UNL Leads $25 Million project targeting *E. coli* threat to food safety

The University of Nebraska-Lincoln is leading a $25 million project to reduce throughout the beef production chain the occurrence of *E. coli* strains that pose a major threat to public health.

The 5 year grant from the U.S. Department of Agriculture's National Institute of Food and Agriculture's National Institute of Food and Agriculture. This project involves 12 universities and other institutions nationwide. UNL veterinary scientist Rod Moxley is the project director.

The project targets Shiga-toxin producing *E. coli*, or STEC, which cause more than 265,000 illnesses in the United States annually. Eating contaminated food or having direct contact with fecal matter from infected cattle and other ruminants cause most of these illnesses.

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 STEC. Studies will include the best-known STEC, *E. coli* O157:H7, along with seven other strains that are not as well understood, partly because outbreaks due to these strains are rarely identified. UNL and Kansas State University will conduct most of the research, education and extension work for the project.

"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 Chavonda Jacobs-Young, acting NIFA director said at the grant announcement in January 2012. "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 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."

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.

"The long-term goal is to reduce the occurrence and public health risks from Shiga toxin-producing *E. coli* in beef, while preserving an economically viable and sustainable beef industry," Moxley said. "This can only be accomplished by a multi-institutional effort that brings together complementary teams of the nation's experts whose expertise spans the entire beef chain continuum."

Scientists will build on years of research into *E. coli* O157:H7 by UNL and other institutions as a baseline. Scientists note 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 percent of infections. The rest are individual or small-scale outbreaks.

The first step will be to develop diagnostic techniques to determine the presence of STEC in cattle, both pre- and post-harvest. Scientists also will:

– study the biological and epidemiological factors that drive STEC-caused illnesses;

– develop intervention techniques to reduce STEC risks from cattle, hides, carcasses and beef and devise ways to implement these interventions for all sizes of beef producers;

– develop a risk analysis model to evaluate the cost-effectiveness of mitigation strategies; and

– communicate findings to stakeholders, food safety professionals, regulators, educators and consumers so they can implement efforts to lower STEC exposure.

About one-third of the $25 million will be devoted to extension and educational efforts. The project also will educate a new generation of scientists who will address these issues in the future.

In addition to UNL and KSU, 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; New Mexico State University; University of New Mexico; Texas A&M University; University of Tennessee, and Mississippi State University.

"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."

Ronnie Green, Harlan vice chancellor of UNL's Institute of Agriculture and Natural Resources, 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 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 S. 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."