

STEC CAP News

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

EMT Update!

This past July, John Luchansky sent you warm greetings from his City of Brotherly Love (Philadelphia) as he informed you that the STEC CAP newsletter would be issued bimonthly with a rotation of EMT members taking the lead



Randy Phebus

to put it together. Dr. Harsha Thippareddi updated you in September's newsletter on STEC CAP business and happenings from wonderful Huskerland (Lincoln, NE) as we watched the arrival of the autumn and the excitement of college football (yes, they still play football in Nebraska). Now, as the chill in the air here in the Little Apple (Manhattan, KS) has arrived signaling the approach of winter, I have the true pleasure to present to you the STEC CAP newsletter – November 2013 edition. I hope you enjoy it and benefit from the information and stories contained. Please share the newsletter widely and proudly.

We have an anniversary coming up! Our STEC CAP grant was awarded under the 2010 AFRI Food Safety Program with our start date being 1/1/2012. We were fortunate to receive both year 1 and year 2

funding initially due to unexpected delays with USDA contracting after winning the award, which set our first contract ending date at 12/31/2013 (our STEC CAP anniversary date). We are considered a "continuation grant". As such, we are required to submit a continuation grant application each year to NIFA to receive our next annual funding

allotment. Dr. Rod Moxley (our project director), with huge assistance by Jill Hochstein and Lynne Smedjr and her staff in the UNL IANR business office, compiled and submitted this continuation application to meet the October 21 deadline relayed to us by Dr. Thurston (our NIFA Program Leader). The Y3 continuation application was basically a resubmission of the original grant components, modified and updated to reflect our plans for integrated research, education and outreach across all five objectives specifically in year 3. The EMT wants to thank each collaborator for your efforts in submitting your statements of work, budgets and budget justifications in September as requested, as these were relied upon heavily to construct the overall Y3 continuation application. I, personally, want to also thank Anita Fahrny and Randy Griffith here at K-State for helping me

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An Introduction to Food Safety Interventions in the Cattle Feeding Industry

Food safety in the cattle feeding industry encompasses two main issues: drug residue avoidance and food-borne pathogen mitigation. Today, producers are also being asked to work towards pre-harvest food safety through the mitigation of food-borne pathogens in live cattle at the commercial feeding facility to limit the amount of pathogen carriage into slaughter facilities. As a primary effort of the Beef Cattle Institute, and as an important component of our STEC CAP grant's Objective 5 Education and Outreach activities, we continue to work with veterinarians and cattle producers to provide training in various areas and encourage development of pre-harvest food-borne pathogen mitigation programs (www.animalcaretraining.org). Animal handling and comfort are important to cattle health and performance. Also, increased stress in cattle has been shown to increase *E. coli* O157:H7 shedding. It is important that producers implement and operate a low-stress cattle handling and facility management protocol detailing

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Scientific Advisory Panel (SAP) Good-Byes and Hellos

Recently, the STEC CAP grant management recognized Dr. Bruce Tompkin with a plaque expressing our appreciation for the guidance that he has provided to our EMT and to the Objective 3 post-harvest intervention team since we were awarded the STEC CAP grant. Dr. Tompkin is one of the most respected microbiologists in the entire food industry, and even though now retired, he has been actively engaged with planning and executing STEC validation research that we have now completed at the USDA Eastern Regional Research Center, led by Drs. John Luchansky and Anna Porto-Fett. As Dr. Tompkin steps away from the SAP obligations and fulfills his plans to spend more time fishing and gardening, he did indicate that

he would always pick up the phone if we needed his ear on anything. Thank you again Bruce for your involvement with our STEC CAP work and best wishes.

The great news is that we have reloaded the SAP with Dr. Peter Taormina. Peter is a principal microbiologist for the John Morrell Food Group and is based out of Cincinnati, OH. Peter has been intricately involved with guiding the aforementioned processed meat validation research that our team conducted at the ERRC already, and many of you met Peter at our STEC CAP breakfast this July at the IAFP conference in Charlotte, NC. Thank you Peter for volunteering your time and expertise to our SAP.

