Division of Agricultural and Food Chemistry of the ACS **Fall 2024**

CORNUCOPIA

including the AGFD program and abstracts for the 268th American Chemical Society (virtual & live) National Meeting on

August 18 - 22, 2024

in

DENVER

Jason Soares & Elizabeth Kreger
Program Chairs

Going to Denver?
Join the AGFD Awards Dinner at Buckhorn Exchange, 1000 Osage Street
Tuesday, August 20, 6:00 - 8:30 pm
(get your ticket at the AGFD information table)

27 minute walking directions from the Convention Center – exit the Center on to 14th St. Make a right and continue to Welton St. Turn right on Welton. Continue on Welton to Colfax Ave. Turn right on Colfax. Continue on Colfax to Mariposa Ave. Turn left on Mariposa. Continue to 10th Ave. Turn right on 10th. Buckhorn Exchange is 2 blocks ahead - corner of 10th and Osage St.

Visit our website - www.agfoodchem.org - for a pdf of Cornucopia, job postings, awards and much more.
Check out our Facebook page - www.facebook.com/agandfood
We're on LinkedIn, too!

MESSAGE FROM THE CHAIR

It seems only recently that I transitioned into the Division Chair role from my predecessor, Jonathan Beauchamp, but time has passed quickly marking over 8 months into my tenure. We are now at the ACS National Fall 2024 meeting in Denver, Colorado with an exciting program and ever-expanding participation within AGFD technical sessions. Before I discuss the Fall 2024 meeting, I would be remiss to not again thank all the support I have received as Division Chair and will continue to receive through the rest of 2024. Jonathan Beauchamp and other key AGFD leaders, including the Executive Committee, have been integral to navigating Chair responsibilities and several ventures during my term and I express my sincere gratitude and appreciation for all their support. Special thanks to Mike Appell, Elyse Doria, Carl Frey, Alyson Mitchell, Mike Morello, Steve Toth, LinShu Lui and Mike Tunick for guiding and continuing to point me in the right direction. I continue to be humbled by this great opportunity and hope my efforts to keep pushing AGFD forward both technically and programmatically are coming to fruition.

Before I highlight the remarkable AGFD Fall 2024 program, I want to reach back to the Spring 2024 National meeting in New Orleans, which was especially exciting with the alignment to the ACS theme "Many Flavors in Chemistry". The AGFD Spring 2024 program had 13 technical symposia with over 250 presentations. Technical topics encompassed flavor chemistry, food allergens, precision nutrition, mycotoxins, food security and chemistry of alcoholic beverages, which included a brewery tour. Also, memorial symposia for two key members of the AGFD community - Michael Granvogl Memorial Symposium and Agnes Rimando Memorial International Student Symposium were well supported by our AGFD community. I congratulate the winners of an exciting special event, Communicating Chemistry Culinary Competition, held at a local New Orleans restaurant – look for this competition at the Spring 2025 National Meeting in San Diego too and please consider joining! I congratulate Virginia "Gigi" Pistilli from the California Institute of Technology for winning our annual AGFD Undergraduate Student Poster Award competition with her poster "Genetically-encoded nanoparticles for siRNA-mediated crop genetic engineering". Lastly, we held our annual Withycombe-Charalambous Graduate Student Award Competition, which included a multitude of impressive award candidates. I congratulate our second place winner Ann-Dorie Webley, University of California, Davis, with her paper entitled "Solubilization of limonene by phospholipid vesicle dispersions" and our co-first place finishers Zhong (Marti) Hua, McGill University, with the paper "Development of a microfluidic device to enrich and detect zearalenone in food using quantum dot-embedded molecularly imprinted polymer" and Zhiya Yin, Rutgers University, with the paper "Developing polymer-based delivery systems to improve bioaccessibility and bioefficacy of procyanidin dimers". Thanks to all the competitors and those who collectively brought together a fantastic AGFD program.

The AGFD Fall 2024 program is equally as exciting with 15 technical symposia comprised of 33 total sessions with over 400 oral presentations and posters. A special thanks to the Fall 2024 Program Chair, Elizabeth Kreger, who has assembled a fantastic program for the AGFD community. Her exceptional efforts coupled with our dedicated symposium organizers is going to deliver an exciting program that includes technical topics: Waste Upcycling, Indoor Farming & Sustainable Agriculture, Processing & Storage Induced Toxins, Bioproducts From Biomass: Renewable Chemicals & Polymers, Whole Grains Bioactives & Human Health, Sustainable Agriceuticals, Elevating Sustainability & Greentech in Agriculture & Plant-Based Foods, and Microbiome Research Consortium. Special sessions include Virtual Graduate Students Symposium in Asia-Pacific Region and Honoring Professor Chi-Tang Ho on the Occasion of His 80th Birth Year. Lastly, the Fall National Meeting is where we honor dedicated AGFD members that have provided incredible contributions to agriculture and food chemistry. I congratulate Tara H. McHugh, ARS-USDA, for winning the Award for the Advancement of Application of Agricultural and Food Chemistry, Joonhyuk Suh, University of Georgia, for the Young Scientist Award, and Elizabeth R. Kreger, for the Young Industrial Scientist Award. Please join us during the dedicated symposia for the award winners and at the Chairs' Award banquet on Tuesday to celebrate the achievements of all the 2024 AGFD award winners and our new AGFD Fellows. Thanks to all of you, the members of AGFD, that attend and participate in our National Meeting programming and thanks to all the symposium organizers and presiders. Additionally, special thanks to all the presenters. We cannot continue to succeed without your valued contributions and your willingness to share your astounding research. For those of you interested in learning more about AGFD and our sub-divisions, visit us on Division Row during ACS SciMix!

This is a longer message than I intended so I will finally close with gratitude for being involved in AGFD, not only as

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2024 Chair, but also as an AGFD member, and the opportunity to connect and network with all of you. It has been a great pleasure and honor to serve as AGFD Division Chair and as an Executive Committee member. Looking forward to 2025, I am excited to transition the Division to an exceptional, capable leader, Elizabeth Kreger, who, as 2025 Division Chair, will continue to advance AGFD's programming and stature in the agriculture and food chemistry community. I hope to see all of you in Denver!

Jason Soares
AGFD Chair 2024

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FUTURE PROGRAMS

SAN DIEGO March 23 – 27, 2025

James Seiber Memorial Symposium Alyson Mitchell aemitchell@ucdavis.edu Matt Hengel, mjhengel@ucdavis.edu John Finley Jfinley101@gmail.com Spencer Walse spencer.walse@usda.gov Mariela Paz Carpio-Obeso MarielaPaz.Carpio-Obeso@waterboards.ca.gov

Flavor Preferences of Companion Animals Scott McGrane scott.mcgrane@effem.com Jonathan Beauchamp jonathan.beauchamp@ivv.fraunhofer.de

Chemistry of Alcoholic Beverages Nick Flynn nflynn@wtamu.edu

Ultra-Processed Foods and the Gut Microbiome Laurel Doherty laurel.a.doherty.civ@army.mil

Applying Mass Spectrometry and NMR Techniques in the Study of Plant and Food Metabolomics Timo Stark Timo.Stark@TUM.de

Extraction, Recombinant Production and Function of Proteins of Food Safety & Food Manufacturing Importance Yuzhu Zhang yuzhu.zhang@usda.gov

Breeding for Flavor Sensory Quality and Sustainability of Fresh and Fresh-Cut Fruits and Vegetables Xiaofen Du xdu@twu.edu Xiuxiu Sun xiuxiu.sun@usda.gov Yiqun Weng yiqun.weng@usda.gov Genhua Niu Genhua.Niu@ag.tamu.edu

Microbial Food Safety: Emerging Technologies for Detection, Intervention, and Antimicrobial Packaging of Foodborne Pathogens Tony Jin tony.jin@usda.gov Yanhong Liu yanhong.liu@usda.gov Xuetong Fan Xuetong.fan@usda.gov

Withycombe-Charalambous Graduate Student Symposium Kathryn Diebler kdd3@cornell.edu Elizabeth Kreger Elizabeth.Kreger@sensient.com Coralia Osorio Roa cosorior@unal.edu.co

General Papers Elizabeth Kreger Elizabeth.Kreger@sensient.com Coralia Osorio Roa cosorior@unal.edu.co

General Posters and Undergraduate Poster Competition Kathryn Diebler kdd3@cornell.edu Elizabeth Kreger Elizabeth.Kreger@sensient.com Coralia Osorio Roa cosorior@unal.edu.co

WASHINGTON DC August 17 – 21, 2025
Chemistry of Aroma and Taste Modification Robert McGorrin robert.mcgorrin@oregonstate.edu

Agnes Rimando Memorial International Student Symposium Michael Tunick mht39@drexel.edu Roberta Tardugno roberta.tardugno@uniba.it

MORE FUTURE PROGRAMS

FALL 2026
3rd Global Symposium on Chemistry and Biological Effects of Maple Food Products Hang Ma hang_ma@uri.edu Navindra Seeram nseeram@uri.edu

OTHER SYMPOSIA OF INTEREST
4th International Flavor and Fragrance Conference - November 4-7, 2024, Auckland, New Zealand

Pacifichem - Honolulu, Hawaii, December 15-20, 2025 pacifichem.org

AGFD Executive Committee Meeting Minutes

Monday, March 18, 5:00- 8:00 PM, New Orleans

Attendance: Alyson Mitchell, Jason Soares, Jonathan Beauchamp, Elyse Doria, Neil Da Costa, Kathryn Deibler, Jun Hu, Michael Morello, Mike Tunick, Liz Kreger, Roberta Tardugno, Jianping Wu, Stephen Toth, Keith Cadwallader, Xiaofen Du, Karly Mahalak, Coralia Osorio Roa

Jason Soares called the meeting to order at 5:09 PM.

The **minutes** of the previous Executive Committee (Fall 2023) meeting were approved with no changes and are published in the Spring 2024 Cornucopia.

Treasurer's Report was given by Steven Toth. An ACS block grant was received by the Division. Division investments are doing well and the Division has $944,000 in the bank. There was $50,000 allocated for the Spring 2024 meeting and the Division will likely meet this budget. AGFD was over budget for the Fall 2024 meeting in San Francisco. A budget of $45,000 was allocated however $54,000 was spent; of this $8,760 was spent on reimbursements. Financially, the division is in a good place.

The **Program Report** was given by Jason Soares. The Spring 2024 National Meeting offered 145 talks, 18 sessions and over 90 posters. The Division held 13 in-person and 6 hybrid sessions. There were no virtual sessions. Two events were organized in conjunction with the meeting including the AGFD Communicating Culinary Chemistry Competition (C4), held at Dickie Brennan's Steakhouse and a tour of the Urban South Brewery. Kathryn Deibler had stickers and reusable bento boxes made with the AGFD logo which were handed out during the meeting. Alyson Mitchell asked to increase the "swag" budget by $500. The budget for "swag" was set and passed at $3,000 per meeting. The first AGFD Leadership Luncheon went well with over 30 people attending. This luncheon will be organized again for the Fall 2024 meeting. Elyse Dorie's tenure as the Student Representative to the Division will conclude after the Fall 2024 meeting. Application for a new representative will be open until April 15, 2024 and can be sent to Alyson Mitchell and Kathryn Deibler. Elizabeth Kreger gave an update on the Fall 2024 meeting. There are currently 17 symposia planned, including the awards symposia. A special symposium will be organized in honor of Chi Tang Ho's 80th birthday. The Microbiome subdivision will hold a student workshop in conjunction with their planned symposia. A budget of $45,000 was set and passed for the Fall 2024 meeting.

Few **Subdivision Reports** were given as attendance by Subdivision chairs at the Executive Committee meeting was low and few sent Subdivision reports to the AGFD Chair via email prior to the meeting. Subdivision chairs were updated twice during the year by Chair Jason Soares on their duties, which are in the AGFD Bylaws. As this is an on-going issue, a work group consisting of Keith Cadwallader, Kathryn Deibler, and Steve Toth will be organized to identify ways to encourage better participation by the Subdivision leaders. The *Agriceutical Subdivision* report was given by Lin Shu Liu who indicated that the Subdivision programmed two symposia at the Spring 2024 meeting and one is planned for the Fall 2024 meeting. The *Flavor Subdivision* report was given by Xiaofen Du. This Subdivision programmed two symposia at the Spring 2024 meeting, and is planning an *Advances in Analysis of Flavors* for the Fall 2024 meeting with a possible workshop. Karly Mahalak gave the *Nutrition & Gut Microbiome Subdivision* report. This Subdivision held two symposia during the Spring 2024 meeting and is planning a symposia and workshop for the Fall 2024 meeting. The *Food Bioengineering, Food Safety,*

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Functional Foods & Natural Products, and Sustainable & Green Technology Subdivision chairs were absent during the Executive Committee meeting and no reports were submitted prior to the meeting for these Subdivisions.

The **Award Committee Report** was given by Mike Morello. The award for the Advancement of Application of Agricultural and Food Chemistry, sponsored by International Flavors and Fragrances was awarded to Tara H. McHugh, Ph.D., Pacific West Area Director, Agricultural Research Services, US Department of Agriculture. The AGFD Fellow Awards have not yet been finalized. The JAFC Best Article of Year Award was the *Proof of concept for cell culture-based coffee* by authors Heikki Aisala, Elviira Karkkainen, Iina Jokinen, Tuulikki Seppanen-Laakso and Heiko Rischer. The Graduate and Undergraduate Student awards report were given by Kathryn Deibler. Zhong (Marti) Hua from McGill University and Zhiya Yin from Rutgers University shared 1st place. Ann-Dorie Webley from the University of California at Davis received second place. The undergraduate competition had only two entries. Michael Morello indicated that there were three nominations and 5 judges for the Young Scientist Award. The awardee is Joonhyuk Suh, PhD, Assistant Professor, Department of Food Science and Technology, University of Georgia. The awardee of the Young Industrial Scientist Award is Elizabeth Kreger, Manager Innovation & Analytical Flavors & Extracts, Sensient Flavors, LLC. The ACS Fellows Award nominations are currently being worked on. The Roy Teranishi Fellowship was awarded to Sarah L. Caballero, Department of Food Science and Technology, Oregon State University, and the Kenneth A. Spencer Award for Food and Agricultural Chemistry was awarded to Atanu Biswa, PhD, United States Department of Agriculture, National Center for Agricultural Utilization Research, Peoria, IL.

The **Student Committee Report** was given by Elyse Doria. Students were actively recruited at the hospitality table for the Leadership luncheon and during the poster session. Elyse organized a student trip to Mardi Gras World during the Spring 2024 meeting and will plan a student hike for the Fall 2025 meeting.

LinShu Liu indicated he will be organizing a symposium at **Pacific Chem**, in Hawaii, December 15-20, 2025. In addition, Michael Qian is organizing the 4th **International Flavor and Fragrance Conference**, November 4-7, 2024, in Auckland, New Zealand. Coralia Osorio Roa proposed having the next IFF conference in Panama as it was previously planned.

Elizabeth Kreger gave an update on **future ACS programs**. ACS would like to emphasize joint and collaborative programming in the future. Starting Fall 2025, meeting programs will be condensed to 3.5 days (Monday-Thursday). All divisions will receive a set number of sessions for each meeting. Beginning Spring 2025, our division will be allocated 19 half-day session for the Spring meetings. Eight % of these will need to be co-organized and only one hybrid session will be permitted. The division will be allocated 23 half-day sessions for the Fall meetings, of which 10% will need to be co-organized. The Fall meetings can have up to 6 hybrid sessions. ACS would like divisions to have symposia programming planned for 2 years out. A Slack channel was proposed as a mechanism to maintain communication and to have a working spreadsheet. Elizabeth Kreger will champion this effort until a person can be identified to manage this change. A new virtual platform will be separate from the in-person meetings and will be programmed by ComSci. Mike Morello indicated that we would benefit by identifying a representative to ComSci from our Division. Jason Soares indicated that the Division would also benefit from a Future Meetings Champion as the Chair changes annually.

Michael Tunick gave the **Councilors Report**. The Division of Biological Chemistry has proposed changing its name to the Division of Biochemistry and Biological Chemistry. This will go up for vote on Wednesday. There are also petitions to charter new International Chemical Sciences Chapters in Guangdong, China and in Egypt. Michael also indicated that the deadline for Innovative Project (IPG) Grant is soon. A grant focusing on improving communication and the Division social media footprint will be organized by Alyson Mitchell, Kathryn Deibler, Jonathan Beauchamp and Neil DaCosta.

Jason Soares gave the **Nominations Report**. The Division will need to identify one councilor, 2 alternative councilors, and one at-large councilor at the Fall 2024 meeting. Voting will follow the meeting and conclude by October 2024.

The Cornucopia Report was given by Carl Frey (email). The *Cornucopia* was posted to the website one week before the meeting. One hundred copies of the short (no abstracts) version were printed for distribution in New Orleans. Thanks to all that contributed content.

Hospitality/Public Relations Report was given by Alyson Mitchell. Alyson indicated that controlling food is difficult during the poster session. The Sunday poster session is supposed to be a welcoming and networking event for our

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members; which is why we offer food and drink. Having all ACS division posters together in a large convention hall takes this element away. It was decided that only a cash bar will be organized for future meetings, and the poster organizer and Student Representative to the Division will hand out tickets for two free drinks to poster presenters.

The **Website Report** was given by Michael Appell (email). The website is used throughout the year – especially around meetings, deadlines and communications. In the past 30 days there were 162 one-time visitors. Most people access the website via a laptop/desktop computer. There were 1999 emails sent, 59% opened and 38% clicked the link within 2 days. Members from 6 continents use the website.

The **Membership Report** was given by Michael Qian (email). Membership dropped from 3000+ before COVID-19 to the current 2100. New members were recruited at the Fall 2023 meeting and at this meeting. Michael indicated that new members will be recruited during the 4th International Flavor Conference.

The **Journal Report** was given by Coralia Osorio Roa. The ACS agricultural and food portfolio of journals is performing very well. Submissions to *Journal of Agricultural and Food Chemistry* have continued to increase and are expected to surpass 10,000 submissions to the journal this year. In 2023 the number of published articles in JAFC increased by 20% to 1,852 articles. The *Impact Factor* of JAFC is now 6.1. The *ACS Food Science & Technology* and *ACS Agricultural Science & Technology* journals are also performing well following their launch in 2020. The Impact Factor for *ACS Food Science & Technology* is 2.3 and for *ACS Agricultural Science & Technology* it is 2.5. These are great inaugural impact factors.

The Communications report was provided by Alyson Mitchell. Alyson asked to have a QR code that links to the ACS membership application at future meetings to make recruiting new members easier. Steven Toth will explore opening an additional bank account to make payment of events easier for our members using card and electronic payment tools. He will report findings at the Fall 2024 meeting.

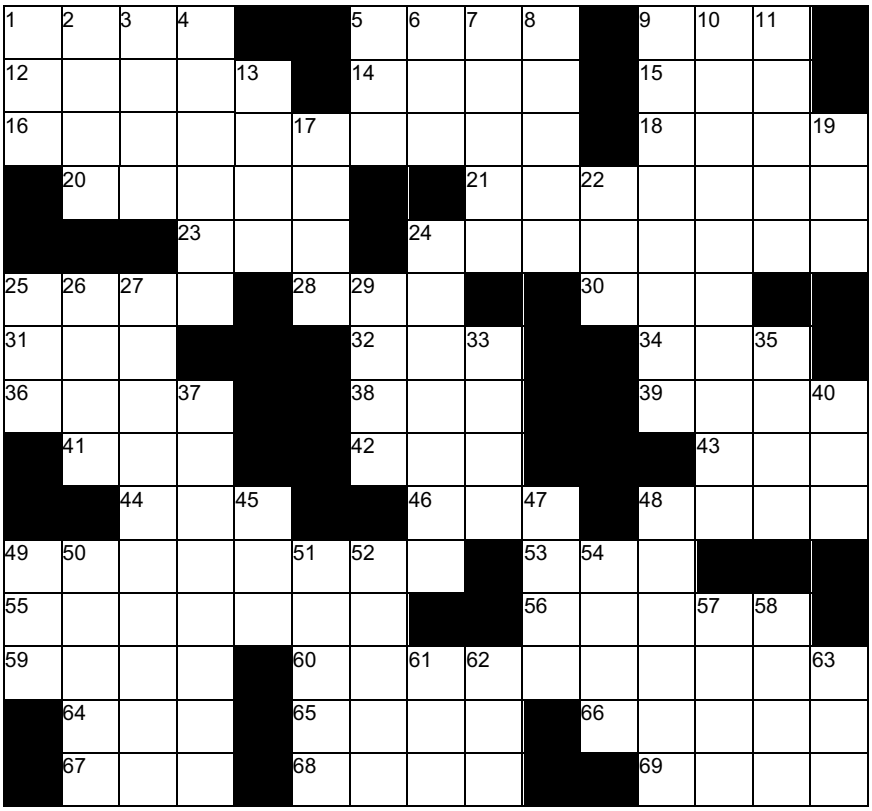
In **Old Business,** Jonathan Beauchamp gave an update on the October 7-8, 2023 Strategic Planning Retreat held in Washington, DC. The retreat, organized by Lauren Jackson, was attended by her, as well as Mike Appell, Jonathan Beauchamp, Neil Da Costa, LinShu Liu, Kanjana Mahattanatawee, Alyson Mitchell, Mike Morello, Coralia Osorio Roa, Omowunmi (Wunmi) Sadik and Mike Tunick. The two-day workshop was intense but highly productive. The team developed a new mission and vision for the division. The new mission is "Driving the Future of Agriculture and Food". The new vision is "Lead and foster a global community to advance, communicate and promote agricultural and food chemistry research & development, education, and outreach". Furthermore, three goals for the division were developed, with each goal being assigned three individual strategies. These were:

- Goal 1: Content Focus. Strategies: Webinars; Symposia; Workshops
- Goal 2: Membership Focus. Strategies: Mentoring; Networking; Demonstrating value
- Goal 3: Communication Focus. Strategies: Social Media; Direct Communications; Journals

Each participant of the Strategic Planning Retreat volunteered to champion the strategy of one goal to facilitate its development and execution. Some goals have progressed (e.g., AGFD Leaders Luncheon at the Spring 2024 meeting; see report above). All goals are ongoing. An update will be given at the next Executive Committee meeting.

There was no **New Business**. The meeting adjourned at 8:02 PM.

DENVER DIVERSION



A prize to the first send a correct solution to Carl Frey (via smartphone photo/e-mail) at - cfreyenterprise@gmail.com

ACROSS

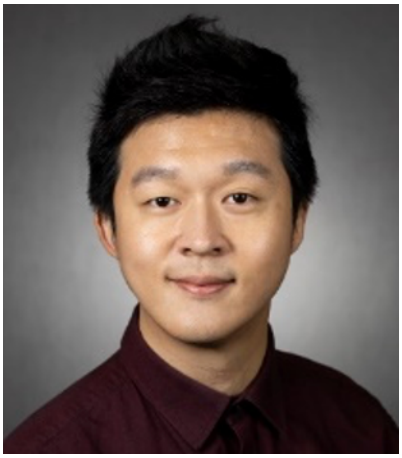
1 Go from solid to liquid
5 $ dispensers
9 FedEx competitor
12 'Famous Potatoes' state
14 Tight, like a rope
15 Analysis using a high energy electron beam
16 *Titanic* survivor from Denver (w/60 ACROSS)
18 Ham in a can
20 Ring-shaped reef
21 Starts to cry
23 NaOH
24 Denver elevation, about
25 Trees for wine barrels
28 Clean air/water org.
30 Mythical big bird of prey
31 Notre Dame home: __ de la Cite
32 Baseball bat wood
34 Calendar abbrev.
36 Boone/Webster nickname
38 Piggy home
39 __ Musk of SpaceX
41 Amino acid suffix
42 On-line __ Talks
43 Mont Blanc is the highest
44 Consume, dine
46 Get angry: see __
48 Peter the Great, for one
49 Amphitheater near Denver
53 A female deer (or rabbit)
55 Rare gas with At. No. 36
56 → or ←
59 Chocolate sandwich treat
60 See 16 ACROSS
64 Miner's quest
65 1056 in old Rome
66 Justice __ Sotomayor
67 'Aries' is Latin for __
68 Landed on, as a fly
69 Liquid precipitation

DOWN

1 1/2 Italian fashion house
2 Poet __ St. Vincent Millay
3 End of the line, final
4 Mercaptans
5 No pushing! One __ time!
6 Paper file folder name place
7 __tasking or __functional
8 Iron/carbon alloy
9 Europe and Asia, once
10 Refreshing beverages w/CO_2
11 Dragon of *The Hobbit*
13 Fleming's *For Your Eyes* __
17 Swiss/German Avant Garde artist Paul __
19 Roadside sign abbrev.
22 Irish carrier: __ Lingus
24 Degrees following baccalaureates
25 Spher__ or cellul__
26 Fastest ball sport: jai-__
27 1960-1963, in the USA
29 Days gone by
33 Jekyll's alter-ego
35 Location a.k.a. 'The Big Easy'
37 e.g. *The Owl & The Pussycat*
40 Home of *Morning Edition* and *All Things Considered*
45 Small child or small deep fried potato
47 June 6, 1944
48 Small child that's a handful
49 Film company that produced *King Kong* and *Citizen Kane*
50 Mistake, misstep
51 Lower half of a semicolon
52 Small, rounded hill
54 Spheres or globes
57 Spanish *Game of Thrones* actress __ Chaplin
58 Conflict that included 47 DOWN
61 65 ACROSS minus 1000
62 Illuminated
63 American photographic artist and social activist __ Goldin

AWARD NEWS

Tara H. McHugh, Ph.D, Pacific West Area Director, ARS, USDA won the 2024 **Award for the Advancement of Application of Agricultural and Food Chemistry**. This award (sponsored by International Flavors and Fragrances, Inc.) recognizes outstanding contributions to pure and applied agricultural and food chemistry. The award celebrates Dr. McHugh's research integrating food chemistry, nutrition, processing, microbiology, and engineering to solve agriculture problems. Her insights led to new approaches to utilize and add value to specialty crops and waste products, developing a novel forming process to manufacture nutritious, value-added shelf stable 100% fruit bars, developing a patented casting technology to form edible films from fruit and vegetable purees, increasing vitamin D content in mushrooms through ultraviolet B processing, using multiple infrared processing technologies to enhance food safety, quality, and healthfulness and collaborating on a transformative process to freeze foods. She is the recipient of a multitude of awards, including the ARS Senior Scientist Award, 2 USDA Secretary Honors Awards, the Arthur S. Fleming Award (given to U.S. Government employees), and 3 Federal Laboratory Consortium Awards. She is an IFT Fellow. She has >230 publications and patents (>180 peer-reviewed). She has led 32 Cooperative R&D Agreements and 20 large grants. Over 200 internationally publicized television and print stories have covered her research.



Joonhyuk Suh, Ph.D., Assistant Professor, Department of Food Science and Technology, College of Agricultural and Environmental Sciences, University of Georgia received the 2024 **AGFD Young Scientist Award.** This award recognizes and highlights important contributions made by early career Ag & Food chemists. Dr. Suh's research centers on applying analytical chemistry in food science, utilizing metabolomics and flavoromics technologies. His work involves establishing analytical platforms for both volatile and non-volatile metabolites (biomarkers) to facilitate the development and processing of food products with enhanced flavor and quality. He explores the synthesis of flavor in fruits, evaluates nut quality, develops consumer-preferred food items and investigates dairy product quality and flavor. Dr. Suh has authored >60 peer-reviewed papers and has been actively involved with AGFD since 2018, holding multiple positions within its flavor subdivision.

Elizabeth R. Kreger, Manager Innovation & Analytical - Flavors & Extracts at Sensient Flavors, Hoffman Estates, IL is the recipient of the 2024 **AGFD Young Industrial Scientist Award**. This award (given for the first time in 2023) recognizes and highlights important contributions of early career Ag & Food industrial chemists. Dr. Kreger's work focuses on the analysis, application and creation of flavors and flavor modulators. She helped Wild/ADM build internal GC-Olfactometry and PTR-MS capabilities enabling application of novel ingredients for flavor creation. At PepsiCo, she developed a screening protocol that resulted in a global toolbox flavors with modifying properties for use in sugar reduction efforts. At Sensient Technologies she manages Innovation and Analytical teams focused on flavors and extracts, creating strategies for development of new flavor and taste technologies. At AGFD she has co-organized multiple symposia, served in the Flavor Subdivision officer rotation and currently serves in the AGFD officer rotation as Chair–Elect/Program Chair.

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MORE AWARD NEWS

Jerry King, PhD, University of Arkansas, Fayetteville, **Youngmok Kim**, PhD, Finlays, North Kingston, RI and **Chibuike Udenigwe**, PhD, University of Ottawa, Ontario, Canada each received a 2024 **AGFD Fellow Award**.

Xuetong Fan, USDA-ARS-ERRC, Wyndmoor, PA received a 2024 **AGFD Distinguished Service Award**. This award recognizes his substantial and sustained service to AGFD.

Sarah L. Caballero, Dept. of Food Science and Technology, Oregon State University (advisor Jooyeoun Jung) received the 2024 **AGFD Roy Teranishi Graduate Fellowship in Food Chemistry**. This honor goes to a beginning graduate student with an outstanding graduate GPA who shows promise of an excellent research career.

The 2024 **Withycombe-Charalambous Awards for Excellence in Ag/Food Graduate Research** were won by (tie for 1st) **Zhong (Marti) Hua** McGill Univ. (advisor Xiaonan Lu) [paper: Development of a microfluidic device to enrich and detect zearalenone in food using quantum dot-embedded molecularly imprinted polymer], and **Zhiya Yin,** Rutgers The State Univ. of New Jersey (advisor Qingrong Huang) [paper: Developing polymer-based delivery systems to improve bioaccessibility and bioefficacy of procyanidin dimers] and (2nd) **Ann-Dorie Webley** Univ. of California, Davis (advisor Stephanie R. Dungan) [paper: Solubilization of limonene by phospholipid vesicle dispersions.] This award is won for oral presentions given at the ACS Spring Nat. Meeting Withycombe-Charalambous Symposium.

Virginia H. Pistilli, California Institute of Technology (advisor Gozde Demirer) won the 2024 **AGFD Undergraduate Poster Competition Award.** This award was won based on her poster (Genetically-encoded nanoparticles for siRNA-mediated crop genetic engineering) presented at the AGFD Undergraduate Poster Competition Symposium (held at the ACS Spring National Meeting).

The following loyal members of AGFD marked **25 Years of Membership in AGFD** in 2024: **Elsayed M. Abdelaal, Bill Aslanides, Carolyn D. Crosby, Kathryn D. Deibler, Alyce D. Fly, Rudy J. Fritsch, Russell J. Molyneux, Martin Moore, Emi Okuyama, Jonna Pratt, Warwick D. Raymont, Joe A. Vinson** and **Hidehiko Wakabayashi.**

The following extremely loyal members of AGFD marked **50 Years of Membership in AGFD** in 2024 **Michael M. Blumenthal** and **John P. Cherry.**

The team of **Heikki Aisala, Elviira Kärkkäinen, Iina Jokinen, Tuulikki Seppänen-Laakso** and **Heiko Rischer** won the **JAFC Research Article of the Year-AGFD** for their paper: *Proof of concept for cell culture-based coffee.*

The team of **Hongxia Lu, Zhongjie Shen, Yujun Xu, Linjing Wu, Deyu Hu, Runjiang Song** and **Baoan Song** won the **JAFC Research Article of the Year-AGRO** for their paper: *Immune mechanism of ethylicin-induced resistance to Xanthomonas oryzae pv. oryzae in rice.*

AGFD and AGRO members of the ARS/USDA, assisted in selecting **John M. Clark**, Ph.D, Professor, Dept. of Veterinary Animal Science, Director, Massachusetts Pesticide Analysis Laboratory, Univ. of Massachusetts-Amherst to present the 2024 **Sterling B. Hendricks Memorial Lecture**, recognizing his research on insecticide modes of action/resistance mechanisms and mitigation strategies for chemical trespass of pesticides, mitigation strategies for pesticide/pollutant residues using adjuvants, boundary zones, vegetative filter strips, dosimetry, and biomonitoring.

Atanu Biswas, Ph.D, Lead Scientist, USDA, Nat. Center for Agricultural Utilization Research, Peoria, IL received the 2024 **Kenneth A. Spencer Award** (administered by the ACS Kansas City section) recognizing his pioneering polymer synthesis and modifications and development of bio-based plastics, coatings, films, hydrogels, absorbents, and bio-lubricants derived from polysaccharides, vegetable oil, protein, edible beans, cotton and agricultural byproducts. His accomplishments include developing new products, processes and methodologies of commercial significance.

Kudos to **Joel Robert Coats**, Ames, IA, **Roy G. Engels**, North Babylon, NY and **Robert Joseph McGorrin**, Covallis OR as **50 year ACS members**.

AGFD congratulates all awardees and looks forward to their continued successes and contributions.

AGFD DIVISION MEMBERSHIP APPLICATION

The Agricultural and Food Chemistry Division (AGFD) of the American Chemical Society (ACS) is a non-profit organization dedicated to the technical advancement of all aspects of agricultural and food chemistry. AGFD encourages technical advancement in the field by -
- organizing symposia/workshops on agricultural/food chemistry at ACS national meetings and other venues
- publishing proceedings of AGFD symposia
- publishing the *Cornucopia* newsletter
- updating members several times a year via e-mail blasts
- hosting social and networking gatherings at ACS national meetings
- providing cash awards and recognition to leading undergraduate and graduate students, young scientists and established scientists in the field of agricultural and food chemistry

At ACS National Meetings you can discuss division activities at the AGFD information table located near the AGFD technical session rooms. Join ~2100 AGFD members via the application form (below) or on-line at www.agfoodchem.org or www.acs.org (click on Communities, Technical Divisions, Technical Division List) or call ACS (800)333-9511 (in US) or 616-447-3776 (outside US). Payment by Visa/MasterCard or AmEx.

Check out AGFD on You Tube: https://www.youtube.com/watch?v=CyBMAnOuFKE

	APPLICATION FOR AGFD DIVISION MEMBERSHIP (7623P)
Title	
Name	
1st address line	
2nd address line	
City	
State	
Zip code	
Country	
e-mail address	
Phone	
check one	**MEMBERSHIP FEE**
[ ]	I am an ACS member and wish to join AGFD ($10.00)
[ ]	I am not an ACS member and wish to join AGFD ($15.00)
[ ]	I am a full-time student and wish to join AGFD ($10.00)
Be cool **J O I N** **A G F D**	Return application, with payment (payable to American Chemical Society), to AGFD Membership Chair: Michael Qian, Professor Department of Food Science and Technology Oregon State University Corvallis OR 97330

Food Security: Tackling World Hunger CCC – August 18–22 - Colorado Convention Center

CCC highlights the role of chemistry in addressing world hunger through food security. Activities include a flagship symposium on 8/20 focused on the impact of climate change on agriculture, student poster presentations on food security and co-sponsored symposia covering sustainable agriculture, regulatory harmonization and food processing.

Food Security: Impact of Climate Change on Agriculture & Tackling World Hunger 8/20 8:00am-12:00pm Rm 603 Heidi Irrig, Qing Li, Michael Morello, Frederick Salzman, Jeffrey Dawson, Pamela Rice, Amy Ritter, Zhuohong Xie, organizers. Z. Xie presider. Host division AGRO

4104892 - Eating out with confidence: Using generative AI and text analytics to improve the quality and effectiveness of food service inspections Tom Sabo, John Gottula, presenters

4107042 - Fabricating gelatin-based edible composite films via different methods and assessing their future applications Ezgi Pulatsu, presenter; Chibuike Udenigwe

4110342 - Multi-functional poly(urethane-urea) materials for smart-food packaging Jerald Dumas, presenter

4096749 - Enhancing pathogen detection using sensing technologies and machine learning Luyao Ma, presenter

4106607 - Enhancing plant protein texturization: Insights from protein interactions and functional changes Yonghui Li, presenter

4103766 - Update on EPA efforts related to climate adaptation and chemical regulation Jeffrey Dawson, pres.

4108030 - Evaluation of carbon sequestration and soil health indicators across a range of agricultural conditions to prioritize adoption of conservation practices Bettina Bettina Miguez, presenter; Jens Kiesel; Jody Stryker

4094326 - Nanobiotechnology-based strategies for climate resilient crops Jason White, Presenter; Lijuan Zhao; Jorge Gardea-Torresdey; Arturo Keller

CCC posters 8/20 Convention Center Hall A-C

4085565 - Role of microbiome in host plant colonization and foraging of an invasive fruit fly Zhangrong Song; Chun Nin Wong, presenter

4094840 - New approach methods to avoid acute oral toxicity testing in animals Mark Nelms; David Hines; Paul Mosquin, pres.; Bethany Cook; Virginia Hench; Elizabeth Baker

4097617 - Using untargeted metabolomics as a new approach for understanding honeybee toxicity Kundi Yang, presenter; Chengli Zu; Steve Hicks; Tamara Lunsman; Gyan Harwood

4099117 - Two-pronged approach to manage the virus complex present in Sweet potato virus disease (SPVD) Flinn Ohara, presenter; Sara Navarro; Jeff Davis; Daniel Swale

4103263 - Predicting the shelf life of avocados using deep learning and portable Raman spectrometer In-Hwan Lee, Presenter; Luyao Ma

4105926 - EnzyRxn-GPT: A generative platform for enzymatic reaction prediction by fusing protein and chemical language models Zhenjiao Du, pres. Yonghui Li

4107921 - Development of isoxazoline insecticides with reduced human brain exposure Sarah E McComic, presenter; Arnab Chatterjee; Katy Wilson; Daniel Swale

4108377 - Mosquito perception to amino acid inclusions for attract-and-kill baits Xixian Ng, presenter; Ellis Johnson; Leslie Rault; Troy Anderson

4110437 - Smart polymeric materials for the detection of pesticides Ira Moore, presenter; Jerald Dumas

Co-Sponsoring symposia (Convention Center)

Sustainable Agriceuticals: 8:00-11:15am 8/18 Rm 404 Hyunsook Kim & Bailiang Li, Org./Presiders; Lin Liu, Org.

Sustainable Agriceuticals: 2:00-5:10pm 8/18 Rm 404 Wallace Yokoyama & Lin Liu, Org., Presiders

Whole Grains Bioactives & Human Health: 8:00am-11:50am 8/19 Rm 405 Shengmin Sang & Chris Zhu, Orgs; Dmitriy Smolensky, Org/Presider

Sustainable Agriceuticals: 8:00-10:50am 8/19, 2024 Rm 404 Lin Liu & Wallace Yokoyama, Org./Presiders; Xuan Huang presider

Whole Grains Bioactives & Human Health: 2:00-5:05pm 8/19 Rm 405 Shengmin Sang & Chris Zhu, Orgs. Dmitriy Smolensky, Org./Presider

Elevating Regulatory Harmonization to Reduce World Hunger & Increase Food Security: 2:00-6:00pm 8/20 Rm 605 Heidi Irrig &Carmen Tiu, Org./Presiders

Processing & the Storage Induced Toxins: 8:00-11:50am 8/21, 2024 Rm 404 Lauren S. Jackson, Alyson Mitchell, & Liangli Yu, Org./Presiders

Bioproducts From Biomass: Renewable Chemicals & Polymers: 8:00-11:43am 8/21 Rm 405 Majher Sarker & Madhav Yadav, Org./Presiders; Helen Ngo, Brajendra Sharma; Jinwen Zhang, Orgs.

Elevating Sustainability & Greentech in Agriculture & Plant-Based Foods: 8:00-11:35am 8/21 Hall D - Rm 4 Michael Appell, Lingyun Chen; Omowunmi Sadik; Y. Jane Tseng; Liangli Yu, Org./Presiders

Waste Upcycling, Indoor Farming & Sustainable Agriculture: 8:00-11:30am 8/21 Hall D - Rm 3 Keith Cadwallader, Xiaofen Du, Yun Yin, Org/Presiders

Waste Upcycling, Indoor Farming & Sustainable Agriculture: 2:00-5:30pm MDT 8/21 Hall D - Rm 3 Keith Cadwallader, Xiaofen Du, Yun Yin, Org/Presiders

Processing & the Storage Induced Toxins: 2:00-5:50pm 8/21 Rm 404 Lauren S. Jackson, Alyson Mitchell, Liangli Yu, Org./Presiders

Elevating Sustainability & Greentech in Agriculture & Plant-Based Foods: 2:00-5:05pm 8/21 Hall D - Rm 4 Michael Appell, Lingyun Chen, Omowunmi Sadik, Y. Jane Tseng, Liangli Yu Org/Presiders

Elevating Sustainability & Greentech in Agriculture & Plant-Based Foods: 8:00-11:15am 8/22 Rm 404 Michael Appell, Lingyun Chen, Omowunmi Sadik, Y. Jane Tseng, Liangli Yu, Org./Presiders

ROSTER OF AGFD OFFICERS & COMMITTEE LEADERSHIP

Chair - Serves 1 year. Presides over Division meetings/appoints committees
Jason W. Soares US Army DEVCOM Soldier Ctr Jason.w.soares.civ@army.mil

Chair-Elect - Serves 1 year. Substitutes for Chair as needed. Organizes technical programs at national meetings.
Liz Kreger Sensient Flavors & Extracts
Elizabeth.Kreger@sensient.com

Vice-Chair - Serves 1 year. Assists Chair-elect. Develops future technical programs.
Coralia Osorio Roa UNAL
cosorior@unal.edu.co

Secretary - Responsible for Division correspondence and meeting minutes.
Alyson Mitchell
University of California, Davis
aemitchell@ucdavis.edu

Treasurer - Responsible for Division finances.
Stephen Toth III
International Flavors & Fragrances R&D
Union Beach NJ stephen.toth@iff.com

Cornucopia Editor - Edits newsletter.
Carl Frey cfreyenterprise@gmail.com

Councilors - Represent Division for 3 years on ACS council.
Alyson Mitchell (thru '26)
aemitchell@ucdavis.edu
Lauren Jackson (thru '26)
lauren.jackson@fda.hhs.gov
Michael Tunick (thru '24)
mht39@drexel.edu

Website Editor - Maintains web site.
Michael Appell
michael.appell@ars.usda.gov

Student Activities - Attracts and retains graduate/undergraduate student members. 2 year term.
Elyse Lauren Doria, eldoria@ucdavis.edu

Nominations - Develops officer slate. Served by immediate past chair.
Jonathan Beauchamp
jonathan.beauchamp@ivv.fraunhofer.de

Finance - Monitors Div. finances. 1 year term. Served by immediate past chair.
Jonathan Beauchamp
jonathan.beauchamp@ivv.fraunhofer.de

Hospitality - Organizes receptions and banquets. Alyson Mitchell
aemitchell@ucdavis.edu

Alternate Councilors - Substitute for Councilors. Serve 3 years.
Kathryn Deibler (thru '24)
kdd3@cornell.edu
Michael Qian (thru '24)
Michael.qian@oregonstate.edu
Brian Guthrie (thru '26)
Brian_Guthrie@cargill.com

At-Large Executive Committee Members - Assist in Div. management. Serve 3 years.
Jane Leland (thru '26)
JLelandEnterprises@gmail.com
Robert McGorrin (thru '26)
robert.mcgorrin@oregonstate.edu
Bosoon Park (thru '24)
bosoon.park@usda.gov
One vacancy

Awards – Oversee awards process.
Chair Michael Morello
mjmorello226@gmail.com
AGFD Fellow Awards
Fereidoon Shahidi fshahidi@mun.ca
Young Scientist Award
Youngmok Kim
youngmok.kim@finlays.net
Young Industrial Scientist Award
Bhimanagouda (Bhimu) Patil
b-patil@tamu.edu
AGFD Distinguished Service Award
Michael Tunick mht39@drexel.edu
Roy Teranishi Graduate Fellowship
Liangli (Lucy) Yu lyu5@umd.edu
Student Awards
Kathryn Deibler kdd3@cornell.edu

Multidisciplinary Program Planner
Helps coordinate nat'l mtg programs
Neil Da Costa International Flavors & Fragrances neil.dacosta@iff.com

Public Relations – Publicizes Div.
Alyson Mitchell
aemitchell@ucdavis.edu

Membership - Recruits and retains Division members. Michael Qian
michael.qian@oregonstate.edu

Agriceutical Sub.Div.
Chair Hyunsook Kim
Hyunsk15@henyang.ac.kr
Chair-elect, Yuzhu Zhang
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V-chair Ying Wu ywu@Tnstate.edu
Secretary Bailiang Li
15846092362@163.com

Food Bioengineering Sub.Div.
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Secretary Jinwen Zhang
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Flavor Sub.Div.
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Vice-chair Yun Yin yunyin2@vt.edu
Secretary Yu Fang yufang@coca-cola.com

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Chair-elect Boyan Gao
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V-chair Vivian Wu vivian.wu@usda.gov
Secretary Yanhong Liu
Yanhong.liu@usda.gov

Functional Food/Nat. Product SubDiv
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Chair-elect Yingdong Zhu
yzhu1@ncat.edu
Vice-chair Khizar Hayat
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Secretary Xiaohong Sun
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Laurel.a.doherty.civ@mail.mil
Chair-elect Ida Pantoja-Feliciano
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Secretary Jenni Firrman
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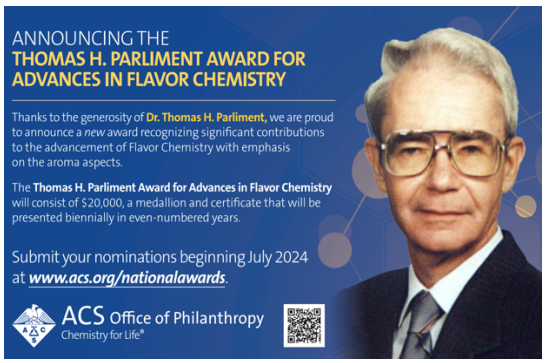
Sustainability/Green Tech. Sub.Div.
Chair Yufeng Jane Tseng
yjtseng@csie.ntu.edu.tw
Chair-elect Lingyun Chen
lingyun.chen@ualberta.ca
Vice-chair Omowunmi "Wunmi" Sadik
sadik@njit.edu
Secretary Yi-Shu Tu
georgetu@gmail.com

In Memorium

Thomas H. Parliament
1/26/39 – 7/8/24



Tom Parliament was born in Hackensack, N.J., got a B.A. from Lehigh University and a Ph.D. in Food Science and Technology from the University of Massachusetts. He served in the U.S. Army, rising to rank of Captain. He had a productive career of >30 years in food and flavor technology at the Tarrytown, N.Y. research center of General Foods, later Kraft Foods. Along the way he had a family, became an avid hiker and nature lover and shared his flavor and food technology knowledge by presenting at AGFD symposia and organizing symposia such as the 9th Charalambous International Flavor Conference. In 2000 he became an AGFD Fellow and won the AGFD Distinguished Service Award. Just this year he endowed the ACS Thomas. H. Parliament Award for Advances in Flavor Chemistry, securing his legacy as a pre-eminent flavor scientist. Tom's many co-workers, collaborators and friends at AGFD miss him and extend condolences to his family.

(Thx to Cathy Culver for assisting with this notice)

AGFD TECHNICAL PROGRAM

Abstracts for these papers appear in the 'abstracts section' immediately after the technical program.

SUNDAY MORNING August 18
Colo. Conv. Ctr. rm 404
Sustainable Agriceuticals
Financially supported by Food Security: Tackling Hunger Convergent Chemistry Community
L. Liu, *Organizer*
H. Kim, B. Li, *Organizers, Presiding*
8:00 Introductory Remarks.
8:05 *Lactobacillus helveticus* ZJUIDS12 rescues alcohol-related liver disease via a *Clostridium butyricum*-regulated Reg3γ pathway in mice. Q. Ding, F. Cao, S. Lai, S. Li, **D. Ren**
8:30 Regulation and mechanism of exopolysaccharide produced by *Bifidobacterium. infantis* E4 on immunomodulatory effect of intestinal mucosa in immunocompromised mice. **B. Li**
8:55 Characterization and quantification of antimicrobial metabolites produced by lactic acid bacteria against canine periodontal pathogens. **K. Seo**
9:20 10-Hydroxy-2-decenoic acid alleviates okadaic acid-induced tau hyperphosphorylation in SH-SY5Y neuroblastoma cell and mouse model of Alzheimer's disease. L. Tao, K. Wang, X. Yu, G. Zhang, **S. Li**, F. Hu
9:45 intermission.
10:00 Enhanced gut microbiota delivery of *Faecalibacterium prausnitzii* through layer-by-layer encapsulation with riboflavin-conjugated sodium alginate and glycol chitosan. **M. Yao**, B. Qiu, L. Li
10:25 Effect of polyphenol extract-derived postbiotics on hindlimb-immobilized mice. **H. Kim**, E. Kim, Y. Jung, S. Jung, H. Youn, H. Kim, K. Seo
10:50 Antibacterial mode of action of a bacteriocin derived from lactic acid bacteria and its modulation effect on intestinal inflammation. **P. Li**

SUNDAY AFTERNOON
Colo. Conv. Ctr. Rm 404
Sustainable Agriceuticals
Financially supported by Food Security: Tackling Hunger Convergent Chemistry Community L. Liu, W. H. Yokoyama, *Organizers, Presiding*
2:00 Introductory Remarks.
2:05 Withdrawn
2:30 Transcriptomic analysis of Taihe black-boned silky fowl leg muscles under different farming models. **X. Huang**, Y. Tan, C. Xu, Y. Huang, **Z. Yin**
2:55 Abnormally elevated thyroid antibodies in Hashimoto's thyroiditis patients were positively associated with inflammation and multiple non-hypothyroid symptoms. **J. Li**, S. Li, Q. Huang
3:20 Transcriptomic and metabolomic analysis of Guyuan chicken breast muscles at different developmental stages. H. Zhang, **X. Huang**, Y. Tan, Y. Huang, Z. Yin
3:45 Intermission.
3:55 Valencia orange peel extract prevents body and adipose weight gain in mice on high-fat diets. **H. Lee**, H. Lee, P. Alves, Y. Wang, W.H. Yokoyama
4:20 10-hydroxy-2*(e)*-decenoic acid improves nonalcoholic fatty liver disease through activation of the peroxisome proliferator-activated receptor signaling pathway. **X. Yu**, S. Li, J. Bao, J. Li, L. Wei, M. Zhu, F. Hu
4:45 Effect of molecular weight, conformation and viscosity of water-soluble yellow mustard mucilage on the proliferation of probiotic strains. **C. Fletcher**, Y. Wu

Colo. Conv. Ctr. rm 405

ACS Microbiome Research Consortium - Microbiome in Foods, Crops & Agriculture: Building Partnership
Cospons, COMP F. Kearns, L. Liu, K. Mahalak, T. Wang, M. Yan, *Organizers* H. Kim, *Organizer, Presiding* S. Spicer, *Presiding*
2:00 Introduction.
2:03 2Blades & the unmet need: Leveraging plant immune receptors to improve crop resistance around the world. **B. Rutter**
2:23 Mycotoxin contamination to wheat grain predicted by microbiome colonization patterns early in the growing season. **B.K. Whitaker**, M.M. Vaughan, S.P. McCormick, T. Becker
2:43 Field inoculation with beneficial mycorrhizal fungi as a tool for sustainable agricultural practices. **S. Lutz**, N. Bodenhausen, A. Valzano-Held, K. Schlaeppi, M. Van der Heijden
3:03 Exploiting the potential of the plant microbiome: The role of biobanks and supporting infrastructure. **M. Ryan**
3:23 Intermission-5 min break.
3:28 Microbiomes and plant health. **M. Bakker**
3:48 Fusarium Identification, from morpho-based to genomic era. **I. Laraba**
4:08 Microbial community composition changes during active viral infection in reared crickets. **K.R. Duffield**, B. Tibbs-Cortes, E. Putz, B. Foquet, J. Ramirez
4:28 Intermission-10 min break.
4:38 Roundtable Panel Discussions with Speakers.
5:58 Concluding Remarks.

Early Career Symposium: Semiochemicals for Sustainable Agroecosystems Spons. AGRO, Cospons. AGFD, ANYL, BIOT, ENVR
Organic Process Research & Development Spons. ORGN, Cospons. AGFD

SUNDAY EVENING 7PM
Colo. Conv. Ctr. Hall A-C
General Posters E. Kreger, J. W. Soares, *Organizers, Presiding*
Note – first 25 posters listed below also presented at Monday Evening Sci-Mix
7:00 01 Effects of unsaturation and polar compounds of vegetable oils on the properties of sunflower wax oleogels. **H. Hwang**, S. Kim, J.K. Winkler-Moser
7:00 02 Performance comparison of the new type II version milk MIoBS ELISA kits with their current version, using commercial and spiked foods. **C. Cho**, R. Panda, P. Rallabhandi
7:00 03 Progress of chiral flavor substances in alcoholic beverages. **Y. Dai**
7:00 04 Fate and transport of manganese oxide nanomaterials in *capsicum annum L* plants. **S. Ahmed**, Y. Ye, K. Flores, J.L. Gardea-Torresdey, J. Hernandez-Viezcas
7:00 05 Evaluating acidity levels in packaged coffee to enhance product label accuracy. **A. Sharaf Eddin**, S. Ibrahim, T. Zimmerman
7:00 06 Covalent immobilization of lactase via amine-epoxide reaction on vapor-deposited polymer thin films: A kinetic study. **F. Fianu**, J. Chen, W. Sun, Y. Cheng
7:00 07 Performance comparison of the new type II Egg MIoBS ELISA kit with its current version for FDA's regulatory purposes. **P. Rallabhandi**
7:00 08 Recovery of Polyhydroxyalkanoates from *Haloferax mediterranei* utilizing glycerol waste. **F. Zhao**, M. Haque, H. Huang, Z. Wang
7:00 09 Effect of cooking conditions on chickpea flour functionality and its protein physicochemical properties. **S. Hong**, R. Xiao, G. Chen, Y. Zhu, A. Garay, J. Yang, Y. Xu, Y. Li
7:00 10 Measurement of urinary sulfate in domestic swine by conductometric titration and ion chromatography. **L.D. Schultz**, L.C. Jackson, R. Srinivasan
7:00 11 Enhancing the functionality and gut fermentability of insoluble dietary fibers from oat husks via subcritical water treatment. **J. Yang**, X. Liu, H. Shen, H. Huang
7:00 12 Differences in the metabolic content of two *cecropia* species from Tabasco, Mexico. E. Medrano Sanchez, **C. Lobato Garcia**, A. Gomez Rivera, A. Gallegos Garcia, M. Gonzalez Cortazar
7:00 13 Stability tests of the nitrogen radical containing 2,2-diphenyl-1-Pirylhydrazyl (DPPH) in different conditions. **Y. Hu**, R. Rebelo, N. Rojas, E.J. Sorensen
7:00 14 Effect of sorghum grains in kombucha fermentation. **F. Zillinger**, **U. Uysal**, **U. Yucel**
7:00 15 Evaluating the effects of natural antioxidants on the quality and stability of refined canola oil during deep frying. **T.M. Alanezi**
7:00 16 Characterization and discrimination of yerba santa by NMR-based metabolomic approach. **J. Zhao**, M. Wang, G. Hervey, S. Saroja, J. Lee, R. Upton, I. Khan
7:00 17 Got lead? An analytical approach to the determination of trace metal concentrations in insulated cups. **V. Hennick**
7:00 18 Performances of non-meltable, reusable and biodegradable stationary cooling media "jelly ice cubes". **J. Zou**, Y. Xie, X. Li, G. Sun, L. Wang
7:00 19 *In vitro* fermentation shows polyphenol and fiber blends have an additive beneficial effect on gut microbiota states. **J.A. Whitman**, L.A. Doherty, I. Pantoja-Feliciano, K. Racicot, D. Anderson, K. Kensil, J.P. Karl, G.R. Gibson, J.W. Soares
7:00 20 Use of avocado oil oleogels as fat substitutes in chicken sausage. **C. Carter**, M. Ferdaus, R. Silva
7:00 21 Modification of purified Ana o 3 with phenylglyoxal disrupts antibody binding. C. Brown, R.A. Adams Dupre, T. Vuong, A. Payne, B. Smith, **C.P. Mattison**
7:00 22 Exploring the potential of nitrogen plasma as a non-thermal alternative in fruit juice processing. **S. Lai**, **Y. Chou**, Y. Ting
7:00 23 Evaluation of the nutritive value of protein concentrates from solanum macrocarpon from Nigeria.

O.O. Onawumi, **A. Sodamade**, **O.A. Adewusi**, **F.A. Amoo**

7:00 24 Medium-throughput phenotyping approach of quantification of 11s/7s protein ratio in soybean. **Y. Zheng**, C. Denbow, G. Pilot, B. Zhang

7:00 25 Natural products magnetic resonance database (NP-MRD): Comprehensive resource for NMR data enabling natural products discovery and understanding. **J.R. Cort**, R. Linington, D. Wishart, L. Sumner, J. Bade, B. Goel, M. Pin, E. Poynton

7:00 Molecular Simulation guided adsorption mechanism of anthocyanin on macro reticular ion exchange resin. **A. Paul**, **A. Mandal**, **A. Dutta**, A. Kundu, S. Saha

7:00 Utilizing a green pH-driven approach for developing curcumin-infused soymilk. **A. Suryamiharja**, X. Gong, C.C. Akoh, H. Zhou

7:00 Organocatalytic acetylation of maize starch through reactive extrusion. **C. Lagunes Delgado**, E. Agama Acevedo, T. J. Gutierrez

7:00 Development of phosphorus and nitrogen rich flame retardant by encapsulation technology. **S. Chang**, J. Smith

7:00 Exploring puffed rice as a novel ink for 3D food printing: Rheological characterization and printability analysis. **B. Park**, L.S. Chewaka, C.S. Park, J. No, K. You

7:00 Effects of proanthocyanidin degree of polymerization on pulse protein-proanthocyanidin interactions. **C. Chen**, J. Awika

7:00 L-Theanine production by whole cell conversion for high concentration of substrates using an ATP regeneration system. **K. Yu**, B. Lee, G. Kim, Y. Jung, J. Ahn, Y. Yang, H. Kim, H. Jang, M. Sohn, S. Park, K. Park

7:00 Application of carbon quantum dots (CQDs) solution as a novel solvent for hydrophobic surface coating on PVA films. **Y. OH**, K. Park, J.R. Ansari, J. Hwang, D. Kim, J. Seo

7:00 Effects of food preparation technology and storage on phenolics and antioxidant activity in sweet corn. **F. Dong**, H. Wu, L. Yu

7:00 Chemical constituents of parsley (*Petroselinum crispum*) extract and its potential in mitigating the SARS-CoV-2 infections. **E. Lee**, Y. Yao, H. Wu, M. Slavin, L. Yu

7:00 Assessing the impact of electrolyzed water treatment on the post-harvest quality of strawberries. **Y. Yagiz**, J. Cheng, H. Chang, A. Maharaj, A. Moussa, **L. Gu**

7:00 Bovine liver hydrolyzate pretreated with either pepsin or pepsin+ultrasound as a valuable source of free amino acids and bioactive peptides. M. Gallego, L. Mora, **F. Toldra**

7:00 Protein and amino-acid contents in mushroom varieties with different cooking methods. **S. Kim**

7:00 Separation of mycotoxins in floral tissue of hemp infected by *Fusarium graminearum*. **I.A. Kagan**, H.S. Smith, N. Gauthier

7:00 Comprehensive dietary glycan Encyclopedia of food: revealing complex carbohydrate molecular structures via LC-MS/MS. **S. Jiang**, S. Ehlers Cheang, C. Suarez, C. Weng, A. Stacy, J. Larke, D. Lemay, C.B. Lebrilla

7:00 Brewing a solution: Practical synthesis of catechin-polymer particles. **S.S. Chang**, J. Pereira, S. Santra

7:00 Evaluating structural and digestive properties of polymerization degree-dependent dextran fraction via *Gluconobacter oxydans* biosynthesis. S. Baek, **B. Park**

7:00 Antimicrobial and antifungal screening of new nitrogen derivatives. Z. González, **C. Gonzalez**, C. Giménez Mariño, A. Ramírez Corbera, J. Poveda Guerrero

7:00 Encapsulation and controlled release of cyanocobalamin from ionotropic gel carriers made from pectins with different nanostructural characteristics. **Y. Kim**

7:00 Utilizing deep learning algorithms (experiential A.I.) for agricultural analysis to optimize urban farming yield in Southern California. S.E. Wettstein, **D. Rakijian**, **M.M. Allard**

7:00 Coriander (*Coriandrum sativum*) extract's chemical composition and potential antiviral effects. **E. Lee**, H. Wu, B. Gao, L. Yu

7:00 Streamlining sample preperation: The decision tree tool for the periodic table of food initiative. **M. Gruszczynski**, M. Read, S.B. Mitchell, J.M. Chaparro, M. Odenkirk, J. Prenni

7:00 Peptide-polyphenol interactions: Antagonistic effect of pea pentapeptide on antioxidant properties of quercetin and rutin in Caenorhabditis elegans. **L. Lam Hon Wah**, S. Reyes Flores, O. Mosibo, T. Fatoki, R. Aluko, C. Udenigwe

7:00 Value-added products from apricot fruits. **Z.K. Muhidinov**, M. Rahmonov, J. Bobokalonov, G. Strahan, A. Hochkiss

7:00 Analysis of soil fumigant emissions by solid phase microextraction with gas chromotography-mass spectrometry **D. Gramckow**, M.A. Nussbaum

7:00 Phony noni: evidence of widespread misbranding of commercial powdered *Morinda citrifolia* products. **B. West**, S. Deng

7:00 Synthesis of carnosine-based aqueous-soluble antioxidant dendrimers. **B. Agbemade**, C. Antwi-Boasiako, C.Y. Lee

MONDAY MORNING August 19

Colo. Conv. Ctr. rm 404

Sustainable Agriceuticals Financially supported by Food Security: Tackling Hunger Convergent Chemistry Community

L. Liu, W. H. Yokoyama, *Organizers, Presiding*, X. Huang, *Presiding*

8:00 Introductory Remarks.

8:05 Improvement of health functional properties of edible insects via fractionation, protein extraction, and fermentation. **E. Oh**, Y. Kim

8:30 High-protein low carbohydrate dietary pattern alleviates chronic alcohol intake-induced hepatic steatosis and liver injury in mice. **S. Li**

8:55 Functional properties and flavor characteristics of milk from cows supplemented with jujube powder. C. Zhang, **H. Liu**
9:20 Intermission.
9:30 Animal bones by-products as a source of cardioprotective bioactive peptides. **F. Toldra**, G. Carrera-Alvarado, L. Mora
9:55 Ultrasound-augmented conjugation of whey protein isolate and propolis: Structural insights and functional enhancements. S. Peng, X. Yu, L. Tao, S. Li, X. Ma, **F. Hu**
10:20 Electrospun biomimetic periosteum capable of controlled release of multiple agents for programmed promoting bone regeneration. **X. Shi**, X. Zhao, J. Yang
10:45 Concluding Remarks.

Colo. Conv. Ctr. rm 405
Whole Grains Bioactives & Human Health
Financially supported by Food Security: Tackling Hunger Convergent Chemistry Community S. Sang, C. Zhu, *Organizers*, D. Smolensky, *Organizer, Presiding*
8:00 Opening remarks.
8:05 Harnessing the chemistry of phenolics to deliver the benefits of whole grain components to human health. **J. Awika**
8:25 Ancient grains: Presentation by Nu Life market president, Earl Roemer. **E. Roemer**
8:45 Health benefits of sorghum products: *In vitro* and *in vivo* studies for anti-cancer and anti-obesity activity. **S. Lee**
9:05 Developing new foods and beverages from health-promoting tannin-containing sumac sorghum bran. **R. Ardoin**, B. Smith, D. Smolensky, S. Boue, S. Bean, F. Aramouni, A. Santana, J. Peterson
9:30 Evaluation and anti-glycation potential of sorghum and quebracho tannins extracted using pressurized liquid extraction. **A. Santana**
9:50 Intermission.
10:10 High-polyphenol Sorghum modulates carcinogen-metabolizing enzymes in colon cancer cells. **P. Tsuji**, C. Lascarez, D. Smolensky
10:30 Golden grains: Exploring the genetic underlying of bioaccessible sorghum carotenoids. **R.C. McDowell**
10:50 Changes in sorghum starch digestibility phenolic profile, and cell bioactivity after cooking. **J. Peterson**, D. Smolensky
11:10 Phenolic ethanolic extracts of sorghum grains and leaves ameliorate intestinal colitis and inflammation induced by dextran sulfate sodium on mice model. **I. Sleem**, A. Rodriguez, B. Chen, D. Smolensky, V. Dia
11:30 Sorghum's nutrients and phytonutrients for human health. **J. Painter**

Colo. Conv. Ctr. rm 403
ACS Microbiome Research Consortium - Carbohydrates & the Microbiome F. Kearns, H. Kim, L. Liu, S. Spicer, T. Wang, *Organizers*, K. Mahalak, M. Yan, *Organizers, Presiding*
8:00 Introduction.
8:03 Dietary carbohydrates regulate intestinal colonization and dissemination of *Klebsiella pneumoniae*. **A. Hecht**, L. Harling, J. Lee, C. Tanes, K. Bittinger, M. Goulian, G.D. Wu
8:43 Long-chain dextran produced by *Weissella cibaria* boosts the diversity of health-related gut microbes *Ex Vivo*. **P. Van den Abbeele**, M. Tintoré, J. Cuñé, L. Dai Vu, J. Poppe, A. Baudot, C. de Lecea
9:13 Prebiotic citrus limonin glucosides promote *Lactobacillus* proliferation. **V. Dadwal**, B.S. Patil
9:38 Zein-Glucomannan active films for fruit preservation. **J.T. Bobokalonov**, I. Ismoilov, D. Uldasheva, Z.K. Muhidinov, L. Liu
10:03 Intermission.
10:18 Design and synthesis of heparan sulfate mimetics in targeting tau-heparan sulfate interaction and attenuating hyperphosphorylated tau-induced cell dysfunction associated with alzheimer's disease. **H.M. Nguyen**
10:58 Elucidating the structures and functions of gut microbiota-derived peptidoglycan fragments in hosts. J.M. Kwan, C. Li, C. Adamson, Y. Liang, A. Ng, E.W. Ng, S.H. Wong, **Y. Qiao**
11:28 Stem cell-based organoid-microbe coculture model to study environmental toxicants and microbial products. I.M. Ibrahim, A. Chakraborty, S. Tocci, L. Dugan, K. Inouye, T. Hazra, L. Alexander, **S. Das**
11:58 Concluding Remarks.

VIRTUAL SESSION
Honoring Professor Chi-Tang Ho on the Occasion of His 80th Birth Year R. B. Pegg, S. Sang, *Organizers* F. Shahidi, L. Yu, *Organizers, Presiding*
10:00 Introductory Remarks.
10:10 Forty-five years career in flavor chemistry research. **C. Ho**
10:40 Chronic benzo[a]pyrene exposure induces aging toxicity and the preventive potential of tangeretin supplementation in *Caenorhabditis elegans*. **C. Wei**, C. How, K. Cheng, Y. Li, M. Pan
11:10 Occurrence of dietary advanced glycation end products in meat products and the potential factors affecting their formation. **W. Hung**, Y. Lin, Y. Liu, C. Ho
11:40 Key roasty odorants in highly roasted tea and their formation mechanism related to the thermal reaction of theanine and sugar. X. Zhai, M. Li, **X. Wan**

MONDAY AFTERNOON
Colo. Conv. Ctr. rm 404
Honoring Professor Chi-Tang Ho on the Occasion of His 80th Birth Year R. B. Pegg, F. Shahidi, L. Yu, *Organizers*, S. Sang, *Organizer, Presiding*, K. R. Cadwallader, *Presiding*
2:00 Introductory Remarks.
2:05 Contributions to the understanding of thermal generation of flavors and aromas. **R.J. Mcgorrin**
2:30 Designing minimally processed plant proteins for human health. **V. Somoza**, K. Gradl, P. Richter
2:55 Insights into citrus flavor and health benefits: Recent progress. **Y. Wang**
3:20 Development of dairy flavors from the Maillard reaction. **M.H. Tunick**

3:45 Volatile compounds generated from the Maillard reaction of Asn-Pro, Pro-Asn, and a mixture of asparagine and proline with glucose. **Q. Xiao**, C. Ho
4:10 Identification of key odorants in roasted pecan oil. **K.R. Cadwallader**, K.L. Malloy
4:35 Chemical drivers of cold brew flavor liking. N. Cordoba, P. Forero, M. Booth, **E. Tello Camacho**, D.G. Peterson

Colo. Conv. Ctr. rm 405
Whole Grains Bioactives & Human Health
Financially supported by Food Security: Tackling Hunger Convergent Chemistry Community S. Sang, C. Zhu, *Organizers*, D. Smolensky, *Organizer, Presiding*
2:00 Opening remarks.
2:05 Characterizing the impact of a novel corn bran derived arabinoxylan in humans: Findings from an exploratory trial in adults with excess weight. **E.C. Deehan**
2:25 Dietary oat β-glucan alleviates high-fat induced insulin resistance through regulating circadian clock and gut microbiome. **J. Liu**, X. Wang, Z. Wang, L. Gong, H. Zhang, J. Wang, Z. Wang
2:45 Impact of probiotics and prebiotics on the function and abundance of *Faecalibacterium prausnitzii*. **W. Dong**, S. Zhang, P. Lee, S. Sang
3:05 Can betainized metabolites be the biomarkers of whole grain intake?. **Y. Li**, S. Sang
3:25 Intermission.
3:45 5-Heptadecylresorcinol alleviated high-fat diet induced obesity and insulin resistance by activating brown adipose tissue. **Z. Yang**, S. Yang, Z. Wang, Y. Hao, Z. Wang, Y. Wei, G. Ye, J. Wang, J. Liu
4:05 Protective effects of wheat bran feruloyl oligosaccharides against intestinal barrier injury in Caco-2 cells. **L. Gong**, J. Wang, L. Hu
4:25 Investigating the gut microbiota mediated health outcomes of whole wheat - a clinical nutritional study with individuals with prediabetes. **C. Zhu**
4:45 Evaluating effects of whole wheat bread on gut microbiome composition using nontargeted LC/MS. **S. Ponneganti**, E. Tello Camacho, M. Teegarden, C. Zhu, D.G. Peterson

Colo. Conv. Ctr. rm 403
ACS Microbiome Research Consortium - Exploring the Microbiome Through Technology: Molecular Modeling to Omics Approaches Cospons. COMP H. Kim, L. Liu, K. Mahalak, S. Spicer, T. Wang, M. Yan, *Organizers*, F. Kearns, *Organizer, Presiding*
2:00 Introductory Remarks.
2:05 Multiscale computational microscopy of viruses. **L. Casalino**, R.E. Amaro
2:40 Minimal cell under a computational microscope. **J.A. Stevens**, M. Bozoflu, L. Grünewald, **M. König**, F. Grünewald, S. Marrink
3:05 How to solve a problem like mitochondria: Building a computational representation using integrative modelling. **C.M. Brown**, S. Marrink
3:30 Onsite multiple analysis system using photo-immobilized microarray chips. **Y. Ito**
3:55 Intermission/Break.
4:05 Structure and function of the gut microbiota of the *in vivo* piglet gastrointestinal tract. C. Rotsaert, Y. Minnebo, C. Duysburgh, **K. Mahalak**, J.A. Firrman, L. Liu, A. Moustafa, L. Mattei, K. Bittinger, M. Marzorati, J. Michiels, T. Van de Wiele
4:40 A comparative study between the porcine gut microbial community and metabolism developed *in vitro* and found *in vivo*. **L. Liu**, J.A. Firrman, A.B. Narrowe, K. Mahalak, J.M. Lemons, C. Rotsaert, Y. Minnebo, C. Duysburgh, M. Marzorati, J. Michiels, T. Van De Wiele
5:05 Metabolomic profiling of tyrosine fermentation in production animals and humans reveals specie-specific preference on metabolic pathways. **R. Su**, C. Chen
5:30 Comparative metabolomics studies examine the influence of unhealthy diets and potential natural remedies on gut metabolism. **K. Jones**, S.R. Campagna
5:55 Concluding Remarks.

MONDAY EVENING 8PM
Colo. Conv. Ctr. Hall A-C
AGFD Sci-Mix E. Kreger, J. W. Soares, *Organizers, Presiding*
Note – also presented are the first 25 posters listed under Sunday Evening General Posters
8:00 Re-thinking use of salicylic acid-based poly(anhydride-ester)s: From biomedical to agricultural applications. **V. Batiz**, M. Reis Nogueira de Lima, G. Regalado, L. Safi, T. Eulgem, K. Uhrich
8:00 Nanoemulsion with *Lactobacillus*-derived exopolysaccharide potentiates the antimicrobial activity of eugenol to protect fresh produce against foodborne pathogens and biofilms. **S. Balyan**, V. Dadwal, B.S. Patil
8:00 Improving astronaut diets in space: Enhanced preservation and nutrition through plasma-treated peas. **L. Chen**, Y. Chou, Y. Ting

TUESDAY MORNING August 20
Colo. Conv. Ctr. Hall D - rm 4
Advancement of Application of Agricultural & Food Chemistry: Symposium in honor of Tara McHugh
M. J. Morello, J. W. Soares, M. H. Tunick, *Organizers, Presiding*
8:00 Introduction.
8:05 Contributions by the USDA's Agricultural Research Service. **M.H. Tunick**
8:25 Greener chemical approaches to reduce mycotoxins and spoilage in commodities. **M. Appell**
8:45 Award Introduction.
8:50 New sustainable processing technologies to produce healthy, value-added foods. **T. McHugh**

Colo. Conv. Ctr. rm 403
AGFD Young Scientists Award Y. Kim, B. S. Patil, *Organizers, Presiding*
8:00 Introductory Remarks.
8:05 Introduction: AGFD Young Scientist Award.
8:10 Metabolomics in food and agricultural science: Current and future. **J. