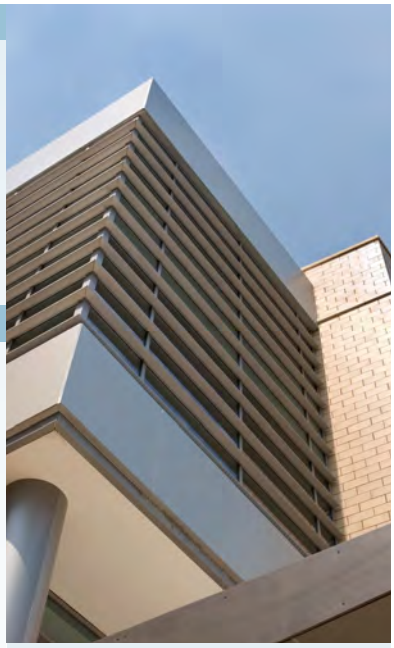
PennState

May 2024

Food Science News

Department of Food Science



Department Head Update

Greetings from Penn State Food Science,

Our very full spring semester came to an end on May 5th when the 32 students from Food Science Class of 2024 graduated! Please join me in congratulating them on their accomplishments and wishing them success in all their future endeavors.

As you will note when you peruse the newsletter, many individuals and groups were recognized for their accomplishments this spring. The Gamma Sigma Delta Celebration of Excellence was a particularly rewarding day for FDSC. Dr. Jasna Kovac was honored with the teaching award, and Dr. Josh Lambert and Dr. John Hayes were both presented with research awards. Following these awards the winners for various divisions of the graduate and undergraduate research poster competitions were announced. You will note from the tally in the newsletter that our student received **4 first place awards**, **3 second place awards** and **2 third place awards**. A fellow department head (Jokingly I think) asked why they even bothered to attend!

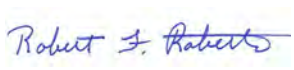
The Penn State Dairy Products Evaluation team participated in the 100th Collegiate Dairy Products Evaluation Contest in Milwaukee on April 17th. The team placed 1st in Butter, 3rd in Cheddar Cheese and 3rd in Cottage Cheese. Interesting fact, in the first ever Collegiate Dairy Products Evaluation Contest in 1916, Penn State also claimed 1st place in Butter.

On April 20th Penn State Food Science hosted the IFTSA Central Atlantic Regional College Bowl competition welcoming students from the University of Maryland, Virginia Tech University, and the University of Delaware to Happy Valley. The students did an excellent job organizing this event. To cap off the weekend, our team, led by captain Madeline Harper, won the region securing a spot in the national competition. If you attend IFT FIRST in Chicago this July, be sure to support our team!

Beginning on May 20th we begin renovation of a space to serve as a product development laboratory. This space will provide flexibility to separate the initial stages of product development from the pilot plant. The new space will be used by our product development course, student product development teams and for various outreach activities. We have been assured the new space will be available for use in the fall. We will share pictures in the next newsletter.

I hope that everyone has an enjoyable and restful summer and that you have already marked October 5th on your calendar to join us for the Food Science Tailgate.

All the best,



Bob Roberts, Professor and Head

Inside this issue

Special Points of Interest

- Upcoming Events
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Foodborne-pathogen Listeria may hide from Sanitizers in Biofilms

The finding could result in more effective sanitation procedures, leading to safer food supply, researchers said

The researchers tested the biofilm-forming ability of assemblages comprising the foodborne pathogens Listeria monocytogenes and environmental microbiota. ***Credit: Penn State Creative Commons***

An estimated 1,600 people in the U.S. contract a serious infection from Listeria bacteria in food each year and, of those individuals, about 260 people die, according to the Centers for Disease Control and Prevention. Penn State researchers may now better understand how the bacteria, called Listeria monocytogenes, survive and persist in fruit-packing plants by evading and surviving sanitizers.

According to their study, which is now available online and will be published in the June issue of the journal Biofilm, biofilms — comprising otherwise harmless microorganisms that attach to each other and the food surface — result in a kind of shield that surrounds and protects the Listeria. The findings may result in changes to sanitation protocols in food-processing facilities that promise to diminish contamination of food with Listeria, the researchers said.

