* I want to state that again, because it is the most important message I want you to take from today's meeting: *What doesn't get measured doesn't get done.* Business gurus have repeated this mantra for years and it is as true for us as it is for them. It is why today's meeting is so important. Continued progress on food safety depends on adopting and implementing the right metrics. …

When the president took office last year, we were in the midst of a large recall. As you know, he responded by establishing the Food Safety Working Group within 60 days of taking office and appointed the secretaries of Health and Human Services and Agriculture as co-chairs.

Which brings us to this, the next critical juncture in food safety.

Guided largely by the Working Group, we're looking at the entire food safety system and across jurisdictions and products. It is a watershed moment. We have a president, two secretaries, and leaders in Congress who have made improving food safety a priority.

> ***We need assessment tools to guide our efforts, gauge the success of our policies and interventions.***

The status quo is unacceptable. Our bosses, the American people, have made that clear. In some cases our laws are outdated, our system too reactive and our structure too fragmented given the complexity of modern food. We need the tools and coordination to meet the challenges of a 21st century food system, and we need better metrics so that we can measure what needs to get done.

Food safety must be improved. Passage of FDA food safety legislation, a high priority for the administration, is a key step. Today's meeting is another. The Food Safety Working Group has made metrics a cornerstone of our efforts.

Major Food Safety Efforts at USDA

USDA is helping lead the change we need to improve food safety.

Led by Secretary Tom Vilsack, major new and revamped efforts are underway to improve the safety of the products we regulate:

We have challenged our leadership, scientists, and analysts to think strategically and creatively about policies to reduce foodborne illnesses.

We're implementing many priorities identified through the Food Safety Working Group deliberations such as new pathogen reduction performance standards for control of *Salmonella* and *Campylobacter*.

We're actively discussing ways to improve product tracing and better educating and training our workforce regarding *E. coli* O157:H7.

We're supporting the secretary's renewed emphasis on research; developing new tools such as a test for non-O157 STECs, and promoting food safety research through the National Institute of Food and Agriculture.

And of course, we continue preparations to launch our dynamic data analytics system, the Public Health Information System, which will revolutionize the way FSIS detects and responds to foodborne hazards.

But while each of these steps could help bring about the significant reduction of foodborne illness we seek, we won't know how best to deploy them unless we can link their use to specific reductions in illness. To do that we must be able to more precisely measure changes in foodborne illness. And to do that we must build robust data collection and analysis.

We are not regulating for the sake of regulation. We want results.

Policy in *any* area is best when a), it's rooted in science and b), it's measured for impact. This same standard applies to food safety.

We want to ensure that our programs, interventions and measures have a positive effect on public health.

So what do we do? What would it take to cut the number of foodborne illnesses in half again?

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USDA Official Calls…

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We need assessment tools to guide our efforts, gauge the success of our policies and interventions, and make a direct link between our actions and outcomes. We need to know what is working — or not working — in order to reach our goal of sharply reducing foodborne illnesses and deaths. And we need specific, measurable, timely markers along the way to know we are on track and to make adjustments if we are not.

For example, although FDA, FSIS and other agencies have varied roles in our nation's food safety, we essentially begin from the same place: the estimated burden of foodborne illness.

Before we make decisions on food safety policies and interventions, we must know how many people are getting sick each year from foodborne contaminants, and from which ones? Who, exactly, is getting sick and from which foods? And, overall, are we making progress toward reducing foodborne illnesses?

These are central questions. However, developing answers to them that we can be confident in and base policy on has proven difficult.

To reach our goals, we must measure progress along the *entire* farm-to-table continuum. Improvements in on-farm interventions can bring improvements at slaughterhouses, which can improve control at processing establishments and so on, until products reach the consumer.

We must leverage data. FSIS has inspectors in our regulated establishments every day. We must make better use of them to measure and monitor levels of contaminants in our products.

And we must better use what we know about industry compliance, process control, and other indicators to assess their impact on public health.

Pathogens evolve and spread through the food *system*, and as long as we approach them as if they respect the purview or jurisdiction of the farm, the producer, the USDA, FDA or other agencies, they will elude us.

That's why the president has charged us to work in a unified way to meet the challenges of our modern food safety system. This workshop is an example of the collaboration our president expects and what is needed to improve food safety.

