

STEC CAP News

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

STEC CAP Annual Meeting, May 27–29th, 2014

EMT Update

Greetings from the EMT. The long, cold winter is hopefully fading and turning into spring where you are.

For the last two months we have been actively planning for the 2014 Nebraska Governor’s Conference / STEC CAP Annual Conference.

We hope that everyone is planning to attend. The conference will be held from May 27-29 in the Embassy Suites in Lincoln, Nebraska. Registration is only \$50 for students and \$150 for everyone else. Details can be found at <http://www.stecbeefsafety.org/annual-conference>. Registration is now open! Our theme is: Ensuring Food Safety: *E. coli* O157:H7 and other STECs – Progress and Challenges. The research presentations will address recent innovations and issues related to STEC along the entire food production, processing, and consumption continuum. Leading experts will speak on the biology, ecology, transmission and epidemiology of STEC. Regulations, public policy, and consumer protection will also be covered. An innovation of this year’s event is combining our annual



Dan Gallagher

STEC CAP Conference with the Governor’s Conference for Ensuring Food Safety. The Governor’s Conference for Ensuring Food Safety was the vision of the former Governor of Nebraska, Ben Nelson, who provided funds to organize the first conference to provide a forum to address the serious issue of *E. coli* O157:H7

in the food supply. Governor Nelson took seriously the need of the nation to address food safety after a 25 million pound recall of ground beef occurred in 1997, and resulted in the closure of Nebraska’s Hudson Foods processing plant. This will be the 4th Governor’s Conference on *E. coli* since 1999, and we are fortunate to have both conferences occur jointly in 2014. Current Nebraska governor Dave Heineman will be among the speakers.

The STEC CAP community was well represented at the recent BIFSCo Beef Industry Safety Summit in Dallas in early March, 2014. Our own Randy Phebus and John Luchansky presented on the goals and accomplishments of the STEC CAP in general and then specifically on implementation and validation

...continued page 3

OEIE Evaluation Update



Office of Educational Innovation and Evaluation

The Office of Educational Innovation

and Evaluation (OEIE) is in the process of revising the achievement documentation survey which helps us document your “Points on the Board”. These changes are designed to enhance your reporting process and to ensure that your progress, successes, and impacts are captured in all quarterly and annual reports to the USDA. We will soon announce when the new achievement documentation survey will be available for all collaborators.

In the meantime, we encourage you to continue to report your recent achievements or POBs with the this **survey link**.

Please remember if you have a STEC CAP-related manuscript (e.g., journal articles, book chapters, conference proceedings, etc.), the EMT has also requested collaborators prepare and submit a Manuscript Documentation form to ensure the USDA-NIFA-AFRI grant is properly cited.

...continued page 3



STEC CAP Team
126D VBS
Lincoln, NE 68905
PHONE: 402-472-8564
FAX: 402-472-9690

stecbeefsafety.org

Inside this issue

Update from the EMT	1
OEIE Evaluation	1
Public Health Impact	2
Fernanda Coura	4
Objective 4 update	4
STEC CAP Annual Conference	5

Challenges of Modeling the Public Health Impact of STEC

Non-O157 Shiga toxin-producing *Escherichia coli* (STEC) are now recognized as an important public health issue. Epidemiological analyses by the Centers for Disease Control and Prevention (CDC) estimate that annual illness from non-O157 STECs surpass *E. coli* O157 for total foodborne sources and for those likely attributed to beef. These outbreak and attribution data are critical components of food safety risk assessments. Non-O157 STECs present unique challenges for risk assessment modeling, and highlight both the importance and limitations of these data.

The USDA Food Safety and Inspection Service (FSIS) develops a wide variety of food safety risk assessments for STEC. Historically, when considering STEC, the agency focused its efforts on *E. coli* O157 but has since expanded its focus to include six non-O157 STECs. FSIS STEC risk assessments have included models of the beef slaughter and production system, consumer practices, and various sampling and testing programs. Though they may differ in their risk management questions, food product of interest, or model type, the majority of these assessments share a common feature—their reliance on illness attribution data to help provide the public health context necessary to guide policy development.

Most recently, two analyses by CDC provide the underpinnings for the majority of this attribution analysis. The first, by Scallan et al. (2011) provides the total annual foodborne illnesses attributable to *E. coli* O157 and non-O157 STEC. The second, by Painter et al. (2013) provides attribution estimates for specific foods, including *E. coli* O157 and non-O157 STEC in beef. Painter et al. (2013) estimate that approximately 39.4% of *E. coli* O157 illnesses and 29.7% of non-O157 STEC illnesses come from beef consumption, which roughly equates to about 25,000 *E. coli* O157 and 33,000 non-O157 STEC illnesses annually.

