

PARTNERING WITH TECHNOLOGY for food safety

by Dan Moser/Mary Garbacz

Based on an interview by Emily Taylor



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—Harshavardhan Thippareddi, Professor, UNL Department of Food Science and Technology, and Extension Food Safety Specialist

FOOD SAFETY IS A DIVERSE FIELD, and includes chemistry, microbiology, engineering, meat science, veterinary science, food production, food processing and consumer education. Multidisciplinary scientific and industry partnerships, along with the newest technologies developed by the scientists, help ensure a safe food supply for the world.

It requires coordination, vigilance and communication.

"When somebody consumes a product that we make, as a food processor, we need to absolutely make sure that the product is safe, because we are affecting the lives of other people," said Harshavardhan Thippareddi, University of Nebraska–Lincoln professor of food science and technology and Extension food safety specialist.

"All along the chain, everyone who handles food has the responsibility to ensure the safety of the product and if they can, improve it," Thippareddi said.

The U.S. has one of the best food safety programs in the world, compared to other countries such as Canada, those in Europe and other developed countries, Thippareddi said — but it requires ongoing research, as well as the cooperation of producers, processors and consumers who prepare foods at home.

Nebraska, as a top producer of beef in the U.S., has benefited from research into safe beef production and processing. The U.S. has the best and the safest beef available anywhere in the world, Thippareddi said, adding that the food safety risk is very minimal when another country chooses to import products from the Midwest.

"The eventual goal — the long-term goal of our research — is to improve public health," he said. "The short-term goal is to improve the safety of these specific products of economic importance to Nebraska and to processors and producers, and to make sure the food they produce is safe."

EXTENSION/OUTREACH

Thippareddi assists food processors every day, offering input on improving processes and product safety. He also conducts workshops frequently, in Nebraska and around the world. Even though U.S. food safety is among the best, that is not true of some developing countries. That is especially important when those countries export food products to the U.S. Thippareddi often travels to those countries to conduct workshops so processes, testing and food safety requirements meet the food safety requirements of the U.S. so products being imported into the U.S. are not turned away at the U.S. port of entry due to quality issues, he said.

Thippareddi's current work with the meat processing industry includes the scope of livestock production and

products. His work with the poultry and egg industry, for example, involves the egg processor, the shell processor and liquid egg and dried egg processors as they improve their processes and the safety of their products. "They consult with me on a daily basis, as does the beef industry here in Nebraska and across the U.S.," he said.

The food industry in the U.S. and in other countries uses Hazard Analysis and Critical Control Points (HACCP), which is a system of preventive measures that can assure the safe production of food products. It is based on technical and scientific principles that ensure product safety from farm to table. HACCP can be applied to production, meat slaughter and processing, shipping and distribution, food service and in-home food preparation. The University of Nebraska–Lincoln holds HACCP workshops; visit <http://food.unl.edu/meatproducts/safety> for more information.

FOODBORNE ILLNESS: CAUSES

Several different pathogens, parasites and viruses cause foodborne illness outbreaks, Thippareddi said, but are largely controlled due to continued research and educational outreach to producers, processors and consumers. In order of the number of illnesses they cause, they are: *Salmonella*; *Escherichia coli* O157:H7 and six other types of Shiga toxin-producing *E. coli* (STEC); *Listeria monocytogenes*; *Clostridium perfringens*; and *Clostridium botulinum*.

Thippareddi and his colleagues not only study the characteristics of the foodborne pathogens, bacteria and viruses that cause foodborne illness and their behavior in foods, they also develop predictive models for use by industry and communicate this information to producers, processors and consumers.

SHIGA TOXIN-PRODUCING E. COLI (STEC) RESEARCH

Foodborne illness can be mild or quite serious. It also can mean the end of a food company. Thippareddi noted that in 1997, Hudson Foods, then a state-of-the-art company based in Columbus, Nebraska, had to recall 20 million pounds of ground beef — two months' worth of product — because a sample of one day's production tested positive for *E. coli* O157:H7. The company went bankrupt as a result.

