

AMI Foundation News

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AMIF Affirms Meat Nutrition, Safety in Response To Recent Cancer Report

In response to the Oct. 31 report released by the World Cancer Research Fund (WCRF), the American Meat Institute said recommendations to limit red and processed meat intake to extremely low levels reflect WCRF's well-known anti-meat bias and should be met with skepticism because they oversimplify the complex issue of cancer, are not supported by the data and defy common sense.

The following article by Randy Huffman, Ph.D., AMIF vice president of scientific affairs, appeared in the December 2007 issue of *Meatingplace* magazine:

False Alarm: WCRF Warnings About the Dangers of Processed Meats are in Stark Contrast to a Full Body of Other Findings

The 2007 World Cancer Research Fund report arrived on Halloween, warning consumers to limit red meat consumption and eliminate

processed meat consumption. As reporters received a 500-plus-page report on deadline, they turned to a press release to interpret the overwhelming data.

“WCRF says the evidence against processed meat meets its ‘convincing’ criteria. But as external reviewers begin to peel back the evidence reviewed by WCRF, questions about this conclusion are beginning to surface.”



- Randy Huffman, Ph.D., AMIF vice president of scientific affairs

The American Meat Institute had seen WCRF's 1997 report and expected the 2007 report would arrive at similar conclusions. In anticipation, we analyzed much of the same literature WCRF analyzed — as well as more current studies that were available after the early 2006 cut-off used by WCRF. We knew what the science could and couldn't support.

But nothing could have prepared us for the insupportable suggestion that there was

no safe level of processed meat consumption. How could the report reach such an extreme conclusion? Because it set the evidence bar low.

To deem a food a “convincing” (see page 6)

Low Ox MAP Enhances Tenderness, Research Shows

Low oxygen packaging systems enhance pork tenderness, according to a new study detailed at the Meat Industry Research Conference (MIRC), held recently in Chicago, Illinois. This finding echoes previous findings about the beneficial effects low-oxygen modified atmosphere packaging (MAP) systems have on beef tenderness.

Dr. Daren Cornforth, professor of meat science at Utah State University, offered an issue update on packaging technologies with a focus on low-oxygen MAP systems. This technology

modifies the gases found in air, removing oxygen and increasing beneficial gases normally found in air such as nitrogen, carbon dioxide and carbon monoxide, which is present in the packaging at the safe and extremely low level of 0.4 percent.

According to Cornforth, researchers in Denmark have released new findings from a study of the tenderness of pork cuts packaged anaerobically (vacuum skin packaging). The Danish scientists concluded that anaerobic packaging provided significantly higher levels of tenderness when compared to (see page 6)

Nitrate and Nitrite Found Helpful to Human Health

AMIF Conducts Q&A with Author of Groundbreaking University of Texas Study

Nitrite and nitrate found in vegetables, cured meats and drinking water may help heart attack survival and quicken recovery, according to a pre-clinical study led by a cardiovascular physiologist at The University of Texas (UT) Health Science Center at Houston. Findings appear in the November edition of the *Proceedings of the National Academy of Sciences*.

AMIF interviewed the study's lead author Nathan S. Bryan, Ph.D., an assistant professor at UT-Houston's Brown Foundation Institute of Molecular Medicine for the Prevention of Human Diseases (IMM), on this recent research and emerging data on health benefits of nitrate and nitrite in the diet:

Q: What are nitrite and nitrate and in what foods do they occur?

Nitrite and nitrate are natural molecules produced from the oxidation of nitric oxide in mammals and are intermediates in the nitrogen cycle in plants. Therefore both nitrite and nitrate are found naturally in all plants and animals. Nitrite and nitrate have been added to meats for centuries and still today to preserve them and protect from food-borne illnesses. As a result, both anions are found in all cured and processed meats such as bacon, ham and lunch meats. They are also found naturally in fruits and vegetables even though they are not added. Green leafy vegetables such as spinach, turnip greens and lettuce are rich in nitrates.

Q: What is the difference between nitrite and nitrate?

Chemically nitrite is NO₂⁻, and nitrate is NO₃⁻. At physiological pH, they both exist as anions, negatively charged molecules. Nitrite is more reactive or less stable than nitrate and is actually the molecule responsible for curing or preserving meats. Nitrite can be reduced to nitric oxide or oxidized to nitrate depending on the local environment. The circulating half life of nitrite in humans is roughly 110 seconds, whereas the



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circulating half life of nitrate is around 8 to 10 hours. However, due to a special circulation within our body called the enterosalivary circulation, nitrate is absorbed, transported and concentrated in our salivary glands. Saliva contains very high concentrations of nitrate and the bacteria in our mouth reduce the nitrate to nitrite, so every time we swallow we ingest lots of nitrite and nitrate. This pathway has been shown to be very important in regulation of blood flow in our stomach and in eradicating pathogenic bacteria in our stomach. Therefore, both nitrite and nitrate can act as alternative sources of nitric oxide.

