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NEWS

A quarterly update on research, education and information

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AMIF Study Identifies Probiotic That Reduces *E. coli* O157:H7 in Cattle By 50 Percent

Texas Tech Researchers Mindy Brashears, Ph.D., and Michael Galyean, Ph.D., Identify Promising New Feed Ingredient

A new feed ingredient that contains probiotics or so-called "good bacteria" can reduce the presence of *E. coli* O157:H7 in live cattle by as much as 50 percent, according to research released this month by the AMI Foundation. The research was done by Mindy Brashears, Ph.D., and Michael Galyean, Ph.D., of Texas Tech University in Lubbock, TX.

Brashears and Galyean fed 180 steers one of three diets: a standard diet of grain and roughage, which served as the control group, or a standard diet that also included one of two strains of *Lactobacillus acidophilus*, much like the bacteria commonly added to yogurt.

The researchers analyzed fecal samples from the cattle when they arrived at Texas Tech University and every 28 days thereafter until they received probiotic supplementation. After a 60-day supplementation period began, samples were analyzed every 14 days. Researchers used USDA test methods - considered the most sensitive available - to detect the presence of *E. coli* O157:H7.

Researchers conducted the study during the summer months, when cattle are known to shed more *E. coli* O157:H7. The numbers of cattle testing positive for *E. coli* O157:H7

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CPC Spray Shows Significant Inhibition of *Listeria* Growth on RTE Products

KSU Study Evaluates Effectiveness of Antimicrobial Spray

Preliminary results from an AMI Foundation-funded research project at Kansas State University (KSU) indicate that cetyl pyridinium chloride (CPC) sprayed on frankfurters before packaging reduces *Listeria monocytogenes* (*L.m.*) and prevents future *L.m.* growth.

The research, by KSU professor Dr. Harshavardhan Thippareddi, began in October 2000 and will be completed later this year.

In the study, frankfurters were inoculated with a five-strain cocktail of *L.m.* and subjected to a control with no treatment, CPC treatment applied as a spray and CPC spray treatment followed by water treatment. CPC was applied at 25 degrees C, 40 degrees C and 60 degrees C

with pressures of 20, 25 and 35 psi for durations of 30, 40 and 40 seconds of exposure.

The CPC spray treatment alone reduced *L.m.* on franks by 1.19 - 2.39 log CFU/frank.

The use of CPC did not cause unfavorable color or textural changes. Also, the duration, temperature and pressure of the application did not appear to impact

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NAS Reviews Microbiological Issues, Recent Dioxin Studies

The National Academy of Sciences (NAS) is reviewing several issues relevant to the meat and poultry industry. NAS is currently conducting the following reviews:

A preliminary farm-to-table process risk assessment of the *Escherichia coli* O157:H7 in ground beef prepared by the U.S. Department of Agriculture. USDA has conducted a draft risk assessment for *Escherichia coli* O157:H7 in ground beef that examines the occurrence and levels of the pathogen along the farm-to-table continuum and includes an empirical risk assessment model. The NAS review of the assessment will include evaluations of the logical structure of the risk assessment and the model, the validity and appropriateness of all input data used, the reasonableness of the assumptions made in the assessment and the anchoring approach that was taken, and the model's mathematics and equations. The committee will offer observations and recommendations for changes to the final version. The *E. coli* O157:H7 study is sponsored by USDA and is being conducted over an eight-month period that began in September 2001.

Review of the Scientific Basis for Criteria for Food and Food Ingredients. The NAS has established an ad hoc oversight committee that will define the relationship between public health objectives and a Hazard Analysis and Critical Control Point (HACCP)-based approach to food safety; define the terms "performance standards" and "criteria" as related to food products and processes; recommend guidelines for determining the type of data that should be used in developing food safety criteria, including microbiological performance standards; and oversee the development of two reports on the use of scientific-based criteria in

relation to performance standards and HACCP: a) One on raw and processed meat and poultry, and b) a second one on raw and processed seafood, produce and related products, and dairy products.

The committee met first in February 2002 and the study is expected to last 14 months. The subcommittee on meat and poultry will produce a report that specifically evaluates the extent to which microbiological performance standards are an appropriate means of ensuring the safety of products in a HACCP-based system.

The committee also will evaluate the scientific basis for existing USDA microbiological performance standards and recommend any necessary improvements. Among the questions that may be addressed: Do microbiological standards ensure that there is a reduction in public health hazards? The committee also will consider whether they are technically, economically and administratively feasible.