"We found two groups of microorganisms in the tree fruit packing environments, Pseudomonadaceae and Xanthomonadaceae, that are very good at forming biofilms and protecting Listeria monocytogenes," said corresponding author Jasna Kovac, the Lester Earl and Veronica Casida Career Development Professor of Food Safety. "Biofilms represent a physical barrier that reduces the effective diffusion and antimicrobial action of sanitizers and is hypothesized to increase L. monocytogenes' tolerance to sanitizers used in food processing facilities."

As a result of the biofilms shielding the pathogen, the sanitizers are not as effective in killing Listeria monocytogenes, explained Laura Rolon, who recently earned her doctorate from Penn State and spearheaded the study.

"Our research suggests that if packing facilities are having a recurring problem with Listeria monocytogenes, they may need to assess whether biofilm-forming microorganisms are causing it," she said.

This study's results indicate a need to assess the efficacy of commonly used sanitizers against non-pathogenic biofilm-forming microorganisms commonly found in the food processing environments to prevent biofilms from establishing, Kovac explained. The results of further assessments could help inform practical recommendations for the industry, such as application concentrations and times, to prevent biofilm formation and improve the control of Listeria monocytogenes in these environments.

In future workshops and short courses, Penn State Extension educators will communicate the research findings to professional organizations dedicated to sanitation in food-processing facilities, noted study co-author Luke LaBorde, professor of food science and extension specialist.

"The findings of this research project will inform and enhance sanitation protocols and extension training efforts targeted at the tree-fruit industry to effectively control L. monocytogenes," said LaBorde, an expert in the tracking of Listeria monocytogenes in produce production and processing environments. The bridge between scientific discovery and dissemination among stakeholders, he added, is a vital part of this work and a prime example of the mission of a land-grant university like Penn State.

To that end, Penn State Extension routinely offers workshops and other resources to communicate research findings, such as the Listeria monocytogenes-biofilms study results, and promote other best practices for controlling foodborne pathogens. These trainings are typically attended by food-processing plant professionals, representatives of industry associations, food safety consultants and government inspectors.

Partially because of their research on Listeria monocytogenes and biofilms, Kovac and LaBorde won the Integrated Team Award from the College of Agricultural Sciences late last year.

Other co-authors include M. Laura Rolon, Olena Voloshchuk and Katelyn V. Bartlett, all with the Department of Food Science in the College of Agricultural Sciences at Penn State.

The U.S. Department of Agriculture supported this research. (Penn State News)

Proteins in Milk - Not just Fat - May help Reduce Oral Burn from Spicy Food

Experiments using both dairy and plant milks to quell the hot sensation caused by capsaicin point to proteins' role

A new study led by researchers at Penn State suggests the classic interpretation that fat is responsible for milk's ability to cut the burn caused by the chili extract capsaicin is an oversimplification. They found that protein content matters, too. ***Credit: Bryon Lippincott/Flickr. All Rights Reserved.***

Spicy food lovers know that milk can ease the oral burn, but why? Some believe that fat is the soother, with whole cow's milk reducing the bite more than low-fat cow's milk or plant milks. A new study conducted by Penn State food scientists, however, suggests that protein plays a role in cooling the heat sensation, too.

Full-fat milk is not more effective than fat-free milk in cooling the burning sensation, according to the results of controlled laboratory studies in Penn State's Sensory Evaluation Center. The findings were recently published in Food Quality and Preference. According to corresponding author John Hayes, professor of food science and director of the center, the work suggests other components may contribute to milk's effectiveness.

"Common folklore and data from the late '80s each suggest whole cow's milk is best when you overdo the hot sauce," he said. "These data reconfirm that belief, while also showing high protein, ultra-filtered full-fat milk outperforms conventional full-fat milk. We also show that soy milk cuts the burn, and soy milk with more protein works better."

The ultrafiltration technique involves filtering out and retaining various components, and then recombining the fluid in a way that results in higher contents of nutrients such as protein and calcium. Milks made this way offer consumers dairy products with increased health benefits, according to the researchers.

Collectively, the study results suggest the classic interpretation — that fat is what cuts the burn caused by the chili extract capsaicin — is an oversimplification, Hayes explained, because protein content matters too.

"This work has implications not only for sensory testing labs and chili heads, but also for food manufacturers," Hayes said. "Specifically, it implies that protein-capsaicin interactions should be considered when formulating products."