Q: Is the only human exposure to these substances through the food we consume? What foods contain the highest concentrates of nitrate and nitrite?

Besides being produced within our body and being used as a preservative in meats and fish, nitrite is also used in manufacturing diazo dyes, n-nitroso compounds, in the textile industry, in

photography and in the manufacture of rubber chemicals. Nitrite is also used as a common clinical and laboratory chemical that is used as a vasodilator, bronchodilator, intestinal relaxant and even as an antidote for cyanide poisoning. Thus nitrite is a very useful molecule in a number of different applications. Nitrate, on the other hand, has no utility in any of the aforementioned applications. The majority of the nitrite and nitrate in our body under fasting conditions is from nitric oxide production. However, depending on individual diets, the majority of nitrite and nitrate in our body can come from the foods we eat. Green leafy vegetables such as spinach, turnip greens, and lettuce are rich in nitrates. Red wine, vegetable juice, particularly carrot and pomegranate juice, are high in nitrite and nitrate.

Q: You have recently published research on potential heart health benefits of nitrate and nitrite. Could you explain these findings?

A heart attack occurs when the blood flow that brings oxygen to the heart muscle is severely reduced or cut off completely. In healthy vessels, our cells make nitric oxide which dilates blood vessels and regulates blood flow. In disease such as atherosclerosis, the coronary arteries that supply the heart with blood slowly become thicker and harder from a buildup of fat, cholesterol and other substances that together are called plaque. The vessels can then no longer produce nitric oxide from L-arginine.

My lab has been interested in alternatives sources of nitric oxide that can compensate for the decreased production. We discovered that both nitrite and nitrate from the diet can be alternative sources or pro-drugs of nitric oxide. During conditions that occur in a heart attack, nitrite can form nitric oxide, which helps to reopen closed arteries and limit the amount of damage to the heart once bloodflow is restored. Mice fed an extra helping of nitrite and nitrate fared much better following a heart attack than those on a regular diet. The mice (see page 3)

with extra nitrite had 48 percent less cell death in the heart following heart attack. The mice with extra nitrite had 48 percent less cell death in the heart following heart attack. Mice with a low nitrite/nitrate diet had 59 percent greater injury.

Furthermore, the mice with extra nitrite were also more likely to survive a heart attack. They had a survival rate of 77 percent compared to 58 percent for the mice that were nitrite deficient. This publication provides the first demonstration of the consequences of changes in dietary nitrite and nitrate on nitric oxide biochemistry and the outcome of heart attack.

Q: Do nitrites and nitrates play a role in preventing disease or illness in humans?

Very preliminary results in my lab suggest that they may play an essential role in the prevention of disease, but these studies are incomplete and not yet published. It has been appreciated for many years in the food industry that nitrite controls and stabilizes the oxidative states of lipids thus preventing lipid oxidation. My lab has ongoing studies to determine if this same chemistry occurs in humans and can protect from lipid oxidation during atherosclerosis.

Q: Are there any other major studies or findings on the benefits of nitrates and nitrites?

There are many recent studies on the benefits of nitrites and nitrates. The research group led by Dr. Mark Gladwin at National Institute of Health has shown that inhalation of nitrite selectively dilates the pulmonary circulation under hypoxic conditions and experiments in primates revealed a beneficial effect of long-term application of nitrite on cerebral vasospasm. Interestingly, formulations of topical nitrite preparations are effective in wound and burn healing. Clinical trials for such uses, as well as diabetic skin ulcers, are under way. It appears that dietary supplements of nitrites and their topical uses will be effective and inexpensive therapies due to their

conversion to nitric oxide. Furthermore, in the stomach, nitrite-derived NO seems to play an important role in host defense and in regulation of gastric mucosal integrity. Most recently a group at the Karolinska Institute in Stockholm led by Drs. Jon Lundberg and Eddie Weitzberg has shown that dietary nitrate supplementation can reduce diastolic blood pressure in healthy humans and dietary nitrate supplementation results in a lower oxygen demand during submaximal work. There has been a surge in nitrite- and nitrate-based research over the past few years with very remarkable findings on their positive health benefits.

Q: You say there has been a gradual evolution – from a negative connotation to a more positive one – on how scientists think about nitrate and nitrite. What caused that change, and how has the scientific community’s stance on these substances changed over time?

The early reports in the sixties and seventies on the potential to form carcinogenic N-nitrosamines from ingested nitrite are what started the negative scientific and public perception on dietary nitrite. At that time, it was believed that nitrite and nitrate were only derived from the diet. Then in the late seventies, researchers at MIT led by Dr. Steve Tannenbaum revealed that our body actually makes nitrite and nitrate. It was this seminal finding that eventually led to the discovery of the nitric oxide pathway in the late 1980s.