The implications of dioxin in the food supply. The NAS will review recent studies reevaluating dioxin toxicity and the human health implications. NAS will evaluate studies by International Agency for Research on Cancer, the U.S. Agency for Toxic Substances and Disease Registry, the National Institute of Environmental Health and the Environmental Protection Agency. Specifically, NAS will look at the presence of dioxin and dioxin like compounds in food, pathways leading to feed and food contamination, evidence for human exposure and trends in body burdens, the existence of susceptible populations, anticipated trends in future exposures and options to reduce exposure via the food supply. The committee has met three times since December 2001, and the project is expected to last 18 months.

AMI Foundation Initiates Economic Analysis of USDA 'Thinking Paper' On BSE Policy Measures

The AMI Foundation has initiated an economic analysis of possible measures detailed in a USDA "Thinking Paper" on bovine spongiform encephalopathy (BSE) released in January. The AMIF analysis will be done by Sparks Companies, a leading economic consulting firm, and will be included in AMI's response to the USDA paper, which was released in January.

USDA's thinking paper followed the release of a risk assessment by Harvard University, released in November 2001, which showed that the risk of BSE occurring in the U.S. is extremely low. The Harvard analysis detailed the possible pathways for human

exposure in the unlikely event that BSE ever occurs in U.S. herds. In response, USDA issued the paper detailing a host of possible actions to minimize human exposure to products that could contain the infective agent that causes BSE in cattle, which may cause the human version of the disease, variant Creutzfeldt-Jakob Disease.

The AMI Foundation has stressed that the list of possible actions in the thinking paper are appropriate only in nations that have BSE in U.S. herds; the U.S. does not have BSE. Experts attribute the U.S.'s success in preventing the disease to the

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*Science Soundbites***Study Finds Sodium Chlorate Fed to Livestock Reduces Pathogens**

Feeding sodium chlorate to pigs and cows on the farm before slaughter selectively kills the pathogens *Salmonella typhimurium* and *E. coli* O157:H7, researchers in College Station, TX, reported last month.

The scientists in the Agricultural Research Service (ARS) Food and Feed Safety Research Unit developed an animal model showing that sodium chlorate reduces these harmful bacteria in the animal intestinal tract.

Salmonella and *E. coli* O157:H7 have an enzyme—respiratory nitrate reductase—that beneficial bacteria lack. When sodium chlorate is added to these bacteria, the chlorate is converted to chlorite which in turn kills the harmful bacteria. Because the beneficial bacteria lack the respiratory nitrate reductase, the added chlorate has no effect on them.

In the study, 45 weaned pigs were fed as much as .04 grams of sodium chlorate per kilogram of body weight after being inoculated with *S. typhimurium*. Within 16 hours, the treatment produced a 150-fold reduction in the number of pathogenic cells in the intestines.

USDA has applied for a patent on behalf of the inventors, ARS microbiologists Robin C. Anderson and David J. Nisbet in College Station and Larry H. Stanker in Albany, CA.

FSIS Microbiological Testing Data Available Online

Ten years of prevalence data for *Salmonella*, *Listeria monocytogenes*, *E. coli* O157:H7 and staphylococcal enterotoxins is now available on the Food Safety and Inspection Service (FSIS) web site. The data was collected from plants chosen at random between 1990 and 1999. Visit FSIS electronic reading room to view the data at <http://www.fsis.usda.gov/ophs/rtetest/index.htm>. FSIS has conducted this microbiological testing program for ready-to-eat (RTE) meat and poultry products since 1983.

A more detailed description of these microbiological testing programs and test results has been published in the *Journal of Food Protection* (Vol. 64, No. 8, 2001, Pages 1188-1193).

Study Finds ARS Testing Method More Sensitive for *Listeria monocytogenes*

A study comparing three methods of testing for *Listeria monocytogenes* (*L.m.*) concluded that a package rinse method developed by ARS provides a more accurate evaluation of the risk posed by surface contamination of frankfurters with *L.m.*

Other methods studied were ARS' product composite rinse method and FSIS product composite enrichment method. Current routine sampling of ready-to-eat products is conducted using approved FSIS and Food and Drug Administration methods of testing, which determine the presence or absence of *L.m.* in foods, but not the level of pathogens present.

