University of Nebraska–Lincoln

NEWS

Vol.8, Issue 2, Summer 2012

DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

THE FOOD PROCESSING CENTER

ALEX HLAVATY: PREPARING FOR INDUSTRY

Alex Hlavaty finishing up work with The FPC's extruder.

Alex Hlavaty is a junior in the Department of Food Science and Technology and will soon be using the skills he's learned here in industry. Alex is a Lincoln, Nebraska native and attended Lincoln Northeast High School. When entering college, Alex's choice of major was easy. He said, "I've always loved food and science, so studying food science seemed like a perfect fit for my higher education."

At UNL, Alex has enjoyed studying under Dr. Robert Hutkins and Dr. Susan Cuppett and said, "One of my favorite courses was FDST 280 because it dealt with contemporary issues with food science, and Dr. Hutkin's class really enabled us as students to think critically and express our opinions. Dr. Cuppett is definitely one of my favorites, I took the FDST 101 lab with her, and she was really sharp and knowledgeable."

Alex is using the resources of the Department, specifically The Food Processing Center, to gain experience and to determine what he'd like in a career in the food industry. Alex is currently employed as a student worker in The FPC's pilot plants. There he has provided setup and cleanup for production trials, helped with cheese and ice cream production in The FPC's dairy plant, and assisted with freeze drying, moisture studies, and other activities. "My current boss [Pilot Plants General Manager] Steve Weier is also one of my favorite staff members. He's the kind of boss who you can joke and mess around with, but you always get work done when it needs to be."

Alex's role in the food industry is already beginning. This summer he has a product development internship with ConAgra. "Hopefully that will go well and I can go straight to work after graduation. A career working with pilot plant equipment would be ideal, but I'm still trying to find out what I really want to do with my career."

FOOD SCIENCE CLUB: 2011-2012 SCHOOL YEAR

The UNL Food Science Club welcomed the 2011-2012 school year by attending the annual Applejack Festival in Nebraska City on September 17-19th. This is the second year the club has worked at this event selling ice cream and caramels. However, this year, the club was able to sell ice cream out of their newly purchased and designed ice cream trailer. The ice cream trailer purchase was made possible by a generous grant given by the Kimmel Research Foundation. In addition to fundraising events, the club also participated in some volunteer activities. In October, the club continued the annual tradition of Trick-or-Treating for canned goods, which resulted in nearly 300 lbs. of food for the Salvation Army. During the holiday season, the club frosted and donated over 200 sugar cookies for the Matt Talbot Community Kitchen and Outreach Center.

During the spring semester, the club has been participating in many more exciting events. In February, the club catered for the Robotics Expo at the Strategic Air and Space Museum, serving a lasagna lunch to over 400 attendees. In April, the club volunteered for the Kids Against Hunger organization packaging dried meals for hungry children around the world. Also in April, fifteen members of the club attended the IFT Area Meeting at the University of Wisconsin, Madison, where the club's quiz bowl team competed. Throughout the school year, ConAgra, Cargill, and Kellogg's representatives have attended club meetings to inform students about internship and job opportunities.

(Left to Right) Katie Hilgren, Brieanna Klooster, and Lydia Molnar sampling University of Wisconsin ice cream

Food Science Club Officers

President.....Brooke Grossenbacher
Vice President.....Katie Hilgren
Secretary.....Kaelyse Clapper
Treasurer.....Abby Burrows
Undergraduate Liaisons.....Lauren Wilson
Samantha Bryant
Graduate Liaisons.....Mary Wang
Kaye Ivens
Public Relations Chair.....Lydia Molnar
Miranda Schurr
Ice Cream Managers.....Alex Hlavaty
Julianne Kopf
Senior Club Advior.....Bob Hutkins

(Left): Miranda Schurr and Annette Hartzell (Left to Right) at the SAC Robotics Expo (Far right): The new ice cream trailer at the Applejack Festival

A MESSAGE FROM DR. FLORES

Right: Dr. Rolando A. Flores

Greetings from the Department of Food Science and Technology and The Food Processing Center!

Before I begin, I would like to express my sadness at the loss of Dr. Charles Walker, who passed away in April. Dr. Walker taught at the Department of Food Science and Technology from 1980 to 1987. During this time he was instrumental in establishing the cereal technology program at UNL and, in 1986, served as interim head of our Department and director of The FPC. Dr. Walker's time with us was amid a successful, 43-year career in both academia and the food industry. We thank Dr. Walker for his impact on the field and our Department and wish his family our deepest condolences.

I'm happy to share some announcements concerning our Department. Dr. Jens Walter has been promoted to associate professor with tenure and Dr. Harshavardhan Thippareddi has been promoted to full professor. We congratulate these professors for this recognition of their hard work and dedication. Dr. Amanda Ramer-Tait has accepted an offer by our Department to serve as a faculty member specializing in gastrointestinal biology. Dr. Ramer-Tait received her PhD in Immunology from Iowa State University. Dr. Ramer-Tait will begin in our Department in August.

As you can see in the column on the right, our faculty are involved in several grant funded projects. Of special note is Dr. Thippareddi's involvement as co-PI in the Shiga-Toxigenic *E. Coli* grant. This $25 million project is being led by UNL and has 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*. The grant is the largest-ever USDA grant to UNL and one of the single largest grants it's ever received.

We had 13 undergraduates complete their degrees with us in May; of these, 10 are already employed in industry. We wish them well in their future careers and thank them for sharing their talent with us. Including our graduated seniors, our Department had 77 undergraduates in the spring semester. This is a sign of continued improvement as 67 undergraduates were enrolled in the program in May 2011 and 56 in May 2010. Additionally, this academic year, the Department had 61 graduate students; this is an improvement over 2011 which had 60 graduate students, and 2010 which had 43. This semester we had 33 PhD students as opposed to the 20 that we had at this time in 2010. On April 26th, our Department held its annual awards banquet to recognize our students for their achievements. There are far too many for me to list here, so please read the awards and scholarships won by our students on page 4.