Risk assessment models, particularly those created to inform regulatory decision-making, need to consider broad public health impacts. Quite often, the final question to be answered in these assessments is, “How many illnesses will be prevented by enacting a new policy or implementing a new set of mitigations?” Attribution estimates can often provide the information critical to answering these questions.

For *E. coli* O157, we might use the distribution of documented outbreaks in foods to represent what we would expect the distribution of all *E. coli* O157 illnesses to be across those foods. Then, if we model the effect of implementing a mitigation that would affect a given food, for example, ground beef, we would expect to reduce the proportion of illnesses attributable to ground beef. While this approach works well for a single pathogen such as *E. coli* O157, the process becomes much more complicated if we were to apply it to non-O157 STECs as a group. To date, although non-O157 STECs have been the suspected or confirmed agent in a variety of outbreaks, there

have not been enough illnesses traced back to the food consumed in order to separate out all of the O groups by where they are most common. Although the lack of outbreaks might seem like good news for public health, it is also likely a reflection of still being in the early stages of product and clinical testing for non-O157 STEC and, without such data, attribution estimates any more precise than for the entire category of non-O157 STEC remain elusive.

“How many illnesses will be prevented by enacting a new policy or implementing a new set of mitigations?”

So what does this mean for STEC risk assessments? As we move forward, we may be challenged to further break down the non-O157 STEC category into the various O groups that compose it. From both an attribution perspective and a modeling one, we are faced with questions such as how do serotypes differ in their prevalence in different products? In their ability to cause disease? In their ability to survive mitigations? When considering how to develop models for STECs now and in the coming years as data gaps are filled, risk assessors must carefully decide how to handle the many uncertainties surrounding this group of pathogens. We also must keep in mind what value is to be gained by distinguishing non-O157 STECs from one another and from *E. coli* O157. Ultimately, the decisions on when to consider them together as STEC and when to separate them into distinct types will depend on the risk management questions to be answered.

Painter, J., R. Hoekstra, et al. (2013). “Attribution of foodborne illnesses, hospitalizations, and deaths to food commodities by using outbreak data, United States, 1998–2008.” *Emerg Infect Dis* 9(3): 407-415.

Scallan, E., R. M. Hoekstra, et al. (2011). “Foodborne illness acquired in the United States—major pathogens.” *Emerg Infect Dis* 17(1): 7-15.

- Rachel Johnson-DeRycke,
Risk Analyst USDA/Food Safety and Inspection Service

...Directors Update ...continued from page 1

of strategies to control STEC-8 from slaughter through to consumption. Dave Renter made a presentation on the recovery of STEC from hides, carcasses, and fecal samples. Josh Hasty, graduate student at California State University - Fresno, presented a poster on interventions to control STEC on hide-on veal carcasses. This objective 3 project was completed in January 2014 through a collaboration of several STEC CAP researchers including Dr. John Henson and Josh Hasty. Substantially more research and outreach efforts are underway for veal producers and processors; you'll be hearing about these efforts soon.

Jill Hochstein (STEC CAP Program Manager) and Grant Weber (STEC CAP Student Intern) designed a gorgeous tabletop display highlighting the STEC CAP grant. It had its inaugural appearance at the BIFSCo meeting and was used again the following day at the annual K-State Cattlemen's Day event in Manhattan, KS. Thanks to both for their efforts.

We are pleased to announce that our International Association for Food Protection (IAFP) symposium proposal entitled "Update on the Shiga Toxin-producing *Escherichia coli* Coordinated Agricultural Project (STEC-CAP)" was accepted for a 3-hour time block at the annual conference in Indianapolis, IN on Monday afternoon, August 4, 2014. We are in the planning stages for a STEC CAP get together during the conference. Stay tuned for details.

This year 9 undergraduate and graduate students will participate in STEC CAP funded -internship during the summer and fall. The collaborators are currently recruiting students. Internship research proposals to recruit student for Fall 2014 and Spring 2015 will be due August 15, 2014 (details to follow). The EMT seeks to encourage broad collaborator participation in the internship program. Thus, if you have not yet had an intern in your group, you are encouraged to develop a small research, educational or outreach project and seek STEC CAP funds to support a student.



There have been some recent changes to our Stakeholder Advisory Board. Dr. Scott Eilert from Cargill has stepped down after serving on the board from 2011. The entire EMT would like to thank Scott for his service. We are welcoming Dan Schaefer to the Board. Dan is the Assistant Vice President for Beef Research and Development at Cargill.