Of the three methods tested, ARS' package rinse method was about six times more sensitive than the FSIS product composite enrichment method and about 10 times more sensitive than the ARS product composite rinse method for identifying packages that were initially inoculated with the pathogen.

For each of the three trials, 10 packages inoculated with an average of 22 CFU (range, 16 to 28 CFU) and 10 packages inoculated with an average of 20,133 CFU (range, 17,460 to 21,250) were sampled using each method.

A primary advantage of the ARS package rinse method is that it requires less hands-on manipulation of the food product, which minimizes the likelihood of product contamination and decreases the time required to sample the product.

The study was published in this month's issue of the *Journal of Food Protection* (Vol. 65, No. 3, 2002, Pages 567-570).

Upcoming AMIF Events

October 24 - 26, 2002

AMI Annual Convention

New Orleans Hilton, New Orleans, LA

October 24 - 26, 2002

Meat Industry Research Conference (MIRC)

Part of the Innovation Showcase

New Orleans Hilton, New Orleans, LA

December, 2002

Implementing *Listeria* & Intervention Control Workshop and AMI Foundation Research Update, TBD

February, 2003

**Animal Handling and Stunning Conference
Kansas City, MO**

Ongoing Research

Listeria monocytogenes

<u>Investigator</u>	<u>Institution</u>	<u>Project Title</u>
Amy C. Lee Wong	University of Wisconsin -Madison	Reduction of <i>Listeria monocytogenes</i> Biofilm Formation in RTE Meat Processing Environments
Joseph G. Sebranek	Iowa State University	Use of Pediocin with Other Barriers for Control of <i>L.m.</i> in RTE Processed Meats
Kalidas Shetty	University of Massachusetts	Elite Herb Extracts Containing High Rosmarinic Acid and Inhibition of <i>Listeria monocytogenes</i> in Meat and Poultry Products
James Dickson	Iowa State University	Optimum radiation dose to eliminate <i>Listeria monocytogenes</i> in packaged RTE processed meats and Survival of <i>Listeria monocytogenes</i> in RTE Processed Meats after Irradiation Processing
Harshavardhan Thippareddi	Kansas State University	Control of <i>Listeria monocytogenes</i> in Ready-to-Eat Meats Using Cetyl Pyridinium Chloride (CPC) and Shelf Life Extension of RTE Meats Treated with CPC
Michael Doyle	University of Georgia	Control of <i>Listeria monocytogenes</i> in Food Processing Facilities by Competitive Exclusion Microorganisms
Jimmy Keeton	Texas A&M University	Antimicrobial Effects of Surface Treatments and Ingredients on Cured RTE Meat Products
Jack Losso	Louisiana State University	Pathogen Inhibition and Shelf-Life of Raw and Precooked Meat with Protamine
Jeffrey Kornacki	University of Georgia	Recovery, Development and Validation of Appropriate Surrogate Microorganisms in Meat and Poultry Emulsions for In-plant Critical Control Point Validation Studies
Jeffrey Kornacki	University of Georgia	The Role of Aerosols in Transmission of Microorganisms (including <i>Listeria</i>) to Ready-to-Eat Meat/Poultry Products
Ferencz Denes	University of Wisconsin -Madison	Plasma-Enhanced Disinfection of Surfaces, Air, And Water in Ready-To-Eat (RTE) Meat and Poultry Processing Environments
Robert Vinopal, Dick Jadamec	University of Connecticut	Development of Ion Mobility Spectrometry (IMS) Applications for <i>Listeria</i> Detection and Monitoring In-Plant Food Processing Plants

Ongoing Research

E. coli O157:H7

<u>Investigator</u>	<u>Institution</u>	<u>Project Title</u>
Andrew Benson	University of Nebraska	Distribution of Virulent and Avirulent Subclones of <i>E. coli</i> O157:H7 in the U.S.
Mindy Brashears	Texas Tech University	Testing of Probiotic Bacteria for the Elimination of <i>Escherichia coli</i> O157:H7 in Cattle
Dale Hancock	Washington State University	Evaluation of Efficacy of a Bacteriophage System in Preventing or Modulating <i>E. coli</i> O157:H7 Infection of Cattle
Alison O'Brien	Uniformed Services University of the Health Sciences	<i>E. coli</i> O157:H7 Intimin Expressed by Transgenic Plant Cells as a Candidate Oral Vaccine for Cattle
Michael Doyle	University of Georgia	Methods to Control <i>E. coli</i> O157:H7 in Drinking Water for Cattle
Chobi DebRoy	Pennsylvania State University	Competitive Exclusion of <i>Escherichia coli</i> O157 using Non Pathogenic Colicin Producing <i>Escherichia coli</i> Strains
Charles Kaspar	University of Wisconsin - Madison	The Use of Egg Yolk Anti-O157:H7 Immunoglobulin to Clear <i>E. coli</i> O157:H7 from the Intestinal Tracts of Cattle