The Food Allergy Research and Resource Program (FARRP) has been heavily involved in international discussions regarding the possible establishment of threshold levels for residues of allergenic foods. In collaboration with the Allergen Bureau of Australia, the International Life Sciences Institute, Unilever, and TNO (a research organization in the Netherlands), FARRP has assembled clinical data on the minimal eliciting doses of individuals with allergies to 11 different foods. Various statistical dose distribution models have been evaluated to provide the necessary background for the establishment of thresholds for allergenic foods. FARRP's work is recognition of the high standing it holds at the national and international level.

The FPC's Food Innovation and Entrepreneurship unit has a new service called the Online Concept Test. This service allows a critical evaluation of a product to see if it falls within consumer preferences. Descriptions, images, and other information concerning a client's product are given to a field of 400-500 online evaluators to assess the importance of the product's attributes and its likelihood of purchase. Within 10 days, the evaluator feedback is incorporated into a robust report on the product's market potential estimate.

In July, our Department will host the annual meeting of the University Creamery Manager's Association (UCMA). Since becoming active in the organization again, our Department has had very fruitful interactions with the UCMA. At the last annual meeting, FPC Dairy Plant Manager Jonathan Hnosko was elected president. Hosting the UCMA's annual meeting will be a tremendous opportunity for The FPC and the Dairy Store to show what we're capable of and what we've already accomplished.

To better serve our clientele and the state of Nebraska, the staff of The FPC has been engaging in professional development. Technical Services Manager Bethany Jackson has been studying food laws and regulations through Michigan State University and Pilot Plants General Manager Steve Weier is working towards his Ph.D. in food science.

July 19th, 2013 will mark the 30th anniversary of The Food Processing Center's founding. We are hard at work to make this event a memorable occasion. You can expect us to share our plans here and at our website, fpc.unl.edu.

You will find more current events for our Department in this newsletter. We hope you enjoy it, and we hope that you can contact us at (402) 472-2831. We always appreciate hearing news of our alumni and friends.

If you would prefer to receive your newsletter electronically, please send your email address to mstandley2@unl.edu. The University is trying to find ways to "go green" and this is an excellent way for us to do our part. Thank you.

ALUMNI SPOTLIGHT: DR. STEFANIE GILBRETH

Left: Dr. Stefanie Gilbreth

Dr. Stefanie Gilbreth received her doctorate from the UNL Department of Food Science and Technology in 2003. Dr. Gilbreth now uses the expertise she gained here at ConAgra.

Born in Broken Bow, Nebraska, Dr. Gilbreth moved to Lincoln at age 15 and later graduated from UNL with a bachelor's degree in Biology. Her transition to food science came through microbiology. She said, "I was a biology major as an undergraduate considering all sorts of healthcare related fields, but I wasn't quite finding my fit. Being involved in research helped me realize how much I liked microbiology; so at the end of my undergraduate study, I started taking graduate level classes in microbiology. One of my professors, Dr. Ken Nickerson, suggested I talk to Dr. Bob Hutkins and Dr. Andy Benson about graduate opportunities in the Food Science program in food microbiology."

Once a Food Science and Technology graduate student, Dr. Gilbreth continued to conduct microbiology research. "My main research project was to examine how carbohydrates that were present in the environment impacted virulence gene expression in *Listeria monocytogenes*. I also did some work examining products and supplements with probiotic claims for levels and types of microorganisms."

She is now director of the Food Safety and Microbiology group at ConAgra. "We provide microbiology support to ConAgra's manufacturing plants, innovation and product development, quality organization, consumer affairs, etc. We are involved with HACCP, environmental monitoring programs for our facilities, microbiological specifications for ingredients, performing validation studies on equipment, shelf life studies, challenge studies, helping with FSMA implementation, troubleshooting microbiological issues, and any other projects or topics that require expertise in microbiology."

Dr. Gilbreth thanks UNL for many of the skills that make her successful at her job. "My education at UNL taught me many important skills for working in industry: trouble shooting, creative thinking, collaboration, presentation skills, writing skills, the ability to work independently, networking and developing relationships."

SELECTED GRANTS

BioGaia AB
Jens Walter
"Miscellaneous Research – BioGaia"
$66,240 (1 year)

Department of Agriculture-NIFA
Jens Walter, Robert Hutkins
"Application Of a Novel Synbiotic to Modulate the Human Gut Microbiota and Improve Health in Obese Adults"
$489,699 (3 years)

Department of Agriculture-RD
Steven Pharr, Suzanne Weeder-Einspahr
"Growth Services for Rural Food Firms"
$65,794 (1 year)

DHHS – National Institute of General Medical Science
Jens Walter, Andrew Benson, Daniel Peterson
"Determination of the Importance of Colonization History in the Assembly of the Gastrointestinal Microbiota"
$319,135 (4 years)

Nebraska Dry Bean Commission
Vicki Schlegel
"Development of Health Promoting Recipes using Dry Edible Beans-Hot Dogs (Phase 2)"
$1800 (1 year)

Pioneer Hi-Bred
Richard Goodman
"In Vitro IgE Testing of a Biotech Soybean Event LEPI 2800"
$200,470 (18 months)

Pioneer Hi-Bred
Richard Goodman
"Serum IgE Binding Assay for Potential Cross-Reactivity in Soybean"
$63,544 (17 months)

Texas Woman's University
Jayne Stratton, Andréia Bianchini Huebner
"Risk Assessment and Intervention Strategies for the Emerging Food Safety Threat of Ochratoxin A in the U.S."
$68,155 (2 years)

UNL-Anna Elliot Fund
Vicki Schlegel
"Comprehensive Phytochemical Analysis of Different Cultivars of Great Northern and Pinto Beans Grown in Western Nebraska."
$58,135 (1 year)

USDA
James Keen, Harshavardhan Thippareddi, Rodney Moxley
"Shiga-Toxigenic *Escherichia coli* (STEC) in the Beef Chain: Assessing and Mitigating the Risk by Translational Science, Education and Outreach"
$24,625,039 (5 years)

VISITING SCHOLARS

John Diamond Raj, a doctoral student from the Indian Institute of Crop Processing Technology in Thanjavur, India, had been working in the Subbiah lab since February, 2011 and returned home in April, 2012.