It then became apparent to the scientific community that the gas nitric oxide, previously thought to be air pollutant from car exhaust, along with nitrite and nitrate were actually produced within our body. There is a step wise metabolism of nitric oxide to form nitrite and then nitrate. Research has since shown that nitrate can be reduced back to nitrite by the bacteria that reside in our mouth and intestines and nitrite can be converted back to nitric oxide. Therefore nitrite and nitrate are now considered pro-drugs of nitric oxide, which is perhaps the single most important signaling molecule in our body. However, this has not been translated to the public. The public perception of nitrite and nitrate are still

quite negative, so many people are surprised to learn about our research.

Q: What is nitrite therapy and who benefits from this procedure?

Nitrite therapy is the use of nitrite for the treatment of specific diseases. Currently, there are numerous clinical trials for the use of nitrite in diseases such as sickle cell anemia, pulmonary hypertension, pseudomonas infection in cystic fibrosis patients and coronary artery disease. Dietary nitrite and nitrate will also help with other conditions characterized by a sudden disruption of blood or oxygen including stroke or peripheral vascular disease.

Q: Do you have any thoughts on the World Cancer Research Fund’s recommendation to avoid nitrite-rich processed meats, saying there was “no safe level of consumption?”

Obviously there is a disconnect between WCRF and the current state of the art of nitric oxide/nitrite/nitrate based research. I think they have failed to recognize the biomedical research over the past 10-15 years and have relied exclusively on research that preceded the discovery of the nitric oxide pathway. Although there were early reports on the “potential” of nitrite to form N-nitrosamines, some of which have been shown to cause cancer, there is still no conclusive evidence that nitrite or nitrate causes cancer.

A recent two year study on the carcinogenicity of nitrite by the National Institutes of Health (NIH) has conclusively found that there was no evidence of carcinogenic activity by nitrite in male or female rats or mice so a causative link between nitrite or nitrate exposure and cancer is still missing. If nitrite and nitrate were harmful to us, then we would not be advised to eat green leafy vegetables or swallow our own saliva, which is enriched in nitrate. Furthermore, the antioxidants we consume in our food have been shown to inhibit nitrosamine formation so there are systems in place within our body and in our foods to prevent this from occurring. There absolutely has to be an open discussion between the WCRF and other cancer researchers with the scientists and clinicians in the nitric oxide-nitrite field. The very least is that there should be a risk assessment for nitrite and nitrate.

AMI Foundation to Host *E. coli* O157 Surveillance Briefing Meeting Will Bring Together Leading Experts to Discuss State of Science

The American Meat Institute Foundation (AMIF) and the National Meat Association (NMA) will host an *E. coli* O157:H7 Surveillance and Prevention Briefing January 23, 2008, at the Doubletree Crystal City Hotel in Arlington, Virginia.

The briefing is conveniently planned just one day prior to the International Association for Food Protection's (IAFP) Timely Topics Symposium "Prepared, But Not Ready-to-Eat Foods-What You Need to Know," which will be held in the same hotel January 24.

Since 2000, the incidence of *E. coli* O157:H7 in ground beef has been cut in half. However, a slight increase in the incidence of the pathogen in ground beef in late 2007 has prompted the industry, scientists and regulators to reassess strategies in the fight against the pathogen. The one-day briefing will bring together leading experts to discuss the state of the science in pathogen prevention and to identify new strategies for ensuring product safety and optimal public health.

The briefing will feature talks on public health surveillance; import and export issues; industry best practices for controlling the pathogen throughout the supply chain; research into interventions to reduce and eliminate the pathogen; regulatory initiatives and consumer knowledge and perceptions about *E. coli* O157:H7, beef handling and beef safety.

Speakers will include J. Patrick Boyle, president and CEO, AMI; Barry Carpenter, president and CEO, National Meat Association; Richard Raymond, MD, under secretary for food safety at the U.S. Department of Agriculture; Mark Dopp, senior vice president and general counsel, AMI; Laurie Bryant, executive director, Meat Importers Council of America, Inc.; James "Bo" Regan, Ph.D., executive director, research, National

Cattlemen's Beef Association; Dean Danilson, Ph.D., vice president, fresh meats quality assurance, Tyson Foods, Inc.; Warren Mirtsching, vice president, quality assurance, Swift and Company; Scott Goltry, vice president, technical services and food safety, Cargill Meat Solutions; Ranzell "Nick" Nickelson, Ph.D., vice president of safety, Standard Meat Company; Brenden McCullough, vice president of technical services, National Beef Packing Co.; Ken Harris, Ph.D., president and CEO, International HACCP Alliance and associate professor, Texas A&M University; Randy Huffman, Ph.D., vice president, scientific affairs, AMIF; Guy H. Loneragan, B.V.Sc., Ph.D., assistant professor, West Texas A&M University; Bernadette Dunham, DVM, Ph.D, deputy director, Center for Veterinary Medicine, FDA; Mohammad Koochmaraie, Ph.D., director, USDA, ARS Meat Animal Research Center; Rick McCarty, vice president, issues management, National Cattlemen's Beef Association; Michele Murray, director, safety public relations, National Cattlemen's Beef Association; Janet Riley, senior vice president, public affairs, AMI; and James Hodges, president, AMIF.