AMI Foundation Analysis of BSE Policy Measures

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“triple firewall strategy”: strict import controls on meat, feed and livestock from nations with the disease; feed restrictions in the U.S. that would help prevent the spread of the disease if it did develop here and surveillance to detect it if it did occur.

In its “thinking paper,” USDA detailed the following options: prohibiting the use of brain and spinal cord from specified cattle in human food; prohibiting the use of central nervous system tissues in boneless beef products, including meat from Advanced Meat Recovery systems; and prohibiting the use of the vertebral column from certain categories of cattle, including non-ambulatory livestock, in the production of meat from AMR systems.

“The best way to maintain the lowest possible

risk is by preventing the disease in animals. When herds are BSE-free, as U.S. herds are, then any product derived from livestock poses no human health risk,” according to AMI Foundation President James H. Hodges. “USDA’s ‘thinking paper’ focuses on actions that pertain directly to meat processing and the meat products sold to consumers. These actions would only be effective to protect public health if we had BSE in this country, which we do not.”

Hodges said it is appropriate for USDA to consider what measures it would take in the unlikely event that U.S. herds did develop BSE. “We fully support this discussion and will work with the Department in our commitment to maintain healthy herds and a safe and wholesome meat supply,” he said.

Probiotic *Lactobacillus acidophilus*

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varied from 18 to 19 percent during the mid-feeding period to less than 10 percent near slaughter. The cattle fed the probiotics, however, showed major reductions in incidence rates. The group of cattle fed one particular strain known as NPC 750 saw a 50 percent drop in the incidence of *E. coli* O157:H7.

In addition to reducing this pathogen, the probiotic is extremely cost-effective. The researchers estimate the cost of feed supplementation at roughly one cent per animal per day. The low costs are offset by improvements in feed conversion.

“Our research affirms the benefits of probiotics in preventing *E. coli* O157:H7 in cattle,” Brashears said. “In the same way that *acidophilus* in dairy products has health benefits for humans, this particular strain of *Lactobacillus acidophilus* clearly reduces the development of pathogenic bacteria in the gut of animals.”

Brashears’ findings confirm data from preliminary trials. Further confirmatory research studies are underway, which if successful will lead to commercial field trials. These field trials are aimed at affirming the benefits of this particular strain of *Lactobacillus acidophilus*.

AMI Foundation Vice President of Scientific Affairs, Randall Huffman, Ph.D., stressed the commitment of the U.S. meat industry to enhancing the safety of beef products. “Safety starts on the farm and ends at the table,” Huffman said. “We believe it is important to take a broad view in achieve our

goal to reduce and eliminate *E. coli* O157:H7 in beef.”

Huffman said new technology developed over the last decade has helped achieve major reductions in bacteria on raw meat products, but still does not permit a pathogen free meat supply. The AMI Foundation, he said, supports a “multi-hurdle” strategy throughout the production process. By using a combination of on-farm interventions like probiotics in cattle feed, careful in-plant processing techniques designed to destroy bacteria, careful temperature control throughout distribution and thorough cooking in restaurants and home kitchens, producers, processors, retailers, restaurants and consumers together can ensure the safest possible beef supply.

“This new research is another tool in the food safety toolbox that can help make the U.S. beef supply - already among the safest in the world - even safer,” Huffman said.

The research is part of a comprehensive Food Safety Initiative funded by U.S. meat and poultry companies and administered by the AMI Foundation. The initiative’s goal is reduce and ultimately eliminate *E. coli* O157:H7 and *Listeria monocytogenes* on meat and poultry products.

To view the research in its entirety, visit the AMI Foundation web site at <http://www.amif.org>.

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CPC Spray

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effectiveness. The CPC treatment also inhibited future *L.m.* growth.

“This promising research will help meat and poultry processors in their ongoing efforts to reduce and ultimately eliminate *Listeria* on ready-to-eat meat and poultry products,” said AMI Vice President Randy Huffman.

A final report from this project will be available on the www.amif.org website upon completion later this year.