STUDENT AWARDS

Aaron Douglas Scholarship
Lindsay Freiburger
Megan Pinches

Ak-Sar-Ben Scholar
Samantha Bryant

Albert and Katherine Wehr Memorial Scholarship
Emilie O'Connor
Katina Talley

Albert Hoesch Scholarship
Ashley Bernstein

Alvin J. Gard Scholarship
Emily Pribyl

American Association of Hispanics in Higher Education, 2012 Outstanding Thesis in Food and Agricultural Sciences – 3rd Place
María Isabel Quintero

Arch and Francis Jorgensen Scholarship
Lindsay Freiberger

Brazil Science Without Borders NU President's Award
Bruna Waechter

Carl and Betty Johnson Scholarship
Spencer Brown

CASNR Ambassador Scholarship
Katina Talley

CASNR Week Award – Outstanding Student Organization Member
Richard Spinner

Chancellor's Leadership Award
Lauren Wilson

Chancellor's Scholarship
Emilie O'Connor

Chancellor's Scholarship
Katherine Ivens

Christian Lieding Scholarship
Samantha Marcoux

College of Engineering Graduate Research Symposium, Outstanding Thesis Award
Jihan Cepeda

Czech Language Scholarship
Samantha Kabourek

David Distinguished Scholarship
Kaelyse Clapper
Julia Harvey
Jacqueline O'Doherty

David H. and Annie E. Larrick Memorial Travel Award
Hui "Mary" Wang

David H. and Annie E. Larrick Scholarship
Nicole Berns
Ashley Bernstein
Juliann Starman

Dean's List
Nicole Berns
Ashley Bernstein
Travis Burger
Stephanie Dritley
Kristen Drvol
Brooke Grossenbacher
Audrey Horrum
Julianne Kopf
Soon Lau
Beth Peck
Katina Talley
Lauren Wilson

Dodie Nakajima Scholarship
Abigail Burrows

Dr. Frank Sorenson Memorial Scholarship
Mariah Brandt

EducationQuest Scholarship
Geraldine Spinner

Edward J. Cornish Fund
Nicole Berns
Travis Burger
Kristen Drvol
Shane Korte

Engler Agribusiness Entrepreneurs Scholarship
Emilia Woeppel

Ethel Elander Memorial Scholarship
Kaelyse Clapper

First United Methodist Church Scholarship
Abigail Burrows

Flemming Schofield Scholarship
Ashley Bernstein
Kaelyse Clapper
Zachary Cook
Julianne Kopf
Emily Pribyl
Katina Talley

Floyd Kerr Memorial Scholarship
Julia Harvey

Food Science Ambassador
Nicole Berns
Juliann Starman

Food Science Club Scholarship
Travis Burger

Gavin Gusak Scholarship
Samantha Kabourek

George Beadle Scholarship
Kyler Held
Kathryn Merckel
Lauren Wilson

George Wenke Scholarship, CASNR
Miranda Schurr

Glen & Ester Foner Scholarship
Abigail Burrows
Xin Liu

Glenn and Mary Jane Plucknett Scholarship
Beth Peck

Global Ambassadors Scholarship
Emilio Ho Chang
Soon Lau

Global Delegate Scholarship
Xin Liu

Global Gateways Scholarship
Brooke Grossenbacher
Emilie O'Connor
Emily Pribyl

Grace M. Keeffe Scholarship
Julianne Kopf

Hamilton Community Foundation Scholarship
Jennifer Pickering

Hanson Teaching Assistance Scholarship
Brooke Grossenbacher

Hazel V. Emley Scholarship
Samantha Marcoux

Henningsen Award
Ben Remington

Holling Memorial Scholarship
Justin Bakke
Samantha Bryant
Brooke Grossenbacher
Audrey Horrum
Kathryn Merckel
Jennifer Pickering
Geraldine Spinner
Taylor Stelk
Nicole Stott

Honors Textbook Scholarship
Nicole Berns
Ashley Bernstein
Travis Burger
Kristen Drvol
Julia Harvey
Kyler Held
Audrey Horrum
Emilie O'Connor
Jacqueline O'Doherty
Beth Peck
Katina Talley
Lauren Wilson

IANR Ambassador Scholarship
Ashley Bernstein
Brooke Grossenbacher
Katina Talley

Ida A. Bengtson Memorial Scholarship
Kyler Held

IFT 2011 Biotechnology Division Student Travel Award
Maria Maldonado

IFT Feeding Tomorrow Scholarship
Kathryn Merckel

IFT Scholarship
Ashley Bernstein

International Affairs Scholarship
Samantha Marcoux

International Scholar Award
Soon Lau

James Canfield Scholarship
Zachary Cook
Brieanna Klooster
Julianne Kopf
Nicole Stott
Emilia Woeppel

Jewish Federation Scholarship
Ashley Bernstein

Johnny Carson Scholarship
Travis Burger

Kellogg's Scholarship
Ashley Bernstein

Ken Morrison Scholarship
Nicole Stott

L.K. Crowe Kiwanis Award Fund
Brooke Grossenbacher

Lampert Family Scholarship
Travis Burger
Soon Lau

Lancaster County Farm Bureau Scholarship
Jacqueline O'Doherty

Leonard & Ida Selling Fund
Stephanie Dritley

Lowenstein Scholarship
Emilia Woeppel

Luther Drake Scholarship
Kristin Smith
Lauren Wilson

Mather Scholarship
Julia Harvey
Jennifer Pickering

Maxcy Food Science and Technology Scholarship
Emilie O'Connor

Midwest Student Exchange Scholarship
Brooke Grossenbacher

2011-2012 Milton E. Mohr Fellowship
Rakhi Panda

2011-2012 Milton E. Mohr Research Scholarship
Ashley Bernstein
Kathryn Merckel

2012-2013 Milton E. Mohr Scholarship
Brooke Grossenbacher
Soon Kiat Lau
Kathryn Merckel