Invited speakers include Rep. Rosa L. DeLauro (D-CT); Patricia M. Wells, M.D., National Center for Zoonotic, Vector-Borne, and Enteric Diseases at the Centers for Disease Control; Kenneth Petersen, DVM, head of the Office of Field Operations, USDA, Food Safety and Inspection Service (FSIS); and William James, deputy assistant administrator, Office of International Affairs, FSIS, USDA.

Registration is \$250 for members, academics and government officials. The non-member rate is \$325. To see a detailed agenda or to register for the conference, go to www.meatami.com or call Heather Schoch, manager of meetings, at hschoch@meatami.com. Room rates at the hotel are \$179. The rate is guaranteed until Jan.14, 2008.

Updated *Listeria* Workshop, Slated for Jan. 29-30, in Chicago

Innovative breakout session topics, discussions on advanced intervention techniques, analysis of a timely case study and a talk on food safety assessments will be part of the agenda for the updated Advanced *Listeria* Intervention and Control Workshop, scheduled for January 29-30, 2008, at the Hilton Chicago in downtown Chicago, Ill.

Co-sponsored by the American Meat Institute Foundation and the North American Meat Processors Association, the two-day workshop has been updated to provide attendees with an even greater take away. The first day of the event begins with a general session on producing safe ready-to-eat (RTE) meat and poultry products and the public health and regulatory implications for *Listeria* control. This session will be followed by discussions on sanitary equipment and facility design and sanitation best practices.

The first day luncheon topic will be an update on USDA's *Listeria* rule and implementation, followed by afternoon sessions on verification and validation, developing a routine sampling plan for process control and data analysis. The first day will wrap up with a reception and technology fair and panel discussion.

On the second day, attendees will benefit from a session where a case study concerning root cause identification will be discussed. A breakout session on best practices for *Listeria* control will be featured as well as discussions on lot and line segregation and successfully completing risk-based *Listeria monocytogenes* sampling (RLM) and food safety assessment.

The workshop is limited to 60 participants. For more information, contact AMI Manager of Membership Services Eric Zito at 202-587-4223 or via email at ezito@meatami.com.

Science Soundbites: A Review of Recent Research

Two New Studies Confirm Effectiveness of *E. coli* Vaccine

Two new studies conducted by the University of Nebraska-Lincoln have found that a vaccine product containing type III secreted proteins of *Escherichia coli* O157:H7 effectively reduces the probability for cattle to shed *E. coli* O157 while also reducing *E. coli* O157 colonization of the terminal rectum under conditions of natural exposure, the first step in its evaluation as an effective intervention for food and environmental safety.

In the first study, 608 same-source steers were utilized. Of these, 480 steers were assigned randomly to 60 pens (eight head per pen) and one of four vaccination treatments (120 cattle per treatment, two head per pen). The four treatments were: no vaccination; one dose, vaccinated on arrival day; two doses, vaccinated on arrival day and again on day 42; and three doses, on arrival day, day 21 and day 42. The remaining 128 steers were assigned randomly to 12 pens within the same feedlot to serve as unvaccinated external controls.

The study found that vaccine efficacy of receiving one, two and three doses of vaccine was 68, 66 and 73 percent respectively, compared with cattle in pens not receiving the vaccine. In addition, this study found that vaccinating a majority of cattle within a pen offered a significant protective effect (herd immunity) to unvaccinated cattle within the same pen.

In the second study, a blinded clinical trial was conducted on 288 steers that were assigned randomly to 36 pens (eight head per pen), and pens were randomized to vaccination treatment in a balanced fashion within six dietary treatments of an unrelated nutrition study. Treatments included vaccination or placebo. Fecal samples were collected and terminal rectum mucosal (TRM) cells were collected for culture. Researchers found vaccinated cattle were 98.3 percent less likely to be colonized by *E. coli* O157 in TRM cells.

Both of these studies can be found in

the *Journal of Food Protection*, Vol. 70, No.11, pages 2561 and 2568.

Listeria On Hides More Prevalent In Cooler Weather

Listeria monocytogenes is consistently more prevalent on hides of cattle presented for slaughter in cooler weather, and interventions being used at cow and bull processing plants appear to be effective in reducing contamination, according a new study by the U.S. Department of Agriculture.

Listeria is routinely isolated from many sources, including cattle, yet information on the prevalence of *Listeria* in beef processing plants in the United States is limited. From July 2005 through April 2006, four commercial cow and bull processing plants were sampled in the United States to determine the prevalence of *Listeria* and the serovar diversity of *L. monocytogenes*. Samples were collected during the summer, fall, winter and spring.