...Food Safety Interventions ...continued from page 1

effective techniques for loading, unloading, and general handling to minimize shedding of pathogens. There are effective tools such as vaccines and probiotics on the market for controlling *E. coli* O157:H7 in feeder cattle, and efforts are underway to expand these to control the broader STEC group of microorganisms.

Humans, insects and animals (wild and domestic) can carry *E. coli* O157:H7, STEC and other pathogens. It is important for managers of cattle feeding operations to implement, enforce and document pathogen prevention protocols and associated training activities of employees related to food safety and personal hygiene. Proper hand washing and general hygiene are important in preventing illness to workers and their family members, along with being important in minimizing the potential spread of pathogens throughout cattle production areas. While it is difficult to completely control these natural vectors, a pest management program for flies, rodents and wildlife can be important in managing food borne pathogens in a cattle feeding facility.

Equipment and facilities must be kept clean and functional to reduce STEC and other pathogens in feeder cattle. We recommend that each cattle feeding facility implement procedures for maintaining clean and functional feed bunks, alley ways and water tanks. Also, it is very important to convey the understanding to employees that

implements used for feeding cattle should not be used for transport of fecal matter, old or discarded feeds, or deceased animals. If it is necessary to use the same loader for multiple uses, then the bucket of the loader must be properly cleaned between uses.

Lastly, but maybe most importantly, good pen floor management at the feed yard is essential to ensure that cattle have a clean and comfortable area to lie down. Mud and dried feces (often referred to as tag) attached to hides is a major risk factor during dressing procedures, and can serve as a key source of *E. coli* O157:H7 and other STEC contamination on beef carcasses. Cattle feeders need to maintain clean pens to prevent mud from caking on the hides of cattle. Also, dust control during the drier summer months is an important pre-harvest STEC control point. Cattle are transported in trailers from feedlots to slaughter facilities. Transportation crews should institute a program for effectively cleaning manure from cattle trailers between cattle shipments.

Pre-harvest food safety is a lot about applying common sense and following through with good cattle care practices. When we have validated pre-harvest pathogen intervention technologies available that are effective, affordable and practical within production systems, we should also get these implemented into formal feedlot programs. We can all do our part on improving food safety

in the beef industry through sound management and proper day-to-day actions. Implementing simple practices and common sense strategies at the beef production (live animal) stage will likely substantially reduce carriage of STEC into the processing facility and spread of contamination onto dressed carcasses, thus resulting in a lower risk of pathogens finding their way into wholesale and retail beef products. My post-harvest beef safety friends (many of which are part of our STEC CAP Objective 3 team focused on validation of STEC interventions) tell me that carcass and subprimal intervention treatments, which are widely utilized commercially today, are impressive in their effectiveness against low pathogen contamination levels, but that problems can arise when "hot" carcasses (those with higher levels of microbial contamination) occur and potentially overload the control capacity of that technology, or series of intervention technologies. I believe them, and that's why we need to pay attention and exert a good effort in pathogen control at pre-harvest cattle production.

**Contributed by Daniel U. Thomson, PhD, DVM
Jones Professor of Epidemiology and Production Medicine
Director, Beef Cattle Institute
K-State College of Veterinary Medicine**

...EMT Update ...continued from page 1

submit the budgetary information needed for our 17 some-odd STEC CAP collaborators.

Simultaneously, collaborating institutions were allowed to ask for a one-year no-cost extension to complete their Y1/Y2 UNL-contracted work and these will end November 30, 2014. *Please understand how important it is that each STEC CAP collaborator be very aggressive in addressing their Y1/Y2 and now Y3 deliverables, and in effectively utilizing their budgets according to the annual schedule of deadlines (and your submitted Gantt charts).*

September and October were very busy months for the EMT. In addition to the above-mentioned Y3 continuation application and no-cost extension requests, we were required to submit an annual report of year 2 work to NIFA through the USDA REEport system. A tremendous shout-out goes to our Office of Educational Innovation and Evaluation (OEIE) partners who took the lead on drafting this report, as they do almost all of our official reports. *To you collaborators, we again emphasize the importance of responding to OEIE's monthly call for points-on-the-board (POB) since these comprise an extraordinary portion of our reports.* Please read the OEIE update in this newsletter, as it has some important procedural information that you will need to be following in the future when submitting publications. I also want each of you to know that we have a very humble leader in Dr. Moxley, but he dedicated an unbelievable amount of time and effort to getting all of these applications and reports submitted on time and in great form, while simultaneously getting his STEC CAP research done and other UNL educational duties covered. An additional accomplishment this period was the launch of a request for proposals for minority serving institutions to conduct targeted research projects related to our STEC CAP effort. Our MSI program coordinators at New Mexico State University assisted in distributing the RFPs broadly, and various STEC CAP collaborators became engaged in recruiting quality proposals. Please read about our two MSI winners, and join me in welcoming them to our STEC CAP initiative.

