

Spring 2013

Center for Food Safety, Spring 2013

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Prominent Food Safety Litigator Visits University of Arkansas School of Law

In the summer of 2011, the Centers for Disease Control and Prevention linked cantaloupes grown in Colorado to an outbreak of *Listeria*. Bill Marler, a Seattle-based attorney who specializes in food safety litigation, said he had been anticipating this type of outbreak for almost 10 years.

“When the outbreak happened last summer, you know, the media of course is like ‘Oh my God, cantaloupes? We didn’t know cantaloupes could poison and kill people,’” Marler said at a November 2012 appearance at the University of Arkansas School of Law.

Marler had been keeping track of such problems for almost a decade and had also noticed patterns of *Salmonella* outbreaks in imported cantaloupes.

“For quite a while, nearly every spring, I could count on a *Salmonella*-linked cantaloupe outbreak coming from Mexico or Honduras,” Marler said.

However, most outbreaks are not import-related, but originate here in the U.S.

“I can tell you that in 25 years of litigating, in every major foodborne illness outbreak that’s occurred in the United States, just a tiny, tiny, tiny fraction actually, of those cases, are import-related,” Marler said.

Instead of blaming the imports, Marler chalks the majority of foodborne illnesses up to negligence and sub-par manufacturing processes.

“It’s really not the imports, in my view, that are the problem,” Marler said. “It’s some of our own manufacturing processes and some of our own manufacturing lapses. So, using imports

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Bill Marler speaks to a group of students and faculty at the University of Arkansas School of Law

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as the boogeyman, I don't think is really appropriate."

In fact, manufacturing lapses at Jensen Farms were the root cause of the "Rocky Ford" cantaloupe *Listeria* outbreak that ultimately effected 147 people, Marler said.

"[At Jensen Farms] they found that the spread of the *Listeria* was really in how the facility was designed," Marler said. "A year earlier, in order to expand production to be able to sell product farther and broader, the auditors suggested a new machine, and the machine was a potato washing machine that they jerry-rigged into washing cantaloupes."

Because the machine was not originally intended for washing cantaloupes, changes were made to the machine. Those changes compromised the cleanliness of the process, leading to the outbreak, according to Marler.

"They didn't use a chlorine wash, but basically what they were doing is they had these big brushes spreading the *Listeria* water all over the cantaloupe," Marler said. "What was really fascinating from an epidemiological perspective, there were no illnesses of *Listeria* in the county and the city surrounding this plant, and people found that sort of perplexing because a lot of people in the community would go out to get cantaloupe from this facility. The interesting thing is that they were getting cantaloupes directly off the ground. They were eating cantaloupes that never went through the packing shed."

Although there is enough blame to go around, Marler said he tends to focus on the manufacturer, who has the most opportunity to fix the problems. However, because Jensen Farms had no assets and very little insurance, Marler started looking into other entities to make sure his clients were fairly compensated.

Marler found that third-party auditors performed an audit while the *Listeria* contamination was present. Jensen Farms still received a superior rating of 96 percent.

"What was interesting about that is that they did the audit right at sort of the peak time when the cantaloupes were going through that plant and wound up in the *Listeria*-tainted product that ultimately led to this outbreak," Marler said.

Though Marler has studied various outbreaks over the past 10 years, this particular *Listeria* outbreak was different.

"This was the first time I'd seen it where the auditor was actually in the plant when the contamination was occurring," Marler said.

Marler said this use of third-party auditors is not a practice that is in consumers' best interests.

"These third-party audits are, in many respects, kind of a dirty little secret, especially in food manufacturing," Marler said. "Big stores require third-party audits from their brokers and shippers. The third-party auditors are retained by the individuals that they are actually inspecting, and they actually pay for it. So, there's some incentives there that ultimately don't work well for the protection of consumers."

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Doctoral Student Wins First Place in Graduate Research Poster Competition

The University of Arkansas' recent *From Abstract to Contract Graduate Student Research and Creative Expression* competition included dozens of high quality graduate student research poster entries. Among the winning entries was doctoral student Si Hong Park's poster featuring his work on the detection of *Salmonella* bacteria in poultry products.

Park began his research on foodborne pathogens, including *Salmonella*, as a junior at Kyung Hee University in South Korea as an undergraduate research assistant. He completed graduate school at the same university in South Korea as well, and joined the Center for Food Safety in 2009 as a Cell and Molecular Biology Program (CEMB) Ph.D. student under Dr. Steven Ricke.

