

# UNL to Lead *E. coli* Research Effort

UNL will lead a team of 48 scientists from 11 land-grant universities and other partner institutions to conduct integrated research, education and extension projects on eight types of Shiga-toxin producing *E. coli*.



**USDA awards grant to the University of Nebraska–Lincoln for *E. coli* research to help reduce public health risks.**

The USDA announced Jan. 23 that it has awarded a research grant to the University of Nebraska–Lincoln (UNL) to help reduce the occurrence and public health risks from Shiga toxin-producing *E. coli* (STEC) along the entire beef production pathway. Chavonda Jacobs-Young, acting director of the USDA National Institute of Food and Agriculture (NIFA), awarded the \$25 million grant to the UNL-led research team Jan. 23 at the university in Lincoln.

“Shiga toxin-producing *E. coli* are a serious threat to our food supply and public health, causing more than 265,000 infections each year,” said Jacobs-Young. “As non-O157 STEC bacteria have emerged and evolved, so too must our regulatory policies to protect the public health and ensure the safety of our food supply. This research will help us to understand how these pathogens travel

***“We will be studying the entire beef chain, from the time an animal is born until the time beef products are consumed.”***

— James Keen

throughout the beef production process and how outbreaks occur, enabling us to find ways to prevent illness and improve the safety of our nation’s food supply.”

James Keen at UNL, along with a multi-institutional and multidisciplinary team of researchers, educators and extension specialists, will use the \$25 million grant to

improve risk management and assessment of eight strains of STEC in beef. This work will include the O104 strain that caused the recent outbreak in Germany. The project will focus on identifying hazards and assessing exposures that lead to STEC infections in cattle and on developing strategies to detect, characterize and control these pathogens along the beef chain. This knowledge will then be used to find practical and effective STEC risk mitigation strategies.

The five main objectives of the project include:

- 1. Detection:** Develop and implement rapid-detection technologies for preharvest, postharvest and consumer environments.
- 2. Biology:** Characterize the biological and epidemiological factors that drive outbreaks of STEC in

preharvest, postharvest, retail and consumer settings.

**3. Interventions:** Develop effective and economical interventions to lessen STEC risk from cattle, hides, carcasses, and ground and non-intact beef; and compare the feasibility of implementing these interventions for large-, small- and very small-scale beef producers.

**4. Risk analysis and assessment:** Develop a risk assessment model for STEC from live cattle to consumption to evaluate mitigation strategies and their expected public health effects.

**5. Risk management and communication:** Translate research findings into user-friendly food-safety deliverables for stakeholders, food safety professionals, regulators, educators and consumers.

Most STEC outbreaks are caused by ingestion of contaminated food

## K-State teams with UNL for food safety

Seventeen Kansas State University (K-State) scientists will join researchers from the University of Nebraska–Lincoln (UNL) and other universities and government agencies in a coordinated, multipronged approach to improve the safety of beef. The team of 48 investigators led by UNL veterinary scientist Jim Keen will use a \$25 million USDA grant to focus on ways to reduce the occurrence and public health risks from Shiga toxin-producing *E. coli* (STEC).

Randy Phebus, K-State professor of animal sciences and industry, will join UNL’s Keen and three others on the overall project’s executive management team. That team will oversee seven interrelated projects that span the five-year life of the grant.

“This USDA NIFA (National Institute of

Food and Agriculture)-coordinated agricultural program (CAP) grant shines the light on UNL, K-State and our other collaborators across the country to address one of the most important issues facing the beef industry, Shiga toxin-producing *E. coli* pathogens, from the calf to the beef consumer,” Phebus said. “STEC management profoundly impacts every beef producer, processor and retailer, and it is one of the most relevant public health threats in the food system. The research and education group that we have assembled is world-class, and we anticipate many successes during and after the life of this grant that can be practically applied for reducing STEC risks across the beef chain.”

In addition to his role on the manage-

ment team, Phebus will lead a project focused on improving methods used to detect and control eight types of *E. coli* (STEC-8) that are most important to public health, including O157:H7, in postharvest beef processing. The goal is to understand how STEC-8 behaves under different conditions in order to enhance beef processors’ food safety management systems. K-State’s unique Biosecurity Research Institute biocontainment research facility will provide the large-scale laboratory setting for much of this part of the project.

Daniel Thomson, Jones Professor of Production Medicine at K-State, feedlot veterinarian and director of the Beef Cattle Institute (BCI), will lead efforts establishing a holistic food safety culture across all sec-

tors of the beef food chain.

“Cattle producers, feedlot operators, transporters, processors, retailers and consumers all must understand and execute their roles in beef safety,” Thomson said. “The BCI will develop and offer training and outreach tools to enhance stakeholder knowledge for all sectors of the beef industry. This will result in a more knowledgeable beef industry workforce and an enhanced beef safety infrastructure.”

Beth Montelone, K-State associate dean and professor of biology, will lead a team that develops training for high school,

and contact with fecal material from cattle and other ruminant animals. Most of what is known about STEC comes from outbreak investigations and studies of *E. coli* O157. The non-O157 STEC strains are not nearly as well-understood, partly because outbreaks due to them are rarely identified. This project will help improve our understanding of these strains in addition to O157 strains.