In other words, we're in this effort together. The progress of each part of the system is tied to the progress of the other. And we must work together to eliminate foodborne illnesses and deaths. ■

Distance Education Provides Food Safety Classes at K-State

Kelly Getty

Making food safety education available through distance education is receiving Food Safety Consortium support at Kansas State University, where about 75 students are earning bachelor's degrees through this means. More than 100 students are using distance education to pursue undergraduate or graduate certificates or master's degrees in food safety.

"A great majority of these students are working in the food industry and are seeking food science knowledge and potential for career advancement through education," said Kelly Getty, a distance education assistant professor at the K-State Food Science Institute.

K-State has teamed with Purdue University and Indiana University to develop a national educational and outreach program for food safety and food defense, with K-State responsible for developing material into a distance education delivery format for graduate students and working professionals.

Last September, 41 participants from the three universities met for a workshop at which they viewed the developed curriculum modules and experienced a computer simulation of an intentional contamination to a food system. Those modules were the basis for developing this summer's K-State distance education course on Food Protection and Defense-Essential Concepts.

K-State's master of public health program includes a food safety emphasis area option. Online versions of the core public health courses will be completed in the spring semester of 2011, at which time the master of public health food safety emphasis area degree could be completed entirely online.

The educational program is also developing multilingual training for employees in the food industry. K-State's Beef Cattle Institute will convert the university's food safety research information into multilingual training materials for beef cattle industry workers. They will be web-based training modules covering food safety issues and best management practices for producers and farm workers.

K-State is also working on adding a food safety and security curriculum option to its existing bachelor of science degree program in food science, with a distance education component in addition to the on-campus curriculum.

"Many of our courses have already been developed as distance education. Some of them also are offered on campus each year," Getty said. ■

Food Safety Digest

by Dave Edmark

The United States and Canada tied for fourth place among 17 nations ranked according to food safety performance by the Organization for Economic Cooperation and Development. *Food Safety News* reported that Austria, Denmark and the United Kingdome tied for first. Italy, France and Ireland were at the low end of the rankings.

The rankings were determined by Sylvain Charlebois, a professor at the University of Regina business school, and Chris Yost, a biology professor and Canada Research Chair in Microbes, Environment and Food Safety. The study covered consumer affairs, biosecurity and trades, governance and recalls, traceability and management.

"Canada and the U.S. do not have well-established farm-to-fork traceability systems for any food product," the report said. It noted that Canada has a tracking system for its livestock industry but is still developing a farm-to-fork system.

■ ■ ■

Also in Canada, Brian Evans has been appointed chief food safety officer of the Canadian Food Inspection Agency (CFIA). *Meat Trade News Daily* reported in June that Prime Minister Stephen Harper appointed Evans, who will continue to serve also in his position as the government's chief veterinary officer. His previous positions include animal health division director of Agriculture and Agri-Food Canada and executive director of CFIA's animal products directorate.

■ ■ ■

Two independent organizations' study in June concluded that the Food and Drug Administration should reorganize itself to do a better job of keeping food safe. The Institute of Medicine and the National Research Council, which are both part of the independent and congressionally chartered National Academies, said in a 500-page report that the FDA lacks the vision necessary to protect consumers, according to the Associated Press.

The AP quoted Robert Wallace, a University of Iowa College of Public Health professor who served as chair of the committee that produced the report, as saying the FDA is too reactive. The agency should focus on preventing outbreaks, the report said.

"As recent illnesses traced to produce underscore, foodborne diseases cause significant suffering, so it's imperative that our food safety system functions effectively at all levels," Wallace said.

The report contained many recommendations that would be met if food safety legislation passed by the House last year is enacted into law. The pending legislation would give the FDA authority to compel food companies to recall tainted products. The report also advocates establishment of a singe federal food safety agency.

■ ■ ■

A laboratory to train foreign food exporters on the science of safe food production is being established at the University of Maryland. The Joint Institute for Food Safety and Applied Nutrition, which is based at the university in partnership with FDA, will launch the initiative in July 2011, *The Baltimore Sun* reported in May.

"Instead of relying on inspection at the border, which is simply impossible to do, we want to go to the source," said Paul Mazzocchi, associate director of the institute.

The new laboratory will bring about 200 foreign food producers a year to the university for scientific training in food safety. The producers will analyze food for chemical pesticides, drugs and pathogens. The facility at Maryland will include $4 million worth of lab equipment donated by the Waters Corp. of Milford, Mass., and will be known as the International Food Safety Training Laboratory. ■