Park has worked on foodborne pathogen research for almost nine years. When he learned he had received an award for his poster, Park was surprised.

"When Dr. Ricke took me to the ceremony, I realized that I was a winner but didn't know that it was first place," Park said. "Honestly, I never thought that I would receive an award because the other students' presentations and research were really good. I was so surprised and honored."

Park's poster, titled "Development of Multiplex PCR for Simultaneous Detection of *Salmonella* Serovar Enteritidis, Heidelberg and Typhimurium Isolated from Chicken Carcass and Farm," detailed his work on the detection of *Salmonella* serovars in poultry.

"The poster is about detecting the *Salmonella* from the chicken," Park said. "Actually *Salmonella* is the most popular foodborne pathogenic bacteria in the United States."

Being the most common foodborne pathogen, *Salmonella* causes substantial economic and production losses each year, according to Park.

"Annually \$2.6 billion of economic loss and productivity loss [result from *Salmonella*]," Park said. "So the focus of my poster is to detect the three most popular *Salmonella*." Park's research in detecting foodborne pathogens in poultry and poultry products has reduced the time it takes to detect *Salmonella*.

"The research is designed to detect the whole *Salmonella* strain, covering 2,579 serovars," Park said. "Subspecies I (over 1,500 serovars) only causes disease in humans, and then the three most popular *Salmonella* strains:



From left: Todd Shields, dean of UA Graduate School and International Education; Jim Rankin, UA vice provost for research and economic development; Nathan McKinney, assistant director of the Arkansas Agricultural Experiment Station; Steven Ricke, director of the Center for Food Safety; Si Hong Park; Sharon Gaber, UA provost

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Typhimurium, Enteritidis and Heidelberg. Using the molecular technique -it's called the Multiplex PCR- we use the conventional method to detect *Salmonella*, which takes three to five days; if we use the molecular technique we can detect these bacteria in one day."

In addition to reducing the time it takes to detect *Salmonella*, Park's research also focuses on reducing *Salmonella* bacteria in poultry.

"The other research focus is to find out how to reduce these bacteria from the food. So we're going to add some prebiotics such as plum fiber and FOS (Fructo-Oligosaccharides). We add these prebiotics to the chicken feed or chicken. So we need to find out how these prebiotics work to reduce the foodborne pathogens," Park said.

Breakthroughs in research, such as Si Hong Park's, are paving the way to safer poultry consumption and faster detection of foodborne pathogens.

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Center for Food Safety Newsletter Gets New Editor

Lindsey Emerson, a junior agricultural communications and agribusiness major at the University of Arkansas, joined the Center for Food Safety (CFS) team last fall as the newsletter editor. Emerson works with Dr. Jeff Miller in the Agricultural and Extension Education department's Experiential Learning Lab (ELL). Through her experiences in the ELL, Emerson is able to serve as the CFS newsletter editor, gaining experience in journalistic writing to compliment her coursework.

"Working on this newsletter has given me a lot more experience with journalistic writing," Emerson said. "I haven't taken the reporting and feature writing class yet, so this gives me a little bit of a head start on it because I will know what to expect."

Along with writing feature stories, Emerson redesigned the CFS newsletter, and takes photos for the stories. In addition to helping her gain experience, this project fits very well into the degree plan Emerson is pursuing, Miller said.

"Journalistic writing is really a fundamental skill that we try to help all our ag comm students develop, and there's no better way to learn how to write news releases and feature stories than just doing it in a real-life situation," Miller said.

Emerson said her goal for this project is to improve her writing skills while providing the CFS team with an entertaining, informative and aesthetically pleasing newsletter.

"I want to improve my writing skills. There's always room for improvement," Emerson said. "It's also very important for me to deliver high-quality products for the newsletter, write the best stories create the most functional and visually appealing design that I can."

"Lindsey's work with the ELL is helping prepare her for a career in public relations in the agriculture and food industries," Miller said. "So, this project with the Center for Food Safety has provided her with some valuable practical experience in communicating with diverse audiences about scientific topics related to food and agriculture."

Emerson said she hopes that her experiences with the ELL and serving as the CFS newsletter editor will help her develop tangible and applicable skills that she can use in her future career.