Lead researcher Justin Gaiser, a doctoral candidate in food science, conducted two experiments with moderate capsaicin consumers to investigate the effectiveness of dairy and plant milks varying in fat and protein content.

In the first experiment, participants repeatedly were exposed to a capsaicin solution before rinsing with, respectively, conventional full-fat cow's milk, ultra-filtered full-fat milk, almond milk, soy milk and pea protein-enriched flax milk. In experiment two, after each capsaicin encounter, they rinsed with, respectively, fat-free, conventional full-fat and ultra-filtered full-fat milk, and three soy milks of varying protein content.

Participants rated the burning sensation they experienced once every 10 seconds for two minutes in the first experiment, and continuously for two minutes in the second experiment. Participants rated the intensity of oral burn using a general labeled magnitude scale, ranging from "no sensation," "barely detectable," "weak," "moderate," "strong," "very strong" and "strongest imaginable sensation."

Both experiments showed significant reductions in the burning sensation over time. In experiment one, participants rated conventional and ultra-filtered full-fat milk as significantly better than water in reducing the burning sensation from capsaicin. Both soy milk and dairy milk significantly out-performed water in experiment two.

Both experiments pointed to ultra-filtered, high-protein, full-fat milk as the most efficient in reducing the burning sensation from capsaicin. They also provide some evidence that higher concentrations of protein helped mitigate capsaicin burn, Gaiser reported, although more research is needed to quantify the relative contributions of fat and protein.

While the findings may be useful for consumers, Gaiser said they may also have broader industry applications, especially for taste testers.

"The general public is interested in novel ideas like how the burn of spicy food can be reduced, especially if a person doesn't like spicy food," he said. "But the main application that we see of this research is within the food industry, because chemesthetic sensations — and spiciness especially — take a long time to completely subside. So, if we can find the most effective way to reduce the burning sensation in somebody's mouth, it allows for people within the industry to test more effectively, tasting more samples in a shorter amount of time, and still get accurate results."

The U.S. Department of Agriculture's National Institute of Food and Agriculture supported this work. (Penn State News)

Sugar-reduced Chocolate with Oat Flour just as Tasty as Original, Study Finds

In A blind taste test, recently published in the Journal of Food Science, 25% reduced-sugar chocolates made with oat flour were rated in some cases preferred, to regular chocolate. ***Credit: Kai Kai Ma / Penn State. Creative Commons.***

The secret to making delicious chocolate with less added sugar is oat flour, according to a new study by Penn State researchers. In a blind taste test, recently published in the Journal of Food Science, 25% reduced-sugar chocolates made with oat flour were rated equally, and in some cases preferred, to regular chocolate. The findings provide a new option for decreasing chocolate's sugar content while maintaining its texture and flavor.

"We were able to show that there is a range in which you can manage a sizable reduction in added sugar and people won't notice and don't care, in terms of liking," said John Hayes, professor of food science at Penn State and corresponding author on the study. "We're never going to make chocolate healthy, because it's an indulgence, but we can successfully take out some of the sugar for consumers who are trying to reduce their intake of added sugars."

Hayes explained that chocolate is about half sugar by weight, with the rest being fat and cocoa solids, so reducing the amount of sugar by any amount can drastically alter the texture and flavor profile of the chocolate.

"The function of sugar in chocolate is both sweetness and bulking, so if we take that sugar out, we have to put something else in that will do the job just as well, or consumers will notice," said Gregory Ziegler, distinguished professor of food science at Penn State and co-author on the study.

Ziegler had the idea of testing two different grains, rice and oats, which contain fine granular starches as replacements for sugar in chocolate. The end result would still contain carbs, which eventually break down into sugar, but the speed of absorption may be slower.

"Starch is still a carbohydrate, so it's not lower calories, but there is an overall reduction in the added sugar content, which has potential health benefits," Ziegler said.

The team conducted two different blind taste tests using dark chocolate made with varying levels of sugars and grain flour. The first test, conducted with 66 participants, was designed to evaluate whether consumers would notice a difference between six varieties of chocolates: a control with a normal 54% level of sugar, four sugar-reduced versions with reductions of 25% or 50% sugar and additions of oat or rice flour, and one 54% sugar chocolate with reduced refining time to test if the grinding time would affect the texture.