### Centered in cattle country

UNL and Kansas State University (K-State) — with 32 scientists — will conduct most of the research, education and extension work for this project.

“This research has enormous ramifications here in Nebraska and across the nation,” said UNL Chancellor Harvey Perlman. “Beef is big business in the state, and the industry prides itself on delivering a safe product to consumers. This project will help ensure the safety of beef products through the research conducted at participating institutions, the transfer of this knowledge to collaborators in the beef industry and educational programs for consumers.”

Keen, the UNL veterinary scientist who is leading the project, said there are 500 known STEC, 100 of which can cause illness in humans. This research will focus on the seven most dangerous strains of *E. coli*, plus a new strain that made its first widespread appearance in an outbreak in Europe in 2011.

“We will be studying the entire beef chain, from the time an animal is born until the time beef products are consumed,” said Keen, who is based at the Great Plains Veterinary Educational Center near Clay Center, Neb.

Scientists will build on years of research into *E. coli* O157:H7 by UNL and other institutions as a baseline, Keen said. He noted that O157:H7 is something of an anomaly among STEC because it is relatively easy to culture and study. The other 99 strains of STEC that can cause illness typically come and go without being diagnosed. While large-scale *E. coli* outbreaks garner headlines, they represent only about 25% of

infections. The rest are individual or small-scale outbreaks.

About one-third of the \$25 million will be devoted to extension and educational efforts, Keen said. For example, university students from across the country will have opportunities for internships with any of the 48 scientists.

“Part of this project is to help educate the next generation of scientists,” who

will deal with these issues in the coming decades, Keen said.

In addition to UNL and K-State, participating institutions include North Carolina State University; the University of California–Davis; the University of Delaware; Virginia Polytechnic Institute and State University; the New Mexico Consortium; USDA Agricultural Research Service (ARS); New Mexico State

University; Texas A&M University; and the University of Arkansas. The team will also work collaboratively with several consumer groups, cattlemen’s groups and meat processing associations, along with numerous industry partners and technology providers, to improve the safety of the beef supply.

Ronnie Green, Harlan vice chancellor  
(Continued on page 156)

undergraduate and graduate students that integrates field and laboratory research with university-level education. Internships and externships linked to the project will place students in the laboratories of the grant’s scientists to learn food safety research techniques, with the goal of recruiting students into majors that will provide highly trained food safety professionals to the food industry.

The USDA reported that as of July 2011, there were 100 million head of cattle and calves in the United States. Kansas had 6.3 million head as of Jan. 1, 2011.

**UNL to Lead *E. coli* Research Effort** *(from page 155)*

of the Institute of Agriculture and Natural Resources (IANR), said UNL is well-suited to lead the research.

“With 6.2 million cattle and the nation’s No. 1 ranking for red meat production, Nebraska is an economic epicenter for the beef industry,” Green said. “This collaborative research will enable the

University of Nebraska and 10 partner institutions to expand on a long history of high-impact research to ensure the safety of beef products on dinner tables around the world.”

Prem Paul, UNL vice chancellor for research and economic development, said, “Today’s complex challenges

simply demand this kind of large-scale collaborative and interdisciplinary approach. Working together, we can accomplish so much. I commend USDA NIFA for funding big, multi-institutional grants to address big problems.”

**New approach to food safety**

Through the President’s Food Safety Working Group, USDA and its federal

**U.S. beef industry at a glance**

- The retail equivalent value of U.S. beef in 2010 was \$74 billion.
- Total U.S. beef consumption in 2010 was 26.4 billion pounds (lb.).
- U.S. beef production in 2010 totaled 26.41 billion lb.
- U.S. beef exports in 2010 as a percent of beef production totaled 8.7%.

**Source:** *USDA Economic Research Service (ERS).*

partners have been working on a new, public health-focused approach to food safety based on the principles of prevention, strengthening surveillance and enforcement, and improving response. In September 2011, the USDA Food Safety and Inspection Service (FSIS) announced a proposal to declare six additional serogroups of pathogenic *E. coli* as adulterants in non-intact raw beef. Under the proposal, if the serogroups O26, O103, O45, O111, O121 and O145 are found in raw ground beef or its precursors, those products will be prohibited from entering commerce. USDA will launch a testing program to detect these pathogens and prevent them from reaching consumers.

The coordinated agricultural project grant announced Jan. 23 is through the USDA Agriculture and Food Research Initiative (AFRI) and administered through NIFA. AFRI food safety grants promote and enhance the scientific discipline of food safety, with an overall aim of protecting consumers from microbial, chemical and physical hazards that may occur during all stages of the food chain, from production to consumption.

AFRI is NIFA’s flagship competitive grant program and was established under the 2008 Farm Bill. AFRI supports work in six priority areas:

- plant health and production, and plant products;
- animal health and production, and animal products;
- food safety, nutrition and health;
- renewable energy, natural resources and environment;
- agriculture systems and technology; and
- agriculture economics and rural communities.

Through federal funding and leadership for research, education and extension programs, NIFA focuses on investing in science and solving critical issues affecting people’s daily lives and the nation’s future. For more information, visit [www.nifa.usda.gov](http://www.nifa.usda.gov).



**Editor’s Note:** *This article and the accompanying sidebars are compiled from news releases provided by UNL, K-State and USDA.*