Newsletter editor, Lindsey Emerson, consulting with advisor
Jeff Miller

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Stopping the Spread of Norovirus

It seems like it is impossible to avoid every year. Your coworker had it last week, your child's best friend missed school today because of it, and you are doing everything you can to keep it out of your home. It's in the newspapers making headlines and was even on TV because they are closing down schools to contain it. It's the norovirus and everyone is at risk to contract it, but researchers like Kristen Gibson are doing everything they can to keep this virus from spreading to your home.

According to the Centers for Disease Control and Prevention [CDC] there are 20 million cases of norovirus in the United States each year. Many people would describe what they have as the stomach flu or a stomach bug, but according to Kristen Gibson, an assistant professor of food science at the Center for Food Safety, what people think of as the stomach flu is actually most likely norovirus.

"What most people call this [norovirus] is the stomach flu, and that's a misnomer because the peak season is during flu season," Gibson said. "So people often think it's related to the flu, but it's not at all."

Gibson explains that the symptoms of the norovirus and flu are actually very different.

"Usually if you have the flu you don't have vomiting at all," Gibson said. "The main symptoms of norovirus are no fever, vomiting and diarrhea."

Norovirus causes acute gastroenteritis illness or inflammation of the stomach and intestines. Norovirus, as the name indicates, is a virus and should be treated differently than a bacterial disease or infection.

"If bacteria are in the environment, they can reproduce and more can form, whereas viruses have to have a host, they do not replicate by themselves," Gibson said. "Human norovirus is specific to humans, and so when it is ingested then it has a host to replicate and cause disease."

Norovirus is extremely contagious and is spread by three primary routes. The virus can be spread through person-to-person transmission, aerosolization and consuming it in food.

"One scenario is if you have an infected food service worker and they prepare ready to eat food for you like a deli sandwich or salad," Gibson said. "That person may not have good hand hygiene and they may touch the food with hands that weren't gloved, so the virus can transfer from the hands to the food."



Dr. Kristen Gibson

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People can also catch the virus by touching contaminated surfaces or interacting with people carrying the virus. According to Gibson, one of the main reasons the virus is so easily spread is because many people don't even know they have it.

"Around 30 percent of the population will become infected but will be asymptomatic, so they have no idea that they are sick," Gibson said. "There is a lot of norovirus being spread around even if you are trying to be hygienic, and that is why it spreads so rapidly, because of secondary transmission of the virus."

Gibson's research at the Center for Food Safety is helping to find ways to stop the rapid spread of norovirus, especially in the food service industry.

"Some of the work that I've done is looking at the thermal inactivation of norovirus," Gibson said. "How high does the temperature need to be and how long does the exposure need to be to kill norovirus?"

This kind of work is important for the food service industry and helps to determine the best food preparation practices in order to prevent the spread of norovirus. Gibson not only looks at food preparation practices, she also studies cleaning procedures and food service environments.

"A study I did here was on cleaning cloths. There are a lot of different types of cleaning cloths that are used," Gibson said. "We found that if you used a bar towel to clean a contaminated surface and then you used it to wipe another surface, the virus fully transfers from that towel to a surface so, you're basically just spreading it around."

Some of Gibson's research has also found that not all cleaning products are equally effective at disinfecting surfaces or utensils from norovirus.

"Norovirus can only be effectively killed using chlorine. A lot of people don't want to use chlorine, but it is the best thing you could possibly use," Gibson said. "It's only effective if you follow the directions, so use the proper concentration and don't just spray it and wipe; it has to sit there for five minutes to inactivate norovirus."

Other recommendations Gibson suggests when trying to avoid getting norovirus include washing hands with warm water and soap, not using hand sanitizers as a replacement for soap and water, and being conscious of hand-to-mouth contact.

"If you have the opportunity to use warm water and soap, do it. That is my take-home advice," said Gibson. "I'm not talking about antibacterial soap, because that is ineffective against viruses anyways. I am just talking about actual physical scrubbing."

Every year norovirus is the number one cause of gastroenteritis and foodborne illnesses, but many people don't even realize why they are sick. Gibson plans to continue to study how to decrease the spread of norovirus in food service

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settings. She would also like to see more outreach and education in the food service industry to lower the number of cases of norovirus that are spread in food service environments.