The study found that *Listeria* prevalence on hides was consistently higher during cooler weather (28 to 92 percent of the samples) than during warmer weather (6 to 77 percent of samples). The *Listeria* prevalence data collected from preevisceration carcass ranged from undetectable in some warm season samples to as high as 71 percent during cooler weather. *Listeria* on post-intervention carcasses in the chill cooler after carcass interventions had been applied was normally undetectable, with the exception of summer and spring samples from one plant where less than 19 percent of the carcasses were positive for *Listeria*.

On the hides observed, *L. monocytogenes* serovar 1/2a was the predominant serovar observed, with serovars 1/2 b and 4b present 2.5 times less often and serovar 1/2c not detected on any of the hides sampled. *L. monocytogenes* serovars 1/2a, 1/2c and 4b were found on postintervention carcasses.

Journal of Food Protection, Vol.30, No.11, 2007, Pages 2578-2582

ELISAs Do Not Detect *E. coli* in Hide and Fecal Samples

A study conducted at Texas Tech University and West Texas A&M University has found that rapid enzyme-linked immunosorbent assays (ELISAs) do not detect *E. coli* O157:H7 in hide and fecal samples.

Researchers collected 165 hide samples from live animals, 157 fecal samples, 80 ground beef samples-both inoculated and non-inoculated, and 96 briskets-both inoculated and noninoculated-to simulate the outer surface of a beef carcass. Samples were tested for *E. coli* O157 with the immunomagnetic separation first followed by three separate commercially available ELISAs using the manufacturer protocols and supplies.

As directed by the manufacturer, the commercially available ELISAs detected *E. coli* O157 in a higher percentage of naturally contaminated samples than the IMS. There were not significant differences between the two procedures for artificially inoculated samples. Results should be used to determine the procedure used in testing hide, carcass and ground beef samples.

Journal of Food Protection, Vol. 70, No. 10, 2007, Pages 2230-2234.

Unwashed Cattle Trucks Increase Risk of *E. coli* Contamination

A recent study by Oklahoma State University emphasizes the importance of washing trailers between loads to reduce the prevalence of *E. coli* O157:H7.

The study found that cattle trucks that were not washed prior to their arrival at the cattle pens contained *E. coli* O157 while no *E. coli* O157 was discovered in trucks that had been washed.

Samples were taken from 12 trucks – three washed and the rest unwashed. Researchers took 14 samples from the floors, walls, and ramps (see page 7)

American Meat Institute Foundation Affirms Meat Nutrition, Safety

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cause of cancer, WCRF decided it needed at least two independent cohort studies (epidemiological studies in which people are followed going forward in time), evidence of a dose-response (the more one is exposed, the more the risk increases) and strong and plausible evidence from human studies or animal models.

WCRF says the evidence against processed meat meets its “convincing” criteria. But as external reviewers begin to peel back the evidence reviewed by WCRF, questions about this conclusion are beginning to surface.

In fact, 14 of the 17 comparisons WCRF reviewed were not statistically significant. Likewise, the strength of the associations in the studies reviewed by WCRF fell short of what is generally considered convincing. The U.S. National Cancer Institute wrote in 2002, “Relative risks or odds ratios less than 2.0 are viewed with caution. Small relative risks are sometimes difficult to interpret.” The average relative risk in the WCRF review for processed meats and colorectal cancer was 1.3.

Even more important, the report’s scientific underpinning — the “systematic literature review,” or SLR — reads, “A number of possible mechanisms by which [red and processed] meat consumption could increase colorectal cancer have been proposed ... Overall, mechanisms explaining the data are far from plausible biological mechanisms.”

Yet in the report’s summary, WCRF writes, “There is strong evidence for plausible mechanisms operating in humans. Processed meat is a convincing cause of colorectal cancer.” The

SLR’s conclusion suggests there is no basis for the WCRF panel’s recommendations.

Add to this the fact that a 2004 Harvard School of Public Health pooling analysis involving 725,000 men and women showed no relationship between red or processed meat and colorectal cancer. This study combined data from 14 studies into a single database instead of attempting to compare studies side by side. The paper was presented as an abstract, but never appears in its complete form three years after it was presented, and thus was not factored into WCRF’s 2007 report.

Pooling analysis is recognized in the WCRF report as providing “increased statistical power” over individual cohort study designs. So how then does WCRF explain that the largest study ever done — one whose design gives it increased statistical power — reaches a conclusion that stands in stark contrast to WCRF’s recommendations?

Perhaps one of the more striking features of the weakness of the findings is found in a special box, where it says, “There is no generally agreed upon definition of ‘processed meat.’”

Given this imprecise information, how could WCRF dispense a precise recommendation to avoid processed meats altogether?

This is a question that we can’t answer — and that many reporters have a hard time formulating. But questions must be asked by policymakers. WCRF plans to issue a public policy report in 2008. It is imperative that food and nutrition policymakers ask critical science-based questions about this report, and not simply take cues from WCRF press releases.



AMI Senior Vice President of Public Affairs Janet Riley responded to the WCRF report on Fox Business News.