Consumers rated the 25% sugar-reduced chocolates and the reduced refining time chocolate similar to the blind control, but the 50% sugar reduction was rated significantly different in both texture and flavor. The team concluded this was mainly due to texture, as participants reported the rice flour chocolate contained "a chalkier texture," while oat-flour-containing chocolates were described as "smoother, softer and creamier."

The second blind taste test involved 90 participants and gauged consumer acceptability for 25% reduced sugar chocolates made with oat and rice flours compared to regular chocolate, the control, made with 54% sugar. Each participant was served one square of each chocolate for a total of three samples and was asked to rate overall liking, flavor liking, texture liking and sweetness liking. The rice flour chocolates were liked significantly less than the normal chocolate control, but the oat flour sample did not differ from control — and in some cases was rated slightly better.

"Our results suggest we can cut back 25% of added sugar to chocolate, effectively reducing the total sugar by 13.5%, if we substitute oat flour," said Kai Kai Ma, a doctoral candidate in food science at Penn State and co-author on the paper. "That addition of oat flour is unlikely to meaningfully impact consumer acceptability, which is great news."

Hayes, who also directs Penn State's Sensory Evaluation Center, said he plans to reach out to some of his former students who are now working in the chocolate industry to share the findings and hopefully spur new varieties of sugar-reduced chocolates by providing a proof-of-concept that oat flour can effectively do the job of added sugars.

"I'm a big believer in meeting consumers where they are," Hayes said. "We've tried for 40 years to tell people to eat less sugar and it doesn't work because people want to eat what they want to eat. So instead of making people feel guilty, we need to meet people where they are and figure out how to make food better while still preserving the pleasure from food."

The USDA National Institute of Food and Agriculture funded this work. (Penn State News)

Bywater places 2nd in Graduate School Three Minute Thesis Competition

Auja Bywater

Congratulations to Auja Bywater, Ph.D. student, on her 2nd place finish in the inaugural Penn State Three Minute Thesis (3MT) Competition. Auja was one of 11 finalist selected to compete in the final round . 3MT is an academic research communication competition developed by the University of Queensland (UQ), Australia, which is now hosted at more than 100 universities worldwide. Sixty students from 42 graduate programs submitted videos as part of the first round of the competition, and a group of volunteer community judges evaluated the video presentations. Auja presentation was on "Improving Food Safety: Exploring Bacterial Diversity in Hydroponic Farming."

Auja received a bachelor's degree in Public Health from Brigham Young University in Idaho, specializing in epidemiology. Her interest in public health and infectious diseases led her to Virginia Tech where she honed her expertise in microbiology and food science. During her studies, she characterized foodborne pathogens collected from the Chobe Region of Botswana.

Auja's current research focuses on controlled environmental agriculture (CEA), where she studies the microbiological aspects to ensure the safety of food products. She strives to better understand the complex microbial communities in various CEA systems. Her goal is that her research will allow fresh food to be more accessible year-round to all populations, increasing global food security.

Auja is also pursuing a dual-title degree in International Agriculture and Development. She has always found joy and inspiration in diverse cultures and aims to have an international component in her career. This summer she will be traveling to the Galápagos Islands to work with local hydroponic farmers. She is also part of a water-energy-food nexus cohort that is focused on using research to improve sustainability, resource management, economic development, and climate resilience. Auja is grateful to be studying at Penn State and is looking forward to her future endeavors.
Auja is advised by Dr. Jasna Kovac. (Penn State News)

2024 Ardeth and Norman Frisbey International Graduate Student Leadership Award

Zilfa Irakoze, Dual title Food Science and International Agriculture and Development Ph.D. student, was selected to receive the 2024 Ardeth and Norman Frisbey International Graduate Student Leadership Award. The award recognizes international students who have contributed significantly to furthering international understanding through academic, athletic, or extracurricular campus activities or community involvement in civic programs or service projects.

Zilfa is advised by Dr. Josephine Wee. (Penn State News)

Zilfa Irakoze

Tyler Chandross-Cohen

International Association for Food Protection (IAFP) 2024 Student Travel Award

Congratulations to Tyler Chandross-Cohen, Ph.D. student, on being awarded a competitive International Association for Food Protection (IAFP) Student Travel Scholarship. The award supports travel of up to 20 qualified students to attend IAFP 2024, to be held July 14-17 in Long Beach, California to students from North America, from outside North America, and from countries with developing economies.