“Our approach to food safety issues and to consumers in general is very bacteria centric, but you deal with bacteria differently than you deal with viruses,” Gibson said. “A lot of prevention strategies that have been in place are geared toward bacteria alone, they are not geared towards viruses, and it is hard to figure out how to educate retail food workers or service employees on the difference between bacteria and viruses.”

Although norovirus is easy to catch and spread, researchers like Gibson are dedicated to finding new ways to control the spread of this nasty virus in all food service settings. These food scientists are working to find ways to raise the bar on hand hygiene and sanitation in order to help reduce the risk of this virus ending up in peoples’ homes.

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CFS Team's Article Makes Journal's Top 10

An article by UA Center for Food Safety scientists published in 2009 in *Foodborne Pathogens and Disease* has been designated as one of the journal's top 10 articles of its first decade of publishing. The article, "Salmonellosis Outbreaks in the United States Due to Fresh Produce: Sources and Potential Intervention Measures," was written by Irene Hanning, J.D. Nutt and Steven C. Ricke and appeared in Vol. 6, No. 6.

Hanning was a postdoctoral associate at the Center for Food Safety when the article was published. Nutt was affiliated with the Texas A&M University poultry science department and is now employed by Yum! Brands, Inc., in Dallas. Ricke is director of the Center for Food Safety.

Hanning, the lead author, earned a doctoral degree in cell and molecular biology at the UA before she joined the Center for Food Safety staff. She joined the University of Tennessee food science and technology faculty in January 2011 with a 100 percent research appointment where her lab emphasizes foodborne illness and pathogenic bacteria, particularly *Campylobacter* and *Salmonella*.

The 2009 article examines outbreaks of *Salmonella* due to contaminated produce, the potential sources of *Salmonella* and possible control measures to prevent contamination of produce.

Foodborne Pathogens and Diseases is a scientific publication that includes articles from several disciplines relating to food safety that has a stated aim of bridging the gap between science and policy to reduce the burden of foodborne illness worldwide.



Irene Hanning and Dr. Steven Ricke

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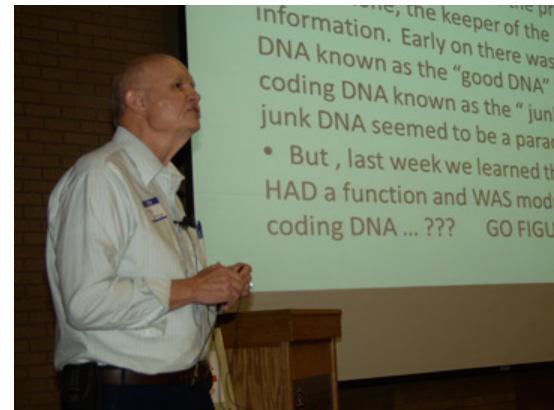
AAFP Conference Set for September

The Arkansas Association for Food Protection will hold its annual educational conference Sept. 10-11 (Tuesday and Wednesday) at the Chancellor Hotel in Fayetteville. The agenda for the meeting is still being developed but will include several speakers from industry, academic and government. There will also be a poster competition.

The Tuesday session will be from 1 to 5 p.m. and the Wednesday session will be from 8 a.m. to 3 p.m. Details about registration will be announced this summer on the AAFP website at <http://arkafp.org>.

As part of a premier farm-to-fork region with some of the world's largest companies in food safety, AAFP has the obligation to explore and provide cutting edge research about emerging issues. This conference will explore emerging issues and research such as:

- Education and training of veterinarians about the nuances of food processing. The training will insure the best inspection capabilities as they apply to the needs of systems thinking for veterinarians and inspectors.
- Pathogen tracking and epidemiology as it applies to whole-chain traceability.
- Retail food safety.
- New research in foodborne pathogen tracking in the environment
- GFSI implementation - concepts and issues
- New research on foodborne *Staphylococcus*, *Salmonella*, *Listeria*, *E.coli* and *Campylobacter*



Michael Johnson, professor emeritus of food science, delivers a presentation at the meeting.



The Chancellor Hotel, Fayetteville Ar.

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Students Gain Real-World Experience through Experiential Learning Lab

According to a study done by Rutgers University, since 2006 51 percent of college graduates have not been able to find full time jobs. With numbers like these there is an even greater need for students to gain work experience while still in college. The Experiential Learning Lab (ELL), at the University of Arkansas, is designed for this exact purpose.

The ELL offers Agricultural Communications students the opportunity to gain real-world experience during college by providing low-cost, professional communications services to clients in the agricultural, food and life sciences disciplines. University of Arkansas student employees who have career interests and skills in agricultural communications provide the ELL's services.

In addition to the ELL offering undergraduate and graduate students the opportunity to gain valuable real-world work experience as they complete their degrees, the ELL provides quality services to clients.

“We had people coming to us wanting students to do small projects for them, and we wanted a way to streamline that process of providing students to do work,” said Jeff Miller, one of ELL's coordinators.

Agricultural Communication students use the skills that they have learned in classes to complete a range of projects brought to them by clients. Projects include website management and design, news and feature writing, marketing and advertising and videography. Agricultural Communication students have an array of skills that they use to complete these projects.

One of the first students to work for the ELL is Lindsey Emerson, a junior Agricultural Communications student. Emerson says that the ELL has given her an opportunity to improve and develop her skills outside of the classroom.

“Through working in the ELL, I've been able to develop my skills beyond what I've learned in the classroom,” Emerson said. “The experience I've had working with actual clients will be really beneficial when I graduate.”

The ELL originated in 2012 in the Agricultural and Extension Education department in the Dale Bumpers College of Agricultural, Food and Life Sciences. The ELL has grown in a short period of time and has begun taking on more projects.

“We got started with a project from the University of Arkansas Equine program, developing promotional materials and putting together marketing campaign plans for their horse sale and annual fundraiser,” Miller said. “We also have done work with the Horticulture Department here on campus, the Natural Resources Conservation Service, and for professional organizations off campus.”

Anyone who is interested in having work completed by the ELL should contact Miller or one of the ELL staff.

“Contact one of the ELL staff or myself, and we would set up a meeting to determine the scope of the project and make sure we have the staff to complete the work,” Miller said. “Then we would set up an agreement on how much they would pay and how much work we would do for them.”

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The ELL specializes in providing clients who have small project needs with affordable, quality work.

“Our rates are really affordable when you think about contract communications services. We charge \$12.50 an hour for our services, and then we make an estimate in the initial meeting of about how many hours it would take for us to perform the work,” said Miller. “I think it is really important for people off-campus to know that we have this service where we charge \$12.50 an hour because most consultants would charge much more than that.”

The ELL staff have two future goals as they move forward: to become a self-sustaining organization and to grow larger in order to hire more students and provide them with the opportunity to gain real-world experience.

“We want it to be self-sustaining first—that is goal number one. We need for the money that comes in to pay for the students and for the facility,” said Miller. Secondly, we want it to get bigger, right now we have two students who work for us, and I can envision having three or four students who work for us and possibly a graduate position to coordinate the lab.”

Not only does the ELL provide students with an opportunity to gain real world experience, but it also improves students’ professional and business skills. Students are responsible for working with clients to ensure their needs are being met, tracking their hours, and working with graduate student leaders to ensure quality.

“We have a couple of graduate students on staff who consult at the beginning of a job and occasionally throughout the production of a creative piece or a campaign. Then at the end their most important role is to ensure quality,” Miller said.

By working closely with the Agricultural Communications faculty members, students can improve their skills by asking questions, and the interactions with faculty can help guarantee quality work.

“The whole idea of ELL was to improve the quality of the student work by allowing the students the ability to check their work with faculty,” Miller said. “Dr. Edgar, Mrs. Cox, and myself all consult on projects, and that is probably one of the most important parts of this exercise—for students to be able to run their work by us whenever they want to.”

The ELL offers many benefits to their clients: quality work, affordable prices, and an array of services, but the true benefits go back to the students.

“The ELL benefits students in several ways. It gives them the practical experience needed to get jobs when they graduate. It also provides them some money. They should get paid for the work that they do,” Miller said. “Their work has value and I want to make sure they get paid for it if they can.”

“Working in the ELL has helped me to prepare for my internship as well as prepare for my future career. It is a great way to make money in college doing the things that I love,” Emerson said.

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With the experience Emerson and other students gain through the ELL their professional futures look bright.

To learn more about ELL services contact Dr. Jeff Miller at jdmiller@uark.edu.

Koo Returns to Korea After Two Years at Center

Ok Kyung Koo completed two years as a postdoctoral associate at the Center for Food Safety and returned to South Korea in November, citing her experience at the university as an opportunity to become exposed to new research areas.

Koo, who came to Arkansas in the summer of 2010 after earning her Ph.D. degree in food science at Purdue University, accepted a position as a senior scientist at the Korea Food Research Institute, a government-based research center near Seoul, where she began work in December.

“My area will be in food safety,” she said of her new position. “They do a lot of fermentation work, so because of that we do a lot of micro-based studies. Those foods are known to be beneficial to our health.”

At the Center for Food Safety, Koo’s research emphasis was the transfer and cross-contamination of *Listeria monocytogenes* in deli slicers and the attachment of bacteria to work surfaces. Her research was associated with the Center’s grant from the U.S. Department of Agriculture’s National Integrated Food Safety Initiative. She also mentored graduate students working on *Listeria* and *Salmonella* projects as well as undergraduates.

“Working here was pretty great for two years,” Koo said. “During that time I got involved in many different research areas, some of which I hadn’t done during my Ph.D. studies. I was exposed to a lot of different perspectives in the food safety area.” She expressed gratitude for the opportunity to publish more articles in scientific journals and to mentor students.

“It was all very interesting and rewarding for me,” she said. “I would like to take all those experiences back to Korea working as a senior scientist.”



Ok Kyung Koo, postdoctoral associate

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Contribute to the Michael G. Johnson Endowed Fund in Food Science

The Arkansas Association for Food Protection has established the Michael G. Johnson Endowed Fund in Food Science at the University of Arkansas in honor of Dr. Michael G. Johnson, emeritus professor of food science. Johnson, who retired in 2009, joined the food science faculty in 1984. He served as research coordinator for the Arkansas component of the Food Safety Consortium.

When establishment of the scholarship was announced at an AAFP meeting, Johnson was honored by testimonials from colleagues and former graduate students. In his remarks to the audience, Johnson said mentors should direct their time to people who are working their way up. This “spirit of investing” prepares the next generation of researchers to pass their skills along to future students, he said. He advised researchers to be proactive in food protection issues and to “take what works for you and pass it on.”

Donors may give to the fund online by following these steps:

1. Go to the UA Office of Development online donor site at <https://onlinegiving.uark.edu>
2. Complete the online donation form. At the drop-down menu for “About My Gift,” select the line for “Other Department or Program.”
3. In the box for “Other Department or Program,” type in “Michael Johnson Endowed Fund in Food Science.” Type your donation in the “Gift Amount” box.
4. After completing the information in the “About Me,” “About My Spouse” and “About My Employer” categories, go to the “For Memorial/Honorary Gift” category. Under the choice of “This gift is being made:” select “In honor of” and type “Michael Johnson” on the box.
5. Leave blank the line for “Who should we notify of this gift?” The UA Office of Development will notify Dr. Johnson of donations to the fund.
6. Proceed with the credit card donation procedures.

To discuss major contributions, contact Trina Holman at the UA Dale Bumpers College of Agricultural, Food and Life Sciences, at tfolman@uark.edu or 479-575-2179.

Workshops at the UA Institute of Food Science and Engineering

Better Process Control School:

Oklahoma State University - There will be a regular Better Process Control School at Oklahoma State University June 12-14, 2013 in Stillwater. Contact William McGlynn for details. (william.mcglynn@okstate.edu)

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Workshops at the UA Institute of Food Science and Engineering

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University of Arkansas - This 3 day workshop will be held the first week of November in Fayetteville AR (November 5-7, 2013).

Food and Nutritional Labeling Workshop – This workshop will be held in Summer 2013 in Fayetteville AR. Details will be available at a later date

Advanced Culinary Arts for Food Technologists - 9/9/2013 <https://www.regonline.com/advancedculinaryartsforfoodtech>

Culinary Arts Fundamentals for Food Technologists - 5/13/2013 <https://www.regonline.com/culinaryartsfundamentalsforfoodtech>

CFS Publications and Presentations

Publications:

Pinder, R.S., Patterson, J.A., O'Bryan, C.A., Crandall, P.G., Ricke, S.C. 2012. Dietary fiber content influences soluble carbohydrate levels in ruminal fluids. *J Environ Sci Health Part B* 47: 710-717.

Crandall, P.G., Ricke, S.C., O'Bryan, C.A., Parrish, N.M. 2012. In vitro effects of citrus oils against *Mycobacterium tuberculosis* and non-tuberculous *Mycobacteria* of clinical importance. *J Environ Sci Health Part B* 47: 736-741.

Jarvis, N., Clement, A.R., O'Bryan, C.A., Babu, D, Crandall, P.G., Owens, C.M., Meullenet J-F, Ricke, S.C. 2012. Dried plum products as a substitute for phosphate in chicken marinade. *J Food Sci* 77: S253-S257.

Pendleton, S.J., Crandall, P.G., Ricke, S.C., Goodridge, L., O'Bryan, C.A. 2012. Inhibition of *Escherichia coli* O157:H7 isolated from beef by cold pressed terpeneless Valencia orange oil at various temperatures. *J Food Sci*. 77: M308-M311.

Božic, A.K., Anderson, R.C., Ricke, S.C., Crandall, P.G., O'Bryan, C.A. 2012. Comparison of nitroethane, 2-nitro-1-propanol, lauric acid, Lauricidin® and the Hawaiian marine algae, *Chaetoceros*, for potential broad-spectrum control of anaerobically grown lactic acid bacteria. *J Env Sci Health Part B* 47: 269-274.

Milillo, S.R., Friedly, E.C., Saldivar, J.C., Muthaiyan, A., O'Bryan, C.A., Crandall, P.G., Johnson, M.G., Ricke, S.C. A review of the ecology, genomics and stress response of *Listeria innocua* and *Listeria monocytogenes*. *Crit Rev Food Sci Nutr* 52: 712-725.

Van Loo, E., Babu, D., Crandall P., Ricke, S. 2012. Screening of commercial and pecan shell-extracted liquid smoke agents as natural antimicrobials against foodborne pathogens. *J Food Prot* 75: 1148-1152.

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Presentations:

Babu, D., Crandall, P.G., Hurd, S., Brown, L., Martin, E., Pelkki, M., Carrier, D.J. The extraction of high value phytochemicals in the context of a biorefinery: Sweet gum as a possibility. Presentation at Bio-refinery conference, Spring 2012. Copenhagen, Denmark.

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Koo, O.K., Mertz, A.W, Sirsat, S.A., Neal, J.A., Ricke, S.C., Crandall, P.G. Microbial ecology of deli meat slicers. Presentation at IFT Annual Meeting, Las Vegas, NV, June 26-28, 2012.

Masuku, S.M., Babu, D., Martin, E.M., Koo, O.K., O'Bryan, C.A., Crandall, P.G., Ricke, S.C. Decontamination efficacy of blended cellulose/cotton cloths and silver dihydrogen citrate on food contact surfaces. Presentation at IFT Annual Meeting, Las Vegas, NV, June 26-28, 2012.

Jarvis, N., O'Bryan, C.A., Babu, D., Crandall, P.G., Owens, C.M., Ricke, S.C. Dried plum products' effects on water holding capacity in marinated chicken breast fillets compared to phosphate. Presentation at IFT Annual Meeting, Las Vegas, NV, June 26-28, 2012.

Davis, M.L., P.G. Crandall, C.A. O'Bryan, and S.C. Ricke, 2012. Processing locally grown poultry and livestock in a safe and affordable manner. Conference on Research and Regulatory Aspects of Food Safety at the FDA's Jefferson Laboratories, National Center for Toxicological Research and Arkansas Regional Laboratory, Jefferson, AR, Apr. 11, 2012.

Ricke S.C. "Food Industry Perceptions on Rapid Detection Methods" Vivione Biosciences, Dept. of Food Science, University of Arkansas, Fayetteville, AR, June 14, 2012.

Ricke S.C. "Overview of UA Center for Food Safety Research Program" Albemarle Corporation, 451 Florida Street, Baton Rouge, LA, June 18, 2012.

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CFS Publications and Presentations

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Ricke S.C. "Development of Novel Strategies for Controlling Salmonella in Poultry Production", Keynote Symposium – Tomorrow's Poultry: Sustainability and Safety, Poultry Science Association Annual Meeting, Athens, GA, July 9, 2012.