Minden Exchange Bank Fund
Kaelyse Clapper

Mortar Board National Senior Honor Society Member
Kristen Drvol

National Merit Stipend
Emilie O'Connor

NCAA Student Athlete Opportunity Fund
Jacqueline O'Doherty

Nebraska Achievement Scholar
Kadee Korgel

Nebraska Legacy Scholarship
Lydia Molnar

Nestlé Purina Scholarship
Alyssa Craig
Lydia Molnar

Oak B. Smith Scholarship
Nicole Berns
Spencer Brown
Lindsay Freiberger
Brooke Grossenbacher
Julia Harvey
Alex Hlavaty
Emilio Ho Chang
Julianne Kopf
Kafui Lawson
Soon Lau
Xin Liu
Kathryn Merckel
Jennifer Pickering
Juliann Starman
Katina Talley
Lauren Wilson
Miranda Schurr
Taylor Stelk
Nicole Stott
Molly Vavra

Peter Kiewit Legacy Scholarship
Emily Pribyl
Katina Talley

Phillips United Methodist Church Scholarship
Julia Harvey

Regents Scholarship
Justin Bakke
Samantha Bryant
Travis Burger
Stephanie Dritley
Kristen Drvol
Audrey Horrum
Shane Korte
Beth Peck
Katina Talley

Robert H. and Dorothy G. Kooper Charitable Foundation Trust
Ashley Bernstein

Scarlet Scholar
Zachary Cook

Shear/Miles Scholarship
Kristen Drvol
Molly Vavra

Spader Fund
Kaelyse Clapper
Beth Peck

Susan L. Hefle Memorial Scholarship
Brooke Grossenbacher

Susan Thompson Buffett Scholarship
Samantha Bryant
Ly Do
Julia Harvey
Juliann Starman
Lachelle Stille

UNL Outstanding Graduate Research Assistant Award
Inés Martínez

Von Gillern Scholarship
Samantha Marcoux

Warren and Velda Wilson Scholarship
Julia Harvey
Kadee Korgel

Wayne E Hill Memorial Scholarship
Zachary Cook

William & Leila Brown Scholarship
Samantha Bryant

Inés Martínez with her advisor, Dr. Jens Walter, after receiving her Outstanding Graduate Research Assistant Award

William Carson Scholarship
Juliann Starman

William M. Bobst and Floyd Kerr Memorial Scholarship
Julia Harvey

UCARE (and Sponsors)
Ashley Bernstein (Michael Zeece) "Research and Development of a Frozen Kefir Product/"

Spencer Brown (Joseph Baumert) "The Effect of Food Processing on Detection of Allergenic Milk Residue."

Travis Burger (Stephen Taylor) "Swab Analysis"

Shane Korte (Wajira Ratnayake and Devin Rose) "Development of Food Ingredient Mixes, and Products with Dry Bean Flour"

Hortencia Lara (Jayne Stratton) "Assessment of Antimicrobial Activity of Various Spices Against *Salmonella*"

Kathryn Merckel (Michael Zeece) "Bioactive Peptides in Muscle Foods"

Megan Pinches (Randy Wehling) "Development of a High Fiber Fruit Dessert"

Richard Spinner (Robert Hutkins) "*Lactobacilli* project"

Juliann Starman (Andreia Bianchini and Lloyd Bullerman) "Evaluation of the Antimicrobial Activity of Various Berries and Cherries"

Taylor Stelk (Stephen Taylor) "Peanut Allergen Research"

EVALUTION AND PERFORMANCE OF THE PREMI-TEST® SALMONELLA SEROTYPING SYSTEM ON PORK AND POULTRY ISOLATES FROM COMMERCIAL SOURCES

Research by Dr. Marcos X. Sánchez-Plata, Dr. Jayne E. Stratton, Dr. Margaret D. Hardin, and Yulie Meneses. Funded by the American Meat Institute Foundation

Dr. Jayne Stratton
Research Assistant Professor
Jstratton1@unl.edu

Salmonella is the leading cause of human gastroenteritis and is annually responsible for 1.4 million cases in the United States[1]. The rapid and accurate identification of *Salmonella* serotypes throughout the food chain is a critical factor in tracing the sources of outbreaks. Eggs, poultry, and meat are frequent sources of transmission of *Salmonella* and other foodborne disease organisms, and are therefore highly regulated, continually monitored, and inspected. The Food Safety and Inspection Service has proposed that further analysis of *Salmonella* should include identification of serotypes frequently reported to cause human illness.

The Premi®Test Salmonella (PTS) serotyping system is a promising tool for rapid identification of *Salmonella* serotypes. The PTS is a DNA-based method that allows processing of samples within 9 hours with no need of highly trained personnel to perform the test. In addition, the chances of contamination are reduced. These could provide advantages over the traditional Kauffman-White method which is typically viewed as the gold standard for *Salmonella* serotyping. Rapid identification of *Salmonella* serotypes could potentially assist meat companies, the Food Net surveillance system, and government agencies in tracing sources of contamination, thus allowing for rapid corrective action when needed. A major outcome would be the decrease in the number of *Salmonella*-contaminated products reaching the consumer. The following report discusses the use of the new Premi®Test Salmonella system to identify serotypes from both pork and poultry operations in the United States. Stored cultures obtained from the USDA along with a collection of fresh isolates were used to compare its ability to distinguish serotypes with that of traditional serotyping. The objective of this project was to evaluate the use of the Premi ®Test Salmonella system as a serotyping tool to identify pork and poultry isolates obtained from vertically integrated operations and to compare the performance of the PTS system with traditional Kauffman-White (KW) serotyping methods.