Tyler is advised by Dr. Jasna Kovac.

Brian Adair joins Staff as Undergraduate Program Assistant

Brian Adair

Please join us in welcoming Brian Adair to the department as the new staff member supporting our undergraduate program. He will be responsible for many of the behind-the-scenes processes that keep the program running as well as coordinating recruitment visits and supporting Dr. Sigler's advising.

Brian is a graduate of Penn State where he obtained bachelor's degrees in French Language and Culture, Global & International Studies, and Telecommunications. Brian also obtained a master's degree in Human Resources & Employee Relations with a specialization in Staffing and Training. Leading up to his position in Food Science, Brian worked as a Records Specialist for 2 years at Education Abroad (Global Programs), 3 years as a Transfer Credit Specialist at World Campus, and 1 year as a Talent Acquisition Specialist with Advanced Powder Products, a local metal injection molding manufacturing company.

Honors and Awards

25-Year Service Awards to Penn State

Dr. John Coupland, Professor of Food Science
Dr. Luke LaBorde, Professor of Food Science

Penn State "We Are!" Shoutout

Jodi Butler, Financial Assistant
Karen Mullen, Administrative Assistant and Graduate Program Assistant

Promotion and Tenure

Darrell Cockburn, granted tenure and promoted to Associate Professor of Food Science
Misha Kwasniewski, promoted to Associate Research Professor of Food Science
Chris Sigler, promoted to Associate Teaching Professor of Food Science

2023 Community of Teaching Excellence Award

Dr. John Coupland

Dr. John Coupland has been selected as a recipient of the 2023 Community of Teaching Excellence Award for the College of Agricultural Sciences. Dr. Coupland joined the food science faculty in 1998. Among his primary teaching responsibilities are a general-education course titled Food Facts and Fads, the lab-intensive upper-level course Food Chemistry and the theory-based graduate course Food Physical Chemistry.

Robert Roberts, head of the Department of Food Science, said that Coupland "demonstrates a deep commitment to the art and practice of teaching and, most importantly, his students. His performance and effort are driven by his desire for students to make connections between concepts, practice and understanding. Because of his approach to teaching, students can go beyond reciting facts and trivia and travel a path to better understanding the 'why.'"

2024 Regional IFTSA College Bowl Champions

The Penn State Food Science College Bowl Team is the 2024 Central Atlantic Region Institute of Food Technologist Student Association (IFTSA) College Bowl Champion. The Penn State team of Madeline Harper (Captain), Maddy Feeney, Heidi Mencl, Betty Raup and Joe Melchiorre defeated teams from Maryland, Delaware, and Virginia Tech to secure a spot in the national competition during IFT FIRST in Chicago this July.

Morgan Failla organized the event and Auja Bywater and Paige Sullivan handled the timing and scoring.

Good Luck in Chicago!

Maddy Feeney, Heidi Mencl, Madeline Harper (Captain), Betty Raup and Joe Melchiorre

Congrats, Class of 2024

Spring 2024 commencement exercises were held May 5, at Pegula Arena. Congratulations, and good luck to the graduating class. Catherine Eisenhut was the Student Marshall * for the graduating class.

William Andre
Morgan Besz
Sarah Boyer
Zhi Chen
Isabella Bosque
Jasir Cook
Madeleine Denlinger
Catherine Eisenhut*
Alayna Faison
Madeline Feeney
Trina Gerovasilis
Rachel Godshall
Sanjay Joshua
Katrina Liu
Nicholas McGervey
Heidi Mencl
Derek Oczypok
August Pfeiffer
Nhu Pham
John Porter
Betty Raup
Erin Readinger
Catarina Rodrigue

Spring Graduates at commencement exercises in Pegula Arena

Anna Sarubbi
Will Sheets
Kailee Shotto
Courtney Swarey
Sabrina Wang
Collin Willett
Tyler Wissner
Tyler Yany
Mackenna Yount

Gamma Sigma Delta Awards

Gamma Sigma Delta is an organization having as its objectives the advancement of Agriculture in all its phases, the maintenance and improvement of the relations of agriculture with other industries, and the engagement of recognition of the responsibility of those engaged in agriculture to their fellow citizens. The society seeks to encourage high standards of scholarship and worthy attainment in all branches of agricultural science and education and a high degree of excellence in the practice of agriculture pursuits.

