

STEC CAP News

CONTROLLING SHIGA TOXIN-PRODUCING *E. coli* TO IMPROVE BEEF SAFETY

Director's Update

Dear STEC CAP Nation,

It is again with a heavy heart that I begin another newsletter article. On September 1, Dr. Prem Paul, UNL Vice Chancellor for Research and Economic Development passed away after a long illness. Prem was a personal friend and colleague for nearly 30 years. Prem impacted many people, and played a significant role in the administration of the STEC CAP. I will always appreciate his optimism, passion, and many efforts to make the world a better place. He was an inspiration to everyone, and will be greatly missed.

On a lighter note, I am pleased to say we had another successful annual meeting in June, and heard a number of positive comments from participants and stakeholders. Thank you, Jill, Carol and others who again made our annual meeting a great success. One of our stakeholders, in response to a survey, had this to say about our work: "They're really defining the prevalence and incident rates of STEC...and ultimately what their end contribution is to food safety." I thank all those members of our Stakeholder Advisory Board (SAB) who took the time to attend the meeting and provide



Rod Moxley

guidance. I especially thank Brenden McCullough (National Beef Packing) for serving as SAB Chair, and with Pat Mies, for providing the written SAB report

following the meeting.

As you know, Dr. Isabel Walls had indicated at our annual meeting in June that she intended to approve a Year 6 no-cost extension, dependent upon receipt of appropriate documentation materials in August and a successful review by her and other USDA-NIFA administrators. I am happy to say that we did get these materials submitted to Dr. Walls on August 23, and she indicated to me that they were indeed what she needed, and that the review is in progress. I will let you know as soon as I receive word from her whether the extension has been approved.

With regard to progress, I am pleased to inform you that we have doubled the number of refereed journal

Economics and Food Safety

For most people, the fact that food scientists, microbiologists, and veterinarians deal with food safety comes as no surprise, but they may not realize that economists often work on the same topic. Indeed, they may wonder what exactly economists contribute when the discussion is about *E. coli*, *Salmonella*, or pesticide residues. But from an economist's perspective, food safety is no more exotic or unusual than corn markets, interest rates, or trade deficits. Food safety, to an economist, is a commodity—one with distinctive characteristics certainly, but nonetheless subject to the laws of supply and demand.

In the U.S., the role of economic analysis in the area of food safety was enhanced by two events toward the end of the 20th century. In 1981, President Reagan introduced rules requiring that any new federal regulation demonstrate that benefits to society exceeded costs. The second event was the infamous Jack-in-the-Box *E. coli* outbreak in 1993. Deaths, especially those of young children, from tainted meat led to increased federal funding for food safety

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research and the introduction of hazard analysis and critical control point (HACCP) rules, subject to cost-benefit analysis, for the meat and poultry industries.

Food safety is what economists call a “non-market” good. That means there are no markets in which it is bought and sold, and so its price cannot be directly observed. While food safety, like other goods, has a supply curve and a demand curve, the fact that it does not trade in regular markets means that those supply and demand curves are not readily observable. One of the primary objectives of economic analysis is to discern the characteristics of supply and demand for food safety. Without knowledge of those characteristics, cost-benefit analysis cannot be accomplished. In a nutshell, the economist’s main role involves informing policy makers about the social benefits (measured using the demand curve) and social costs (measured using the supply curve) of new policies or regulatory initiatives relating to food safety.

My recent work on the STEC-CAP project focused on consumer demand for food safety. In particular, my colleague, Dr. Ji Yong Lee, and I were interested in the value consumers place on reducing risk from *E. coli* in hamburger. If food safety were a market good, that value could be calculated fairly readily. In a hypothetical market, the value of risk reduction would be, for example, the difference between the average price of Brand A hamburgers having a 1 in 105 probability of containing pathogenic *E. coli*, and Brand B hamburgers where the probability is 1 in 106. That value would depend on other factors including the characteristics of the population and other characteristics of the hamburgers.

For non-market goods like food safety, economists employ other approaches to uncover the demand curve. Ideally, one would conduct a retail trial and measure how market shares vary as prices are adjusted. More often, though, economists rely on what are called stated-preference methods – i.e., surveys in which respondents make choices among different alternatives or respond to questions about how much they would be willing to pay for certain products or attributes. Survey responses are, of course, hypothetical, and may not accurately reflect the choices consumers would make in an actual market setting. For that reason, economists frequently use laboratory experiments, in which participants bid in an auction market for alternative products. Participants

in experiments often end up consuming the product for which they reveal the highest value. The fact that values revealed in an experiment can lead to an actual purchase or consumption of a product leads economists to believe that those values may be more reliable predictors of market behavior than values elicited in surveys.