STORED ISOLATES

Ninety *Salmonella* strains were obtained from the USDA–ARS-SPARC in College Station, TX, who generously allowed us to use them for this project. These cultures had been isolated using a modified version of the USDA method, serotyped according to the traditional Kauffman-White scheme, and cryogenically stored. Isolates were shipped to the University of Nebraska-Lincoln (UNL) for typing using the PTS system for comparison. An additional 10 cultures were obtained from cryogenically stored cultures in the UNL Food Processing Center Laboratory's stock culture collection for a total of 100 isolates.

FRESH ISOLATES

Fifty *Salmonella* strains from poultry and fifty from pork were isolated by investigators at Texas A&M using a modified version of the USDA method. Samples were collected from carcasses at different stages during the processing chain: live haul receiving, scalding, after evisceration, after chemical treatments, after cooling, and from final products. Sponge samples were taken by pre-moistening a dry, sterile cellulose sponge with 25 ml of Butterfield's buffer. Following collection, samples were incubated overnight in buffered peptone water and then transferred to tetrathionate and Rappaport-Vassiliadis broth. After incubation overnight at 42ºC, a loopful of the sample was streaked onto XLT4 and BGS agar. Samples showing typical colonies were screened for *Salmonella* using the GeneQuence® from Neogen (Lansing, MI). Samples with positive results for *Salmonella* from the GeneQuence® were confirmed using the API 20E biochemical system from BioMerieux. A subculture was then shipped to Mississippi State for serotyping according to the traditional Kauffman-White scheme, and to the University of Nebraska- Lincoln for typing by the Premi ® Test Salmonella system.

THE PREMI® TEST SALMONELLA SEROTYPING SYSTEM PRINCIPLE

The Premi® Test Salmonella system uses a methodology called multiplex ligation detection reaction (LDR) to generate a collection of circular DNA molecules which are subsequently PCR amplified. The test uses 25 DNA markers, three of which are generic markers used to verify that the isolate belongs to the *Salmonella* genus, once the generic markers have confirmed the presence of *Salmonella*, the other 22 remaining markers are used to identify the serotype. The system creates a specific hybridization profile for each S. enterica serovar. A profile is generated by detecting positive hybridizations, each of which generates a spot. Each spot has a certain value assigned, thus the Genovar score is determined by adding up the spots in the pattern in which those spots have formed. Once a certain serotype yields a specific genovar score at least three independent times, this serotype-genovar score is added to the PTS database and the software will indicate the serotype as well. In cases where the serotype-genovar association has not been found often enough, the software will only indicate the genovar score. However, the genovar score can still be useful in traceability. The system allows processing three samples in one single tube because of the use of unique ZIP codes assigned to each LDR probe which are complementary to the oligonucleotides (cZIPcodes) immobilized in the microarray.

RESULTS FROM CULTURE COLLECTION

A total of 100 isolates from the USDA and UNL culture collections were tested using the PTS system and compared to the traditional Kauffman-White scheme. For poultry isolates, the PTS system was unable to match KW serotyping on all 27 *Salmonella* serotypes that were not in the database as expected. The system did respond with either a Genovar score or an alternative serotype, and correctly identified the isolates as *Salmonella* species 96% of the time. The PTS system matched KW serotyping on 45% of isolates tested that were present in the database. Again, the system did respond with either a Genovar score or an alternative serotype, and correctly identified the isolates as *Salmonella* species 96% of the time.

For pork isolates, of the five that were tested that were not in the database, none matched the KW serotyping results as expected. The system was able to correctly identify all isolates as *Salmonella* species, and produced either a Genovar score or alternative serotype. The PTS system was able to match KW serotyping on 74% of the isolates tested. For the remaining isolates, a Genovar score or an alternative serotype was produced. The system also correctly identified all 27 isolates as *Salmonella* species.

RESULTS FROM THE FRESH ISOLATES

A total of 100 fresh isolates (50 from poultry, 50 from pork) were tested using the PTS system and compared to the Kauffman-White serotyping method. The dominant serotype isolated from poultry was *S. Braenderup*, which comprised 52% of the total number of serotypes. Of these the PTS system matched the KW method in 78% of the isolates. The total match rate was 60% for all isolates. For those isolates that did not match, the system responded with either a Genovar score or an alternative serotype. The system also correctly identified the isolates as *Salmonella* species 100% of the time. The dominant serotype isolated from pork was *S. Anatum*, which comprised 28% of the total number of serotypes. Of these the PTS system matched the KW method in 73% of the isolates. The total match rate was 66% for all isolates and the system correctly identified the isolates as *Salmonella* species 100% of the time. Again, for those isolates that did not match, the system responded with either a Genovar score or an alternative serotype. One that was unknown (or untypable) by the KW method was given a Genovar score by the PTS method.

Overall, in tests with the USDA culture collection, the PTS results appeared to be reproducible independently of the source (pork or chicken). 69% of the serotypes present in the PTS database matched traditional serotyping, and all were identified as *Salmonella*. 31% of the isolates present in the database were identified as *Salmonella*, but did not match results from traditional serotyping. Further investigation may lead to discrepancies due to mistyping of the original isolates by the traditional method or overlaps with known serotypes. Certain isolates not present in the PTS database were recognized as *Salmonella* Genovars, although the profile was unknown. It was difficult to decide whether these should be declared a "match" or not because the inherent limitations of the database preclude making this determination. Although some serotypes were not present in the database, the system did correctly identify these isolates as *Salmonella* species 96% of the time, indicating that the generic microarray markers were accurate in determining species.

Above: Premi® Test Salmonella Test Kit

A total of 200 isolates were evaluated using both the traditional Kauffman – White method and the Premi®Test Salmonella system. From the USDA isolates a wide variety of serotypes were assessed, with more than 60% of successful matches between the two methods occurring when the isolates were present in the database, if not, a Genovar score was generated. The presence of the genetic markers of the genus *Salmonella* were detected 100 % of the time. The results from serotypes present in the PTS data base that did not match the traditional method could be explained by a possible overlap with the profiles of those serotypes present in the database due to a close evolutionary relationship. It is also possible that *Salmonella* serotypes isolated in the United States have enough antigenic differences from their European counterparts to cause mismatches within the microarray, which was produced, manufactured, and validated in the Netherlands. According to a surveillance conducted on the world-wide distribution of *Salmonella* from 2000-2002, *S. Enteriditis* accounted for 85% of *Salmonella* cases, whereas *S. Typhimurium* was the most common human isolate (29%) in North America. In addition, the variety of serotypes in the U.S. was more evenly distributed with *S. Enteriditis* (21%), *S. Newport* (15%), and *S. Heidelberg* (10%) accounting for a sizeable proportion of the isolates[2].

The PTS system has tremendous potential for additional growth, expansion, and research even though the results of this study indicate that it does not yet possess the discriminatory power necessary to replace traditional serotyping. As the system and method evolves, it should continue to undergo rigorous testing on as many isolates from as many sources as possible that originate from all parts of the world. If perfected, this new technology could provide a means of rapid surveillance of *Salmonella* serotypes in the food chain and in epidemiological investigations.

REFERENCES

[1]Centers for Disease Control and Prevention. Consulted on June, 2009. *Salmonella* Annual Summary 2006. Available on line at http://www.cdc.gov/ncidod/dbmd/phlisdata/salmonella.htm

[2]Galanis, E., D.M.A. Lo Fo Wong, M.E. Patrick, N. Binszein, A. Cieslik, T. Chalermchaikit, A. Aidara-Kane, A. Ellis, F.J. Angulo, and H. Wegener. 2006. Web-based surveillance and global *Salmonella* distribution, 2000-2002. Emerging Infectious Diseases 12(3):381-388.

GRADUATES OF THE B.S. PROGRAM

Food Science and Technology

Nicole Berns
Ashley Bernstein
Travis Burger
Stephanie Dritley
Kristen Drvol
Shane Korte
Geraldine Spinner
Richard Spinner
Juliann Starman
Taylor Stelk
Katina Talley
Molly Vavra

Food Technology for Companion Animals

Christopher Faimon

GRADUATES OF THE M.S. PROGRAM

Maria Alexandra Calle Madrid

Thesis: "Validation of Thermal Processing to Control *Salmonella SPP,* and *Clostridium Perfringens* During Prime Rib Preparation from Intact and Non-Intact Meat"
Dr. Harshavardhan Thippareddi, Advisor

Rebbeca Duar

Thesis: "Adaptation and Validation of Existing Analytical Methods for Monitoring Prebiotics Present in Different Types of Processed Food Matrices"
Dr. Vicki Schlegel, Advisor

GRADUATES OF THE PHD PROGRAM

Poi Wah Lee

Dissertation: "Characterization of IgG and IgE Binding to Parvalbumin Derived from Commercially Important Fish Species"
Dr. Stephen L. Taylor, Advisor

Jess C. Sweley

Dissertation: "Understanding and Characterizing Flake Polymorphisms as a Quality Attribute for Microwave Popcorn"
Dr. David S. Jackson and Dr. Devin J. Rose (co-chair), Advisors

FOOD SCIENCE GRADUATE STUDENT RECOGNIZED BY AMERICAN ASSOCIATION OF HISPANICS IN HIGHER EDUCATION

María Isabel Quintero, a PhD student under Dr. Robert Hutkins, placed third at the Outstanding Master's Thesis Award Competition held at the seventh annual American Association of Hispanics in Higher Education (AAHHE) conference for her master's thesis "Adherence Inhibition of *Cronobacter Sakazakii* and Other Pathogens by Prebiotic Oligosaccharides, Plant Extracts, and Other Naturally Derived Molecules".

María, a U.S. citizen, was born in Bogotá, Colombia and, for her undergraduate work, studied food engineering at Universidad de La Sabana. After learning of the UNL Food Science and Technology program through a campus visit by Dr. John Rupnow, María interned at UNL with Dr. Robert Hutkins in 2008. "I got very interested in the type of research they developed in the lab and in the Department of Food Science and Technology in general. That's when I decided to start my graduate program in Food Science and Technology at UNL."

On her current activities, María said, "I work in Dr. Hutkins' lab and my research is mainly focused on assessing the ability of different prebiotics and plant extracts to inhibit the adherence of foodborne enteric pathogens to the surface of intestinal epithelial cells. Working with Dr. Hutkins has been a great experience. He has been a great advisor and has helped me in the journey of grad school. He has given me the required tools to be able to succeed. His knowledge in the area is impressive and he is always willing to teach you something new."

In 2011, María submitted an abstract of her master's thesis to the AAHHE conference. With the collaboration of USDA-NIFA and Texas A&M University Corpus Christi, a career preparation institute was held concurrently with the annual AAHHE meeting, with participants selected through the Outstanding Master's Thesis Award Competition. Theses were eligible if they were in domains related to the USDA priority areas, including food safety, climate change, sustainable energy, and childhood obesity. María ultimately received third place in this competition.

María receives her award. (Left to right) María Quintero, Dr. Irma Lawrence, Dr. Refugio I. Rochin & Dr. Enrique E. Fiueroa)

As a result of this placement, María was granted a 2012 USDA Graduate Fellowship and invited to present her thesis at the AAHHE conference in March 2012 in Costa Mesa, California. "It is very gratifying to receive a thesis award, it means all the hard work you are putting into your research is being recognized and there are more people who are interested in it, even though they are not from the same discipline as you," María said, adding, "The Department was recognized for the quality of the thesis and the research it develops. Additionally, it gives an opportunity for the Department to be recognized in other areas."