Just a head's up that the VTEC symposium will be held in Boston on 5/31-6/3/2015. The previous symposium was held in Amsterdam in 2012. The formal announcement and web page are not available yet, but you might want to keep your calendar clear for this week. It would be nice to have a strong showing from the STEC CAP community. Under our typical schedule, the VTEC meeting will likely be the week following the 2015 Annual STEC meeting.

On behalf of the entire EMT, we want to thank everyone for your hard work and dedication to our continued successes. Don't forget to submit all of your Points-on-the-Board to OEIE on a very regular basis, and let us know if you have any needs, suggestions, or concerns.

Regards,
Dan Gallagher

...OEIE Update ...continued from page 1

In addition, we wish to thank the collaborators who shared their recent STEC CAP-related accomplishments. We learned of an additional 10 notable achievements during February 2014, including scholarly talks, publications, educational media, partnerships, media contacts, research progress, and other activities.

As always, the OEIE team welcomes your feedback and questions regarding STEC CAP evaluation activities. Please contact us at:

Office of Educational Innovation and Evaluation (OEIE)
(785) 532-5930
steccap@ksu.edu



Welcome Fernanda Coura

Welcome to Lincoln, NE **Fernanda Coura!** Fernanda is a visiting PhD student at the Federal University of Minas Gerais, in Belo Horizonte, Brazil, and is here to work in the Moxley laboratory for one year under a PhD “Sandwich” Program with Brazil, sponsored by the CAPES Foundation. Fernanda will be doing research that is a part of the STEC CAP project, which will address how non-O157 Shiga toxin-producing *E. coli* (STEC) adhere to intestinal epithelial cells early in the infection cycle, prior to the development of attaching-effacing lesions.

Objective 4 update STEC-CAP newsletter March 2014

The holistic quantitative microbial risk assessment (QMRA), the framework for our STEC CAP, is progressing according to plan; collecting data to track the changes in concentration of the 8 STEC from the farm, through processing, retail, the consumer’s home and finally to consumption. The data needed to produce the QMRA will be a combination of what is already in the scientific literature and any new data generated by the STEC-CAP grant or published by other researchers.

A thorough search of scientific literature is underway to identify any relevant data on STEC prevalence and concentration in feces, hides, carcasses and subprimals. Most of the currently available data is on *E. coli* O157 with very little on the other 7 STEC. We have worked to identify on-farm prevalence and concentration distributions of STEC (mostly O157) in cattle feces, and on hides. We are also collecting data to identify differences in on-farm prevalence and concentration depending on the type of cattle (i.e., feedlot cattle, dairy cows, beef cows). To be as thorough as possible, we have contacted authors of numerous published papers to get additional data for our assessment and analyses. Authors have been very receptive and helpful in providing clarifications and additional data.

To be as thorough as possible, we have contacted authors of numerous published papers to get additional data for our assessment and analyses.

We are also collecting available published data at the slaughter plant on fecal, hide and carcass prevalence and concentration in each type of cattle. Again, most of the available data is for *E. coli* O157.

Another area for which we need better data is the efficacy of interventions to decrease STEC prevalence and concentration. We have already collected data on pre-harvest interventions, including vaccination of cattle and use of feed additives, along with data on various interventions on hides and carcasses around slaughter. Again, most of the available research that has been done is on *E. coli* O157. While there are a number of intervention studies, there is little

replication of studies using the same methods or strains. Further, the range of processes in place in the industry is quite wide; we are in the process of defining the most representative interventions to model with the help of our industry advisory board.

All this data collection has also clarified important data gaps that the STEC-CAP grant can fill with active data collection. The Objective 4 team which is responsible for the STEC CAP QMRA continues our conversations with our Objective 1, 2, 3, and 5 colleagues to identify opportunities and guide research decisions toward the most important projects to understand the risks associated with each component of the beef production chain. Already we have begun to collect data on the other 6 STEC from feces, hides, and carcasses with additional data collection ongoing. We are also planning collaborations with our industry advisory board commercial beef processors to collect data for the QMRA. The base code for the QMRA is written in the R language. We are currently working on making the code more efficient and will soon begin coding the interventions. It will take all of this data to produce a robust and useful QMRA that can help to understand and validate optimal control methods and in so doing decrease risk to consumers.

Governor's Conference/ STEC CAP Annual Conference

Ensuring Food Safety: *E. coli* O157:H7 and other STECs – Progress and Challenges

May 27-29, 2014
Embassy Suites, Lincoln NE

Register Today at:
www.stecbeefsafety.org/annual-conference

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 27–29th at the Embassy Suites in Lincoln, NE in conjunction with the Nebraska Governors' Conference on *E. coli* O157:H7 and STECs. The topics will include the prevalence, control and the risk of STECs in the environment and other industries such as produce. **Register Now!**



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.