"Assuring the safety of beef is very important, especially for Nebraska, as beef is a critical component of the

state economy — the production as well as the processing sides," Thippareddi said.

Nebraska's strength in beef production and processing led scientists from the University of Nebraska–Lincoln and 15 other educational institutions and food industries to apply for grant funding from the U.S. Department of Agriculture to study Shiga toxin-producing *Escherichia coli* (*E. coli*), or STEC. The group was awarded \$25 million in funding over a five-year time period; the researchers are now initiating the third year of research focused on controlling not only *E. coli* O157:H7, but also six other serotypes of STECs.

The STEC team's research addresses the risk mitigation strategies, from production and processing to consumer handling of meat products. (Read about the researchers' work at <http://www.stecbeefsafety.org>.)

Progress has been made in methods of detection of STEC organisms, Thippareddi said. Researchers discovered that methods being used were not adequately sensitive or specific, so they have developed new techniques to improve detection methods. The USDA Food Safety and Inspection Service (FSIS) has reported greater prevalence of STECs in veal cuts and ground veal. The research team has focused on developing interventions that can be used during veal slaughter and identified options for their use during processing. Those interventions already have been implemented in veal processing to reduce risk, he said.

"Some of the work we have done so far has been



Harshavardhan Thippareddi



CONSUMER RESPONSIBILITY FOR FOOD SAFETY

Consumers are responsible for the safe storage, handling and preparation and cooking of food products once they are purchased, Thippareddi said. Consumers can minimize the risk of foodborne illness by:

- ➔ Refrigerating meat, fish, eggs and produce immediately so pathogens don't have the opportunity to grow.
- ➔ Keeping fresh produce separate from raw meat, fish and eggs, including use of separate utensils and cutting boards.
- ➔ Cooking meat, fish and eggs to the correct temperatures; a good resource is: <http://www.foodsafety.gov/keep/charts/mintemp.html>. Even though the risk of *E. coli* is very low, cooking it to an internal temperature of 160° F can destroy the organism if it happens to be present.
- ➔ Sensitive populations, like children, pregnant women, the elderly and those with compromised immune systems may wish to take extra care, as foodborne illness risks are greater for these individuals.

instrumental in providing input to regulatory agencies like the U.S. Department of Agriculture's Food Safety Inspection Service," he said. "The publications that we have generated are used by several of the food industry food processors and are a basis for their food safety management system or food safety plan development — and assuring the safety of the food products," Thippareddi explained.

"We need to continue research, we need to continue to develop programs so we can reduce the prevalence of the STECs in the beef supply," he said. The research will continue and the methods will improve, including adding a food safety curriculum for children from kindergarten through high school, as well as in higher education. "We want to disseminate this information through educational activities as well as extension activities," he said.

"If I, as a consumer, don't consider those risks and don't understand those risks, I can mishandle the products and cause a foodborne illness," Thippareddi said.

"We try to put that (responsibility) on the processor, but I think we also need to understand that as a consumer we have that responsibility as well. I am the one feeding myself and my family, so I need to be careful about how I handle the product, how I cook the product and how I serve the product," he said.