In our work, we were particularly interested in how the value for risk reduction was influenced by the technology used to reduce the risk. To elicit that value, we used both a mail survey and a laboratory experimental auction. In each, we provided respondents with basic descriptions of food irradiation, direct-fed microbials (DFM), and high pressure processing (HPP). Respondents were asked to evaluate the acceptability of each technology and how much they would

be willing to pay for a hamburger from each of those technologies compared to a regular untreated hamburger. In the experiment, participants were required to consume either a regular hamburger or one of the alternative “treated” hamburgers if they acquired it in the auction.

Respondents in both the mail survey (n=207) and laboratory experiment (n=112) indicated reasonably high levels of acceptability for all three technologies. Responses to likert-scale questions, where 1 indicated “totally unacceptable” and 5 indicated “perfectly acceptable,” averaged from 3.46 for food irradiation up to 3.93 for DFM, and the average

responses were similar in both samples – survey and experiment. Substantial differences emerged however, when respondents revealed what they would be willing-to-pay for the different hamburgers. Survey respondents indicated that, on average, they were willing to pay a higher price for each of the treated hamburgers compared to the untreated burger - 5c more for an irradiated burger, 40c more for a HPP burger, and 51c more for a burger from animals treated with DFM. But in the experiment, where respondents were required to consume a burger, participants revealed lower, rather than higher values for the treated burgers. Compared to the regular burger, participants, on average, were willing to pay 30c less for an irradiated burger, 5c less for a DFM burger, and the same price as regular for a HPP burger.

The results point to the potentially misleading results that surveys can generate. For the HPP technology for example, the 40c per burger average premium predicted from the



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survey results disappears completely in a situation where respondents face the possibility of actually consuming the product. And that pattern – lower valuation in the experiment compared to the survey – was found for all three of the risk reducing technologies. This is not to say that profitable niche markets might not exist for some of these risk reducing treatments. For HPP, even though the average premium was zero in our experiment, slightly more than 20% of the sample indicated that they would pay a premium for the HPP burger. Overall however, the results suggest that,

in the absence of successful efforts to educate consumers, widespread adoption by the beef industry of the technologies we considered in this study is unlikely to be profitable.

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Penn. schools get grant to study Shiga-toxin producing *E. coli*



Souderton students visiting UNL during the STEC CAP Annual Conference, June 2016

The Souderton Area School District received \$250,000 from the U.S. Department of Agriculture on Monday to help fund a career-exploration program for students who want safe food.

The money is part of a \$25 million grant named after a bacteria commonly associated with foodborne illnesses.

The STEC-CAP grant, also known as the Shiga toxin *Escherichia coli* Coordinated Agricultural Project, will connect Souderton students to researchers across the country whose objectives are to identify and eliminate

pathogenic *E. coli* on food, said Kyle D. Longacre, the high school's assistant principal.

The University of Nebraska-Lincoln directs the research, which involves participants from 13 colleges and universities.

According to Longacre, a partnership between the USDA and Souderton schools has prospered since 2014 when 10 high school teachers were trained about food safety methods, bacterial growth labs and the latest research related to Shiga toxin-producing *E. coli*.

The money will also help Souderton's Pathway 360 program, which places motivated students in the professional workplace with mentors.

Longacre, who leads Pathway 360, said the high school would use the money to spread the word about food safety and to get students to consider a career in food science and agriculture.

"It's been a tremendously creative program," said Dr. Rodney Moxley, a professor in the School of Veterinary Medicine and Biomedical Science at the University of Nebraska-Lincoln. "Pathway 360 has its own inherent accomplishments in that you are helping students to get jobs."

According to the district, the money also will help fund the possible expansion of partnerships with Upper Perkiomen, Norristown and other school districts.

Longacre said students in Pathway 360 take part in an initiative called "Message to the Masses" in which Souderton's Design, Marketing and Communications club partnered with three advertising agencies to create slogans for the USDA's program on safe handling of beef.

Students in the design and marketing club presented their ideas to advisers following Monday's announcement

of the grant. The ideas were then critiqued by advisers with the STEC-CAP grant program. Longacre said the advisers will select the best idea, and the USDA will fly five or more Souderton students to Nebraska in June to present their ideas to a national council of STEC-CAP advisers.