Gamma Sigma Delta 2024 Celebration of Excellence

New inductees (graduate students and postdoc)

Tyler Chandross-Cohen
Morgan Failla
Zilfa Irakoze
Cynthia Loi
Ashley M. Ohstrom
Nataliia Voloshchuk
Jasmine I. Williams

New inductees (faculty)

Dr. Darrell W. Cockburn

Faculty Awards:

Teaching Award - **Dr. Jasna Kovac**
Research Award - **Dr. Josh Lambert** and **Dr. John Hayes**

Research Expo:

Undergraduate

Animal & Human Pathogens

2nd place - **Mackenna Yount** (Advisor: Dr. Jasna Kovac)
"Surface colonization area was associated with phylogenetic group and hemolysin BL production in *Bacillus cereus sensu lato*"

1st place - **Zoe Goldblum** (Advisor: Dr. Ed Dudley)
"*Salmonella* Isolates from Wastewater and Clinical Sources are Genetically Related, Suggesting an Approach to Enhance Surveillance for Bacterial Pathogens"

Environmental-Related Systems

2nd place - **Zhi Chen** (Advisor: Dr. Josephine Wee)
"Optimization of lactose-rich cheddar cheese sweet whey using *Kluyveromyces lactis* Y-1205 and Y-1564"

Human Behavioral and Social Systems

1st place - **Nhu Pham** (Advisors: Dr. Robert Roberts, Dr. John E. Hayes, Dr. Greg Ziegler)
"What is the Just Noticeable Difference for Overrun in Ice Cream?

Graduate

Food Systems

3rd place - **Cynthia Loi** (Advisors: Dr. Helene Hopfer, Dr. John E. Hayes)
"The role of saliva in astringency perception of cocoa polyphenols"

2nd place - **Astrid D'Andrea** (Advisors: Dr. Helene Hopfer, Dr. John E. Hayes)
"Counterion affects perceived sourness of citric acid and citrate salt mixtures"

1st place - **Auja Bywater** (Advisor: Dr. Jasna Kovac)
"Comparative analysis of microbial quality of nutrient solution and bok choy in five types of hydroponic systems"

Microbiology & Microbiome Systems

3rd place - **Zilfa Irakoze** (Advisor: Dr. Josephine Wee)
"Development of an HS-SPME GC/MS method for characterization of volatile-mediated interaction between biocontrol *Trichoderma* and aflatoxigenic *Aspergillus*"

1st place - **Ashley Ohstrom** (Advisors: Dr. Josephine Wee, Dr. Jasna Kovac)
"Starter to Slice: Characterizing Sourdough Microbiome Diversity and Its Influence on Bread Quality and Nutrition"

Contact Information

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Giving to the Food Science Department go to: GiveTo.psu.edu/FoodScience

Upcoming Events

May	21-23	Food Microbiology Short Course, University Park, PA
	22	Dairy Basics - Fundamentals of Quality and Safety, Lancaster, PA
June	17-21	Penn State Chocolate Short Course, University Park, PA
	17-26	Better Process Control School (Virtual)
	25-28	Fundamentals of Food Science Short Course, University Park, PA

SAVE THE DATE: Food Science Annual Tailgate

Join us on October 5, 2024, at the Erickson Food Science Building, University, PA, for the annual Food Science Tailgate hosted by the Department of Food Science, the Food Industry Group, and the Food Science Club. Alumni, parents, students, faculty, staff, and other supporters of the department are welcome to attend and enjoy food and good company before attending the Penn State football game.

October 5, 2024
Penn State vs. UCLA

Update Your Alumni Information

Updating your information with the Alumni Association is now easier than ever. You can change your home address, work address, e-mail address, and other information online at the Penn State Alumni website. Or you may also contact the Alumni Records staff directly.

Web: Record Update Form
Phone: 800-548-LION (5466), option 2
Mail: Penn State Alumni Association
Alumni Data Access & Services
Department B
Hintz Family Alumni Center
University Park, PA 16802

PennState Alumni Association