Did y'all hear that there was a government shutdown? Well, we weren't immune to the negative and frustrating impacts of that process. First, the websites and agency support staffs that we needed to work with to submit the reports and applications above were down. Even our USDA ARS collaborators at Eastern Regional and MARC were shut down (let's say on forced vacation). I hear that John and Anna had plates that incubated for 17 days! The most notable impact for us was that the EMT had scheduled an October 9-10 work session outside of Philly to finalize reports and applications, and strategize about up-coming Y3 grant activities. We also had most of the Objective 3 (Interventions) team set to attend to thoroughly cover our science and outreach efforts. Unfortunately, we were forced to postpone this meeting since our key government participants couldn't attend. We have

rescheduled this important meeting for December 17-18. During this meeting, we will be reviewing all collaborators' Y1/2 annual reports and budgets, along with Y3 plans to be sure that we are all tracking towards defined deliverables and overall grant scientific needs.

I think everyone knows this by now, but I am genuinely honored to serve as a co-PD on this STEC CAP grant with so many elite, dedicated researchers and educators focusing on the challenge of minimizing Shiga toxin-producing *E. coli* in our beef chain. This and previous newsletters contain only a very small sampling of the important activities going on across our 13 institutions. More information is always available on our website (www.stecbeefsafety.org) and Facebook page (www.facebook.com/stecbeefsafety). I implore you to realize that we are almost mid-way through our five-year grant; we have accomplished a significant amount already, but we have massive volumes of work yet ahead of us.

You'll be hearing from Rod again in January's newsletter. Let him or Jill know if you have any contributions you would like to include in the newsletter, or at anytime on the website or Facebook page. We would love to hear from you. On behalf of Rod, Jill, John, Dan, and Harsha, we thank each of you and wish you the best. Now... to the November 2013 newsletter...

Randy Phebus

"The STEC internship program, while challenging, was extremely worthwhile. Through this program, I learned much about the proper methods and procedures involved in conducting research in a laboratory setting, as well as doing research for and writing scientific papers. This internship program has given me great insight into how research is professionally performed, and for that, it is immeasurably valuable."

Jianshi Li
Former STEC-STEP intern with Dr. Jim Cullor
UC Davis-Tulare

STEC CAP's Reasoner to Receive Master's Degree in December 2013

We are seeing great successes associated with our STEC CAP grant, and for the Objective 5 Education and Outreach component (by the way, this component of our integrated grant claims about a third of our overall effort and budget!), a good portion of these successes focused at the student level can be directly attributed to the expertise and dedication of Sarah Reasoner. Sarah is the Distance Education Program Coordinator at Kansas State University and serves as the STEC-STEP Internship/Externship Program Coordinator for the STEC CAP grant. STEP stands for Student Training and Education Program in case you're becoming weary of acronyms.

Sarah received her bachelor's degree in Animal Sciences and Industry from K-State in 2004. She began working in her current position in the Food Science Institute in 2005. As the distance program coordinator she helps create and facilitate the distance education courses that make up the bachelor's degree completion program in both Animal Science and Food Science and the distance master's degree in Food Science. Additionally, Sarah provides technical assistance and support to the aforementioned departments in capturing, delivering and supporting all of the courses delivered by distance.

As our grant's STEC-STEP Internship/Externship Coordinator, Sarah aids in initiating the calls for collaborator proposals for internship positions, compiles intern and extern applications for collaborator review, works closely with the accounting office to provide intern stipend payments, and helps make arrangements for interns to present their internship research

at the STEC CAP annual meeting. We want all STEC-STEP interns and externs to have favorable and productive learning experiences, and the personal attention that Sarah provides is key to ensuring that this is the result.



Sarah Reasoner

Another thing that Sarah brings to STEC CAP collaborators is assistance in disseminating results and information from their research through formalized educational modules that can be offered for collegiate credit, and that will help with stakeholder education and training across the cattle producer to consumer continuum. Sarah is available to facilitate capturing and delivering relevant material in the form of online distance modules. Do not hesitate to call on her (sreason@ksu.edu) to get her guidance on how and what you may offer, how modules might be structured and utilized across various programs and/or institutions, and how you might utilize her unique educational expertise. This is a tremendously important part of our STEC CAP mandate.

Sarah successfully defended her master's degree this fall and will be receiving her degree in Biomedical Sciences during the December 2013 commencement ceremonies at K-State. She was co-advised by Drs. Doug Powell and T.G. Nagaraja who also collaborate on our STEC CAP grant. The main focus of her master's program was utilizing advances in technology to enhance food safety distance education. WAY TO GO SARAH!

Thinking About the Beef Industry's Next Generation of Science Leaders

Back in 2010 when various people in our group started discussing submission of a proposal to USDA NIFA's AFRI program to try to win the coveted STEC CAP grant, we knew that a well-conceived student food safety educational component would be critical to our success in the competition. Education experts within our collaborator group quickly determined that the best way to "educate" students was through hand-on, aggressive and highly applied experiences with the world-class researchers and educators from our affiliated institutions mentoring

undergraduate and graduate students across several associated disciplines. Two other things were obvious; 1) we can only educate students in food/beef safety if they become interested and engaged in the STEC CAP programs, and 2) the cattle and beef processing industries and the food service sector are multi-culturally diverse and so must be our STEC CAP education and outreach programs.

During the first two years of our NIFA-funded efforts, we have successfully initiated key elements of the student-focused programs that we

proposed originally. The core of all university research programs are the graduate students who do the heavy lifting to generate, manage, analyze, and interpret massive volumes of data (and make professors look very good). The STEC CAP grant supports many graduate stipends, and thus, is key to the education of these impressive students and future food/beef safety leaders. Let's focus now in this newsletter on the other student programs that are features of our STEC CAP grant deliverables, those being the STEC-STEP Internship and Externship Programs.

STEC-STEP Student Internship Program (Open to All Students)

Many of you have participated in the internship program since its inception, either as interns per se, mentors, or as lab mates to students conducting internship projects. We have had three rounds of internships thus far (spring, summer and fall 2013), and a total of 27 students have completed the program working under 19 different collaborators. Those first interns who completed their projects in the spring presented research posters at our first annual STEC CAP annual meeting at the end of May in Lincoln. It was an impressive group of students and projects, to say the least. The summer and fall 2013 and spring 2014 interns will present their posters at the second STEC CAP conference, again held the last week of May in Lincoln.

The internship program continues to be strong. We approved 14 internship proposals from collaborators for the spring and summer 2014 terms and we are currently receiving applications from university students across the country for these positions. The student application deadline is November 29, 2013, and selected students will be notified by December 15. Collaborators are encouraged to advertise and promote these internship positions through channels available to them and their institutions. Please refer potential candidates (undergraduate and graduate students and pre-veterinary or public health students) to www.stecbeefsafety.org/internship-i for more information about the program, to download an application form, and to see the list of available internship projects for spring and summer 2014. Completed applications should be submitted to internship@stecbeefsafety.org by the deadline. Collaborators should watch for another call for fall 2014 internship proposals sometime in April.

STEC-STEP Minority Student Internship Program (Open Only to Students from Officially Designated Minority Serving Academic Institutions)

The minority serving institution (MSI) program within our STEC CAP grant has two primary components; 1) a research grant program that funds competitive projects at MSIs addressing specified needs of the STEC CAP grant, and 2) a STEC-STEP student internship program specifically reserved for students who attend a designated MSI. Please visit www.stecbeefsafety.org/msi-program for detailed information.

Students attending MSIs apply for the general STEC-STEP internships that are available and previously discussed. However, a separate group of internship positions (up to 11 stipends in 2014) is reserved for these MSI-based students. In most cases, these MSI students would attend one of the collaborating STEC CAP institutions (universities, USDA ERRC or USDA MARC) to complete their internship. The deadline for receiving applications from MSI-based students for spring and summer 2014 terms is November 22, 2014 and selected students will be notified by December 15, 2014.

As you see elsewhere in this newsletter, a MSI research grant program was recently initiated and two MSI-generated proposals were selected for funding in 2014. This research will be conducted at the MSI by our new 2014 collaborators, Dr. Salina Parveen at the University of Maryland-Eastern Shore and Dr. Armitra Jackson-Davis at Alabama A&M University. This opens up additional opportunities for MSI-based students to apply for internships affiliated with these two MSI researchers. It is important to note that MSI student internship applicants must use the MSI-specified form found on the MSI program webpage link. Also, it is important to note that STEC CAP collaborators from the 13 core institutions are encouraged to submit

internship proposals specific for MSI-based students (using the Collaborator Form linked on the MSI webpage). The deadline for these collaborator proposals for summer and fall 2014 terms is February 14, 2014.

“My experience in the STEC internship program was an experience that made me never look at food the same way again. I was able get a closer look into the many aspects of food safety and be a part of the thought process that went into the local and state sides of food distribution. On a personal level, I was able to think from the point of view of both a food service manager and a server. This also allowed me to experience the difficulty of effectively communicating to different levels of management and the difficulty of creating a working food safety plan that satisfies all parties involved. Through this internship process, I gained a deeper appreciation of food as well as an understanding of the risks associated with food.”

*James Su
Former STEC-STEP intern with Dr. Ben Chapman
North Carolina State University*

In summary, the two STEC-STEP internship programs are very similar but are operated separately. They have different collaborator proposal forms, student application forms, and different associated due dates. Additionally, Sarah Reasoner at K-State coordinates the general internship program, while Kevin Andrew and Anthony Parra at New Mexico State University-Las Cruces coordinate the MSI program.

STEC-STEP Student Externship Program

Today, I (Phebus) met a young lady who is a junior at a small rural Kansas high school. She was visiting our Food Science Institute to learn more about food science as a major, and when I asked her how she learned about food science, she said that one of her high school science teachers had given a single lecture in biology class on food safety. She all of a sudden knew that she could put her interests in microbiology to work in an agriculturally affiliated field. I immediately thought to myself...how many students are out there who love science but don't know that food safety/microbiology exists and is one of the best career paths out there? It only took one teacher one lecture to expose this particular student to this field of study.

This was the idea behind the STEC-STEP externship program---to give high schoolers and undergraduate students a brief and focused exposure to the many scientific disciplines contributing to food safety as a major and as a career. Generally with externship experiences,

interested students "shadow" a CAP grant collaborator, one of their experienced graduate students, or an acceptable laboratory staff person for a half to full day to see what it's all about.

We committed to this program in our NIFA-funded proposal and during the reverse site visit in Washington, DC. All collaborators are sincerely asked to host one or a few externs each semester. Tell them about what you do and why it is important. Show them how research by our team on STEC can protect consumers, cattle producers, beef processors and food service operators from bad outcomes. Use your imagination and energy to entice local youngsters to fill out and submit an Externship Application Form (www.stecbeefsafety.org/externship-program), then accommodate their request and, finally, submit the very short Externship Summary Report form back to Sarah so we can record as POBs and follow up with evaluation activities.



Here are a couple of ways that Sarah and I will be recruiting externs:

- Visit local high schools and community colleges and discuss with science instructors the availability of these externships. Encourage them to either bring a group of students at one time for a couple of hours to visit and learn, or get them to announce the externships so that individuals can arrange visits.
- Announce externship opportunities in undergraduate classes at your university (food science, animal science, biology, microbiology)
- Spread the word to student clubs and organizations in agriculture and sciences.

OEIE Update: STEC CAP Accomplishments

Thank you for sharing your recent STEC CAP-related accomplishments. As of October 31, 2013, the following achievements or Points on the Board (POBs) have been submitted to the Office of Educational Innovation and Evaluation (OEIE) since January 2012.

- 81 Scholarly presentations or talks
- 61 Media contacts
- 10 Workshops or specialized training
- 51 Publications (of these, 11 refereed journal articles, 2 book chapters, and 1 technical report have been published, 1 book chapter has been accepted, and 1 refereed journal article has been submitted for publication)
- 18 Educational media
- 16 Partnerships
- 6 Funding requests
- 11 Research progress updates
- 34 Other notable activities

As always, we encourage you to continue to share your recent achievements or Points on the Board (POBs) with OEIE at your earliest convenience. This helps ensure that your progress, successes, and impacts are captured in all quarterly reports to the USDA.

This is also a friendly reminder that the EMT has asked that STEC CAP collaborators provide basic information on manuscripts of STEC CAP-related work via the Manuscript Documentation form. The purpose of this form allows for the proper documentation of POBs as well as to ensure that the USDA-NIFA grant is properly cited in all manuscripts. You may request the Manuscript Documentation form by emailing steccap@ksu.edu.

Office of Educational Innovation and Evaluation (OEIE)
(785) 532-5930
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Dr. Christina Lanzas joins the STEC Team

Dr. Christina Lanzas from the University of Tennessee has joined the STEC Team with a project she will be working on, entitled; **Transmission dynamics of Shiga-toxicogenic Escherichia coli (STEC) in cattle**. Although STEC serotypes may share common

transmission pathways and habitats, differences in the ability to thrive and survive in different cattle and environment habitats may result in differences in transmissibility and persistence of the serotypes in beef production systems. The overall objective of the project is to quantify the transmission of

STEC serotypes in the beef production system. Dr. Lanzas's team will develop a stochastic transmission model to describe the STEC dynamics in cattle, and fit the model to the data collected in objective 2 to compare the relative transmissibility of the different STEC serotypes in cattle.



Dr. Christina Lanzas



Two MSI Research Awards Announced

Two MSI Research Awards in the amount of \$50,000 each were awarded to Dr. Salina Parveen of University of Maryland Eastern Shore and Armitra Jackson-Davis at Alabama A&M University on November 1, 2013.

Dr. Salina Parveen's project is entitled; Prevalence and Characterization of *Escherichia coli* O157:H7 Recovered from Retail Ground Veal in Mid-Atlantic Region of the United States. The objectives of this study are to: 1) determine the prevalence of *E. coli* O157:H7 in retail ground veal collected from Maryland, Delaware and Virginia; 2) determine the presence of virulence genes; and 3) characterize *E. coli* O157:H7 isolates by phenotypic and genotypic methods. The findings of this project will not only fill the data gap of STEC CAP grant's goal but also provide information that is critical for meat industry and USDA/FSIS to develop a scientifically supportable regulatory food safety policy related to the public health impact of *E. coli* O157:H7.

Dr. Armitra Jackson-Davis's Project is entitled; Quantifying the Impact of Intervention Technologies and/or Control Practices Applied at Pre-harvest Production and Post-harvest Processing Stages of Beef Manufacturing. This project's research will investigate the effectiveness of UV light treatment and ultrasound in combination with organic acids and surfactants on



Dr. Salina Parveen



Armitra Jackson-Davis

the inactivation of non-O157 and O157:H7 STEC on beef trim. The long-term goal of this work is to improve the safety of beef products by developing "multiple-hurdle" intervention systems, which would inactivate STEC on beef. This work will provide insight into the effectiveness of the proposed multiple-hurdle antimicrobial technologies on the inactivation of non-O157 STEC. Processors will be able to use this information in controlling different serotypes of *E. coli* in beef products.

Check us out on the Web! Visit us at: www.stecbeefsafety.org
Subscribe to the listserv. Send an email to: listserv@unl.edu In the message field: **subscribe stecbeefsafety**

2014 STEC CAP Annual Conference

The second annual STEC CAP Conference will be held May 28 – 30th at the Embassy Suites in Lincoln, NE. Please hold these dates on your calendar; more information will be coming soon!



This project was supported by Agriculture and Food Research Initiative Grant No. 2012-68003-30155 from the USDA National Institute of Food and Agriculture, Prevention, Detection and Control of Shiga Toxin Producing *Escherichia coli* (STEC) from Pre-Harvest Through Consumption of Beef Products Program –A4101.