Low-Oxygen Modified Packaging Enhances Pork Tenderness, Research Shows

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cuts packaged in high oxygen modified atmosphere packaging, Cornforth said. This finding is much like earlier findings that low oxygen MAP packaging systems can enhance beef tenderness.

According to Cornforth, tenderness is just one of the many benefits of low-oxygen packaging. In his talk, he detailed other studies that have found that beef steaks or ground beef held in low-oxygen, CO-MAP have lower aerobic plate counts (APC), and lower anaerobic plate count (AnPC) than similar samples held in PVC overwrap.

In addition, studies have documented that ground beef held in low-oxygen CO-MAP also has less growth of food pathogenic

bacteria than similar samples in aerobic packaging, according to Cornforth.

Cornforth pointed out that CO is naturally occurring in the human body at measurable levels. He said that studies show that the mean CO-hemoglobin levels of non-smokers is 1.5 percent of total hemoglobin, with 0.5 percent due to normal bodily CO production.

Cornforth’s presentation was part of MIRC’s opening session on current issues in the meat industry. Other conference session topics included: the consequences of going natural, meat and human nutrition and food defense.

Study Examines Efficacy of Chlorine Dioxide Against *Listeria* in Brines

While chlorine dioxide may potentially be an effective pathogen-control agent in brines, further investigation is necessary to improve the efficacy of the compound against *Listeria*, according to a new AMI Foundation study conducted by Pennsylvania State University.

While several research reports have focused on the use of interventions to control pathogens in brines, only a few have addressed the use of chlorine dioxide as an antimicrobial to inhibit pathogens in these systems.

In this study, four experiments were conducted. The experiments found that *Listeria monocytogenes* (*L.m.*) is able to survive in brine solutions composed of 10 and 20 percent sodium chloride, and 10 percent calcium chloride after 8 hours at 0°C. These findings are in agreement with other published research studies. However, *L.m.* was reduced ~1.2 logCFU/ml when suspended in 20 percent calcium chloride brine solutions after 8 hours at 0°C. Approximately 3 log CFU/ml reduction was observed after 24 hours.

In 10 and 20 percent sodium chloride and 10 percent calcium chloride brine solutions, a 3 ppm chlorine dioxide treatment

for 90 seconds at 0° C resulted in approximately 4 log CFU/ml reduction in *L.m.* However, in 20 percent calcium chloride solutions, *L. monocytogenes* was reduced approximately 2 log CFU/ml in 90 seconds. It should be noted that a precipitate was observed during experiments with 3 ppm chlorine dioxide in 20 percent calcium chloride.

Subsequent experiments demonstrated that previous exposure of *L.m.* in brine solutions does not impart protection or enhanced resistance against chlorine dioxide. It appears that the 20 percent calcium chloride affects the activity of chlorine dioxide by potentially binding up the compound, interfering with activity, or diminishing the oxidizing capacity. As such, the use of calcium chloride brine solutions at a 20 percent concentration should be carefully evaluated for use in combination with 3 ppm chlorine dioxide.

And finally, 3 ppm chlorine dioxide was not effective for reducing *L.m.* in spent brine solutions from hot dogs and hams due to the presence of organic and possibly inorganic material. Interventions, such as filtration of spent brine solutions prior to disinfection with chlorine dioxide, should be investigated to improve the efficacy of the compound against *L.m.*

Science Soundbites

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of each truck. The floor samples from unwashed trucks included fecal samples. *E. coli* O157 cultures were isolated using fluorescence and color signatures, and each culture was tested by agglutination for O157 and H7 antigens and the production of a Shiga-like toxin. All unwashed trucks tested positive for the presence of *E. coli*, and 94 percent of the cultures produced a Shiga-like toxin.

Journal of Food Protection, Vol. 70, No. 10, 2007, Pages 2383-2385.

Direct-Fed Microbial Reduces *E. coli* and *Salmonella* Prevalence in Cattle

Researchers at Texas Tech University and West Texas A&M University have found that cattle that received doses of *Lactobacillus acidophilus* were less likely to shed *E. coli* O157:H7 and *Salmonella* in their feces.

Fecal samples were taken at harvest from 240 steers that had received control, low, medium or high doses of *Lactobacillus acidophilus*. Cattle receiving the low dose

were 74 percent less likely to shed *E. coli* O157, and cattle receiving the high dose were 48 percent less likely to shed *Salmonella*. The low and medium doses did not have a significant effect upon the prevalence of *Salmonella*.

Journal of Food Protection, Vol. 70, No. 10, 2007, Pages 2386-2391.

Multiple Interventions Minimize Shiga Toxin-Producing *E. coli* in Foods

A review of studies on the efficacy of nonthermal processing treatments and antimicrobials on the growth and the virulence of transmission of Shiga toxin-producing *E. coli* (STEC) done by the University of Georgia show that multiple interventions minimize Shiga-toxin producing *E. coli* in foods.

The studies showed that ruminants, especially cattle, are the primary reservoirs of STEC, but they differ in the mode of contamination during slaughter, washing, skinning and/or bung tying.