“It's been a tremendously creative program...you are helping students to get jobs.”



On my behalf I just want to say what a positive experience being part of the STEC CAP grant has been. It is a unique opportunity to get major players from multiple disciplines (industry/academia/consumer/regulatory) together and work on a specific issue as a

group. In addition, it is the first time that I am aware of that the real world environment is being considered in the validation and testing world. The education portion of the STEC CAP grant is an extremely important section of the overall grant focus, and for me selfishly, is an opportunity to impact potential future food safety professionals as well as a rare opportunity to have interaction even at the high school level.

Brenden McCullough
STEC CAP Advisory Board President

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publications we have to our credit in the past year. As we enter what will likely be the final year of the grant, I will continue to "beat a dead horse" and say let's do our best to get projects completed, papers published, and "points on the board" reported through the Piestar system (<https://steccap.piestar.com>). On a related note, I will be requesting an annual report from you this fall, and will soon send out instructions, which should not deviate much if any from previous years. Since each of you completed a report this past summer, much of that information should already be available in your files, which should minimize the effort. However, since we have 50+ collaborators, I still need your help to collect and update this information to allow me to submit the REEport in December. I have found through personal experience that effective reporting of efforts often takes multiple looks at the information.

I would like to take a moment to congratulate Dr. Curtis Kastner on his retirement from Kansas State University in July. Thank you, Curtis, for all your past efforts as Objective 5 Team Leader, and thank you also for offering to continue to help with the STEC CAP until its completion.

In closing, I would like to state that, pending approval of our no-cost extension, we are planning to have an annual meeting in 2017 and will let you know as soon as possible about the dates and location. As always, please feel free to contact me, Jill, or the Executive Management Team if you have any questions or concerns, and thanks again for all you do for the STEC CAP.

– Rod Moxley

STEC CAP Grant – A Global Snapshot



Had you asked me where I saw myself after obtaining my Master's at the beginning of my program, my answer most likely would have involved working either in a laboratory, or for a food company, somewhere in the American Midwest, or maybe along one of the coasts if I was feeling adventurous. The answer most assuredly would not have been engaged as a Food Scientist in Bangkok Thailand.

I began working for Dr. Randall Phebus of Kansas State as an undergraduate and knew that if I pursued a higher degree I would want to do it in his laboratory. I knew it was the place for me not only because of the innovative work that was being conducted, but also due to the great people that I met during my time there. With this in mind I set out to begin my research in the preliminary days of the STEC CAP grant. In my case, this entailed evaluating media suitability for growing the Big 6 STEC. While quite challenging, and occasionally a bit repetitive (there were a lot of dilutions), because of the collaboration of the CAP teams I knew that I was not alone in my endeavors. Working with so many different people brought fresh perspectives to bear on any problems that arose, allowing them to be resolved quite efficiently.

Besides my own research, I had the opportunity to work on projects that spanned multiple universities and the USDA. This greater exposure to ways of working was vital to helping me understand and develop a greater appreciation for the work that the organization was doing. It was also a great chance to develop skills and gain experience in areas that could complement my project.



Alas, as my work began to wrap up it was time to me to part ways with the fine people with which I had surrounded myself. It was no small feat to summarize all that I had spent years learning. But with a great deal of help and the support of my wonderful Graduate Committee (Dr. Randall Phebus, Dr. Harshavardhan Thippareddi, and Dr. Sara Gragg, I couldn't have done it without your guidance), I managed to bring the journey that I started seemingly so long ago to a close.

Having completed my degree just over a year ago at this time, I look back fondly on my time with the STEC CAP Grant team. Working with myriad universities and the great researchers from each, it was a collaboration of wonderful people working together to solve issues that otherwise seemed impossible. I wholeheartedly feel that the connections and interactions that I experienced during my time as a graduate student allowed me to develop the skills needed to succeed not just academically, but also in the challenging world beyond grad school. My skills have taken me from the comfort and familiarity of the American Midwest, to the Far East.

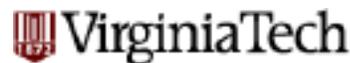
From a former STEC CAP member in Bangkok, Thailand, keep making the world better.

– *Nicholas W.L. Baumann*



Kastner Retirement

After 41 years of service, Dr. Curtis Kastner, Director, KSU Food Science Institute has announced his retirement. STEC CAP Nation is proud of your service and thanks you for your leadership, service and commitment for the best of the Food Science programs at Kansas State University and beyond.



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