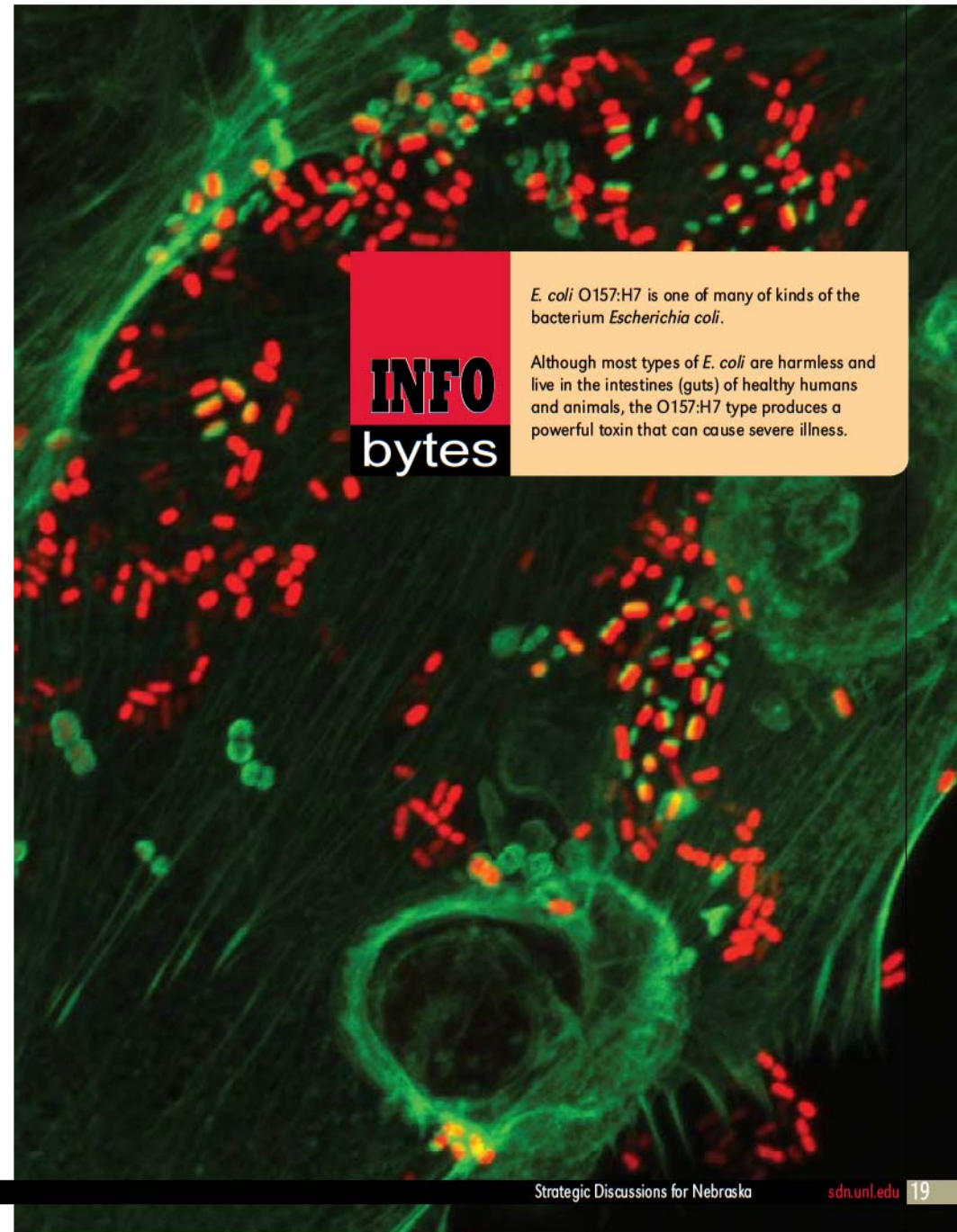
THE SUSTAINABLE, GLOBAL FUTURE

The need for feeding more than 9 billion people by 2050 requires careful management of water and other resources, but there are other needs as well.

"We need to improve our ability to properly store, handle, and process and prepare these products," Thippareddi said. Products will have to be stored for extended periods of time in the future, so it will be necessary to ensure they are safe at the point of consumption.

If you look at the U.S. compared to the rest of the world, the number of people getting sick from foodborne illness in the U.S. is relatively small, Thippareddi said. That shows the industry is doing an excellent job in ensuring a safe product, but at the same time, researchers, producers and industry must continue to work to make products continually safer.

"There's always room for improvement," he said.



INFO bytes

E. coli O157:H7 is one of many of kinds of the bacterium *Escherichia coli*.

Although most types of *E. coli* are harmless and live in the intestines (guts) of healthy humans and animals, the O157:H7 type produces a powerful toxin that can cause severe illness.