Environmental exposure of produce may occur through feces either in river and/or lake runoff or manure fertilizer. Cross-contamination in retail settings was also common when cleaning practices for cutting boards, knives and cooking utensils did not effectively kill the pathogen. Non-refrigerated temperatures support the survival and growth of *E. coli* O157, but specific products were more favorable such as milk and cheese. *E. coli* O157 has an increased heat tolerance in beef containing less fat and emulsified turkey products containing various concentrations of fat. The risk of cross-contamination and high rates of survival of the pathogen indicates that multiple interventions are important.

Studies show that heat, ultrasound, ionizing and UV light radiation techniques are effective at reducing pathogens, while freezing, drying and fermentation are not effective. New antibiotic technologies for *E. coli* O157 included high hydrostatic pressure and pulsed-electric field processing to inactivate pathogens.

Journal of Food Protection, Vol. 70, No. 10, 2007, Pages 2426-2449.

Annual Meat Conference to Bring Retailers and Industry Together

This year's Annual Meat Conference, slated for March 9-11, 2008, at the Gaylord Opryland Resort and Convention Center in Nashville, Tenn., will serve up some bold thinking about selling strategies, operational efficiencies, packaging, marketing, technology and workforce issues.

General session topics include the secrets to unshakable customer loyalty, and an in-depth look at meat through the customers' eyes.

Workshops will focus on important topics such as regulatory compliance, animal welfare, grilling trends, environmental sustainability, electronic marketing and new ways to increase



sales. In addition to numerous educational sessions and workshops, the 2008 conference will feature the popular Product Tasting Reception on Monday, March 10. Nearly 50 meat and poultry companies showcase newly developed products and brand line extensions to a retail buyer audience.

AMC 2008 also will feature the annual Tech Fair Luncheon. At this luncheon, suppliers to the meat, poultry and retail supermarket industries display new technology, ranging from irradiation services to labeling machinery to in-store processing and packaging equipment. The complete conference program, as well as a registration form, may be accessed at www.MeatConference.com.

Animal Handling Conference to Examine Global Trends in Animal Welfare *Special Pre-Conference Workshop on Livestock Transportation to be Featured*

Current trends in animal welfare will be the focus of the keynote address at the 2008 Animal Care and Handling Conference, February 14-15, 2008, at the Westin Crown Center in Kansas City, Missouri. The speech will be delivered by Marie Belew Wheatley, president & chief executive officer, American Humane Association.

The conference will again feature three focused tracks — Management and Policy, Applied Pig Handling and Applied Cattle Handling — to provide in-depth instruction on specific topics.

Attendees in the Management and Policy Track will benefit from sessions on foreign animal disease investigations, animal welfare and security, hiring and retaining for animal care jobs and a session focusing on the Professional Animal Auditor Certification Organization, Inc. (PAACO), including an audit update.

Participants in the Applied Pig Handling Track will attend sessions on handling, transition to CO2 stunning, equipment options and new research.

The Applied Cattle Handling Track will include sessions religious slaughter and how to troubleshoot problems in Kosher and Halal operations, handling and stunning issues, challenges and behavior principles.

In addition, exhibitors may showcase their products and services during a special Welcome Reception Feb. 14. To reserve exhibit space, contact Heather Schoch at hschoch@meatami.com.

A special pre-conference workshop on livestock transportation will be held on February 13. Attendees of this workshop will benefit from a packed educational agenda with sessions hosted by industry leaders. Discussion topics will include international perspectives, developing a national emergency program, driver

fatigue management, ventilation, loading density, managing losses and more.

For a complete agenda or to register, go to www.animalhandling.org.

Kansas State University to Conduct Food Defense Survey

A survey on food defense preparedness among meat and poultry establishments is being conducted by Kansas State University, in cooperation with NAMP, AAMP and AMI.

The University is asking for employees of large, small and very small meat and poultry processing establishments who are involved with, or responsible for, food defense preparedness activities to participate.

The purpose of the survey is to better understand the needs of processors in setting up and operating food defense (security) programs, and develop effective training materials and other tools based on the responses. Participation is voluntary and all responses are strictly confidential.

The survey will be available through a link on the NAMP, AAMP, and AMI Web sites, as well as on some state organizations with Web sites.

For more information, contact Lisa Sobering at lab3434@ksu.edu.

Ongoing AMI Foundation Research

E. coli O157:H7

Investigator	Institution	Project Title
Chance Brooks, Mindy Brashears, Mark Miller, Adam Tittor ¹	Texas Tech University	Impact of Ground Beef Packaging Systems and Temperature Abuse on the Safety and Quality of Ground Beef

¹Co-funded with the National Cattlemen's Beef Association

Listeria monocytogenes

Investigator	Institution	Project Title
Mary Alice Smith, Joseph Frank	University of Georgia	Refinement of <i>Listeria monocytogenes</i> (<i>L. monocytogenes</i>) Low Dose Data from Pregnant Guinea Pigs for Human Risk Assessment
Kathy Glass, James Claus	University of Wisconsin	Minimum Nitrite Levels Required to Control <i>Listeria monocytogenes</i> on Ready-to-Eat Meat and Poultry Products
Charles Carpenter, Jeffrey Broadbent	Utah State University	Validation of Levulinic Acid for Topical Decontamination of Meat Surfaces

Salmonella

Investigator	Institution	Project Title
Annette O'Connor ²	Iowa State University	A Systematic Review of Literature on Pork Chain Epidemiology

²Co-funded with the National Pork Board

Targeted Research

Investigator	Institution	Project Title
Bradley Marks, Alicia Orta-Ramirez, Alden Booren, Elliot Ryser	Michigan State University	Determine the Likelihood that <i>Salmonella</i> Develops Heat Resistance during Thermal Processing of Commercial, Whole-Muscle, Ready-to-Eat Meat Products
Catherine Cutter, Ed Mills	Pennsylvania State University	Determination of the Efficacy of Chlorine Dioxide as an anti-Listerial Agent in RTE Brine Chilling Solutions
Jeffrey Savell, Kerri Harris, Alejandro Castillo, Wesley Osburn	James H. Hodges President Texas A&M University jhodges@meatami.com	Evaluation of Alternative Cooking and Cooling Procedures for Large, Intact Meat Products to Achieve Lethality and Stabilization Microbiological Performance Standards
Randall Phebus, Douglas Powell, Harshavardhan Thippareddi	Randall D. Huffman, Ph.D. Vice President, Scientific Affairs University of Nebraska rhuffman@meatami.com	Beyond Intent: Assessment and Validation of On-package Handling and Cooking Instructions for Uncooked, Breaded Meat and Poultry Products to Promote Consumer Practices that Reduce Foodborne Illness Risks

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Calendar of Events

For additional information on any of these upcoming events, or to register, please visit our Web site at MeatAMI.com and navigate to Events/Education or contact Heather Schoch at 202/587-4241 or hschoch@meatami.com.

***E. coli* O157:H7 Surveillance and Prevention Briefing**

When: Jan. 23, 2008

Where: Doubletree Crystal City Hotel, Arlington, Va.

What: This briefing will feature talks on public health surveillance; import and export issues; industry best practices for controlling the pathogen throughout the supply chain; research into interventions to reduce and eliminate the pathogen; regulatory initiatives and consumer knowledge and perceptions about *E. coli* O157:H7, beef handling and beef safety.

***Listeria* Intervention and Control Workshop**

When: Jan. 29-30, 2008

Where: Hilton Chicago in downtown Chicago, Ill.

What: Co-sponsored by the American Meat Institute and the North American Meat Processors Association, the two-day workshop has been updated to provide attendees with an even greater take away. The first day of the event begins with a general session on producing safe ready-to-eat (RTE) meat and poultry products and the public health and regulatory implications for *Listeria* control. This session will be followed by discussions on sanitary equipment and facility design and sanitation best practices.

Animal Transportation Pre-Conference

When: Feb.13, 2008

Where: Westin Crown Center, Kansas City

What: – In response to an increasing focus on ensuring optimal care during livestock transportation, the AMI Foundation (AMIF) together with the Animal Transportation Association (ATA) will host this pre-conference immediately before AMIF's Animal Care and Handling Conference, Feb.14-15, 2008. Attendees will benefit from a packed educational agenda with sessions hosted by industry leaders. The conference is designed for members of the meat industry, livestock producers and transporters and anyone involved in the care and handling of livestock.

Animal Care and Handling Conference

When: Feb. 14-15, 2008

Where: Westin Crown Center, Kansas City, Mo.

What: The AMI Foundation Animal Care and Handling Conference for the Food Industry, the leading animal welfare education opportunity for meat companies, their customers and those involved in the production and management of livestock and meat products, will open with an informative general session on current global trends in animal welfare, keynoted by Marie Belew Wheatley, president & chief executive officer, American Humane Association. Following the keynote, the conference will break into three focused tracks: Management and Policy, Applied Pig Handling and Applied Cattle Handling

Annual Meat Conference

When: March 9-11, 2008

Where: Gaylord Opryland Resort and Convention Center, Nashville, Tenn.

What: Co-sponsored by the American Meat Institute (AMI) and the Food Marketing Institute (FMI), this conference each year attracts 800 members of the retail grocery and meat industries. It is considered the leading educational event focusing on meat and poultry marketing developments, merchandising issues and consumer purchasing trends.

Conference on Worker Safety, Health & Human Resources

When: April 13-15, 2008

Where: Marriott New Orleans at the Convention Center, New Orleans, La.

What: Expanded sessions, updated workshops and an all new OSHA 501 Course – specific to the meat industry – will all be features of the 2008 Conference on Worker Safety, Health & Human Resources.

AMI Foundation Contacts

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