Ricke S.C. "Application of Genomics and Metabolite Analysis to Assess Gastrointestinal Ecology in Alternative Poultry Production Systems", Symposium - Next Generation Sequencing Tools: Applications for Food Safety and Poultry Production, Poultry Science Association Annual Meeting, Athens, GA, July 10, 2012.

Ricke S.C. "Antimicrobials for Salmonella in Dog Food", Anitox, Lawrenceville, GA, July 11, 2012.

Ricke S.C. "Campylobacter in Pasture Flock Poultry", REU-NSF program, University of Arkansas, Fayetteville, AR, July 16, 2012.

Ricke S.C. "Current Perspectives on Antibiotic Resistance in Salmonella," Poultry Processing & Safety Workshop, Extension Food Science Training Facility, University of Georgia, Athens, GA, July 25, 2012.

Park, S.H., I. Hanning, A. Perrott, E. Alm, S. Pendleton and S.C. Ricke. 2012. The gastrointestinal microflora profiles in poultry are modified by supplementing feed with prebiotics. XXIV World's Poultry Congress, Bahia Convention Center, Salvador-Bahia, Brazil, Aug. 5-9.

Gibson, K. E., I. Mojica, B. Putman, and S. C. Ricke. 2012. Presence of fecal indicator bacteria and pathogenic microorganisms at recreational beaches in Beaver Lake in Northwest Arkansas. Amer. Soc. Microbiol. General 112th Annual Meeting, San Francisco, CA, June 16-19.

Park, S., M. Munro, I. Hanning, W. Gilbert, L. Devareddy, and S.C. Ricke. 2012. Different gastrointestinal microflora of obese mice by adding fresh or aged blackberry powders to feed. Amer. Soc. Microbiol. General 112th Annual Meeting, San Francisco, CA, June 16-19.

Schielack III, V., M.D. Buser, B. Adam, S.C. Ricke, and P.G. Crandall. 2012. Concept of a stakeholder-driven whole-chain traceability system for agricultural products. ASABE Annual International Meeting, Dallas, TX, July 29-Aug.1.

Koo, O.K., M. Munro, S.A. Sirsat, A. Muthaiyan, and S.C. Ricke. 2012. The physiological and genetical responses on Salmonella Typhimurium exposed to sublethal thermal stress. Institute of Food Technologists Annual Meeting and Food Expo, Las Vegas, NV.

Koo, O.K., A.W. Mertz, S.A. Sirsat, J. Neal, S. C. Ricke and P. G. Crandall. 2012. Microbial ecology of deli meat slicers. Institute of Food Technologists Annual Meeting and Food Expo, Las Vegas, NV.

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Gibson, K., O. Koo, C.A. O'Bryan, S. Ricke, and P.G. Crandall. 2012. Observational assessment and relative quantification of cross-contamination within a mock retail deli environment. Institute of Food Technologists Annual Meeting and Food Expo, Las Vegas, NV.

Jarvis, N., C.A. O'Bryan, D. Babu, P.G. Crandall, C.M. Owens, and S. C. Ricke. 2012. Dried plum products' effects on water holding capacity in marinated chicken breast fillets compared to phosphate. Institute of Food Technologists Annual Meeting and Food Expo, Las Vegas, NV.

Kalpana, K., F.W. Pohlman, S.C. Ricke, P.N. Dias-Morse, and D. Babu. 2012. Effect of octanoic acid treatments applied using conventional and electrostatic spray methods on microbial and color characteristics of ground beef. Institute of Food Technologists Annual Meeting and Food Expo, Las Vegas, NV.

Masuku, S.M., D. Babu, E.M. Martin, O.K. Koo, C.A. O'Bryan, P.G. Crandall, and S.C. Ricke. 2012. Decontamination efficacy of blended cellulose/cotton cloths and silver dihydrogen citrate on food contact surfaces. Institute of Food Technologists Annual Meeting and Food Expo, Las Vegas, NV.

Ricke, S.C. 2012. Development of novel strategies for controlling Salmonella in poultry production. Keynote Symposium, Poultry Science Association Annual Meeting, Athens, GA.

Ricke, S.C. S.H. Park, I. Hanning, A. Perrott, B.J. Bench, and E. Alm 2012. Application of genomics and metabolite analysis to assess gastrointestinal ecology in alternative poultry production systems. Symposium - Next generation sequencing tools: Applications for food safety and poultry production, Poultry Science Association Annual Meeting, Athens, GA.