Reflecting on this recognition, María said "The field of food safety is of great importance and interest. New ways and efforts for approaching the different issues with contaminated food are granted. The thesis gives a novel approach on how foodborne infections could be mitigated or prevented by using different non-digestible food ingredients as a prophylactic treatment."

THE FPC PROVIDES INTERNSHIPS AND EXPERIENCE FOR STUDENTS

For the past several years, The Food Processing Center (FPC) has provided a one semester undergraduate internship for international students. This internship places the student in a rotation that gives them experience in several areas of food processing such as product development, food safety microbiology, dairy technology, extrusion technology, and business development. Program coordinator Dr. Jayne Stratton stated, "Students who have the opportunity to gain hands-on experience in food processing are highly valued by the food industry."

"The internship was begun to provide an avenue for international food science students to gain experience abroad," Dr. Stratton continued. "It also provides the students with a stepping stone into graduate school if that is their goal."

The internship was also developed to meet the graduation requirements of some programs, such as Escuela Agrícola Panamericana Zamorano in Honduras. Victor Escobar, a student of Zamorano said, "An internship is a requirement to obtain my bachelor's degree. I chose UNL because it has one of the most highly recognized food science and technology programs in the United States."

Fellow Zamorano student Luis Sabillon added, "The University of Nebraska offers a really complete program in food science and technology and that is the main reason why I chose this program. The versatility of the program came from the combination of industry reality and science. The applied research that is available throughout different laboratories makes me understand the different tendency and technology that is going to impact food process production in the near future."

In the spring of 2012, The FPC hosted six interns. From Escuela Agrícola Panamericana Zamorano were Escobar, Sabillon, and Daniel Latacunga; from Universidad del Valle de Guatamala were Carmen Cano and Maricarmen Estrada; and from Universidad Nacional del Litoral in Argentina was Agustina Pedro

Dr. Stratton stated, "The goal is to foster a team approach in managing workplace activities and in solving problems they may encounter as a future professional in the industry. By the end of their internship, the students should have a working knowledge of food processing and the experience of working with a variety of professionals."

Victor Escobar and Maricarmen Estrada collecting milk samples at Prarieland Dairy Plant

The students she worked with in spring noted how the internship program has benefitted them. Carmen Cano said, "My experience at UNL has been very satisfying. The staff at The FPC Microbiology Laboratory has been very welcoming and helpful. I've had the chance to meet graduate students and other interns at The FPC. The experience of working outside of my country will definitely help me in my preparation as a professional."

Escobar added "The rotation throughout The FPC gives the opportunity to have a general vision of your future goals. You are able to interact with your professors and know what they are working with in their areas. With this general vision you can know which area you can focus on to continue with your master's degree."

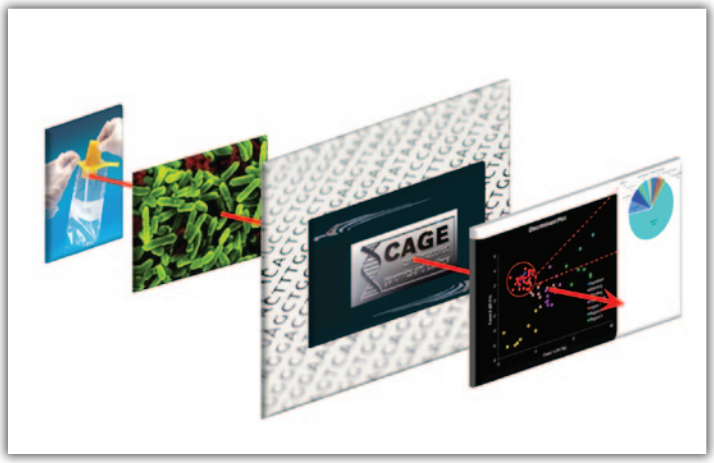
THE NATIONAL SMALL FOOD MANUFACTURER CONFERENCE

In early April, The Food Processing Center, with the assistance of the Nebraska Manufacturing Extension Partnership, held the 4th annual National Small Food Manufacturer Conference in Omaha, Nebraska.

The conference, which was held April 2nd and 3rd, is intended to address key issues and business strategies to help small food businesses grow and succeed in the marketplace. Nationally recognized industry experts from throughout the country presented on the challenges and opportunities of small food manufacturing businesses. Speakers included Todd Hale, senior vice president of the Nielsen market research firm, and industry experts from The Food Processing Center.

In her assessment of the conference, organizer Jill Gifford said, "It was good, everyone was happy. The content was very high caliber. We had excellent industry experts speaking. There was a lot of great takeaway information provided for the attendees to implement."

CAGE AND CONAGRA WORK TOGETHER TO PREVENT PRODUCT SPOILAGE



Workflow from sponge sample to DNA sequencing to analysis data

The Department of Food Science and Technology has been harnessing its strong relationship with ConAgra to develop new methods for microbiological analyses of foods to help food producers. For the past two years, the Research, Quality and Innovation Division at ConAgra has been working with Dr. Andrew Benson to fully explore bacterial populations that exist in and around a food production line.

This partnership first developed when senior ConAgra executives were introduced to the research programs and infrastructure at the Department, including the Core for Applied Genomics and Ecology (CAGE) led by Dr. Benson. Dr. Benson states, "There was tremendous interest in the Next-Generation DNA sequencing capacity and the bioinformatics infrastructure that we had built through CAGE to support the Gut Function Initiative. DNA sequencing is used widely by GFI members to analyze complex populations of microorganisms in the gut. So we began to explore whether this same powerful technology could be used to map the microbial ecosystems present in a food production system."

Dr. Benson's team developed a plan to holistically analyze the numbers and types of bacteria that could be found in a production environment and to develop preventative measures that would reduce spoilage of food products downstream. A test bed was planned using a relatively simple product. Dr. Benson said, "Even within a simple production system, we still needed to build the capacity to extract and sequence microbial DNA from a broad range of sample types, including all ingredients, as well as swabs and sponges used to sample production machinery surfaces and the production environment." ConAgra employees carried out the sampling.

To differentiate living bacteria and those killed by the production process, the partners developed a method to determine if a sample contained live bacteria. Dr. Benson explained, "A portion of each sample was subject to liquid culture amplification, and quantitative PCR was used to compare the amount of bacterial DNA extracted directly from the original sample and the amount extracted from the culture enrichment to determine if any growth had occurred in culture."

"Once this process is complete, DNA from samples that contain live bacteria is sequenced using our Roche-454 Titanium pyrosequencing platform. The resulting mass of sequencing data is processed through the computational infrastructure developed at CAGE; DNA sequence information from each sample is searched against databases of microbial gene sequences to classify and count each bacterial species in the sample. Methods for data mining and statistical analyses are then used to correlate samples that contain similar microbial profiles, thereby indicating a common origin or source of the microbiota."

This new methodology provides industry, and specifically ConAgra, with the ability to proactively prevent the spread of bacteria rather than back-tracking from a spoiled product further down the line.

"The approach involves a discovery phase (identifying problematic organisms and linking areas in the production system where they can be found) and a translation phase (developing rapid genetic tests to track them)," Dr. Benson explained. "This translation phase is important as it provides ConAgra with simple, but very meaningful tests that can be used to monitor organisms that would otherwise have gone undetected or which may be masked by complex combinations of organisms that normally inhabit the system but don't cause spoilage or health concerns."

As a result of this first foray into a simple product, a series of rapid PCR-based tests are being developed to monitor problematic organisms in this production line. CAGE, and the Department of Food Science and Technology, look forward to more fruitful interactions with the food science professionals of ConAgra.

FACULTY AWARDS

In early May, **Dr. Glenn Froning**, professor emeritus in the Department of Food Science and Technology, received the inaugural Gilbert Eckhoff Award from the United Egg Association Further Processor Division (UEA). This award recognizes the notable contributions to the food industry Dr. Froning has provided concerning eggs.

The American Society of Agricultural and Biological Engineers (ASABE) has given their 2012 Superior Paper Award to research co-written by **Dr. Rolando Flores**. "Progressive Hull Removal from Barley Using the Fitzpatrick Comminuting Mill" was prepared by Dr. Kevin Hicks, Jhanel Wilson, and Dr. Rolando Flores, and was published in "Applied Engineering in Agriculture". The authors will be formally recognized on July 30 at the ASABE Annual Meeting in Dallas, Texas.

THE SCIENCE OF FOOD ONLINE

For the past nine years, Dr. John Rupnow has been teaching Food Science and Technology 131, "The Science of Food", online for UNL and UNO.

FDST 131 is an introductory course on food science, which covers food microbiology, nutrition, and safety. It is intended to show students the applications of engineering, biology, chemistry, and math in the processing and distribution of food. Specific subjects covered include food safety processing methods (drying, microwaves, fermentation, etc.), foodborne diseases, food safety regulations, and the Hazard Analysis Critical Control Point (HACCP) system for ensuring food safety.

The course first went online after in-person enrollment became too high to accommodate every interested student. As a result of this, Dr. Rupnow started an experiment where a lecture was recorded and offered on demand to distant students. The online course accommodates roughly 650 students each semester with 100 students each summer. The course is offered through UNO and UNL, and is cross-listed with Nutrition and Chemistry. The course is also available to high school students through the Nebraska Scholars programs, where students can obtain college credit at reduced tuition for courses taken online.

Dr. Rupnow offers the course live every fall where it is recorded for that year's online lectures. Dr. Rupnow stated "This enables me to update the information constantly with issues that are current." Dr. Rupnow is constantly innovating the course by pushing visual quality and providing investigative studies that require students to formulate and test hypotheses.

On the impact of the course, Dr. Rupnow stated, "I think course evaluations indicate general student appreciation, and increased enrollment indicates students are recommending the course to friends. This is not a required course for Food Science majors; however, 25% of students currently majoring in Food Science took this course and later decided to transfer."

Dr. John Rupnow and his live Science of Food class

HELP OTHERS WHO SHARE YOUR HUNGER FOR FOOD SCIENCE.

Donations to the Food Science and Technology Fund are used in scholarships to enhance undergraduate recruitment. To contribute online, go to **www.nufoundation.org/foodscience**. To learn more, please contact Ann Bruntz, IANR Director of Development, University of Nebraska Foundation, 402-458-1176, or e-mail her at abruntz@nufoundation.org.

University of Nebraska Lincoln

DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY

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143 Food Industry Complex
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CONFERENCES & WORKSHOPS

Food Entrepreneur Program Seminars	August 10, 2012 – Lincoln, NE November 3, 2012 – Lincoln, NE
Annual University Creamery Managers Conference	July 17-19, 2012 – Lincoln, NE
2012 FPC Extrusion Workshop	October 23-25, 2012 – Lincoln, NE
Better Process Control School	October 30-November, 2012 – Lincoln, NE

ONLINE REGISTRATION AVAILABLE AT FPC.UNL.EDU

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We'd love to hear from you! Tell us about your career changes, progress, or any news. Also send us your current contact information to ensure you receive future Alumni Newsletters and other exciting Food Science and Technology news. Visit our website: **foodsci.unl.edu/alumni**

Department of Food Science and Technology
143 Filley Hall, UNL, Lincoln, NE 68583-0919
Phone: (402) 472-2381 Fax: (402) 472-1693
Twitter: UNL_FOODSCIENCE

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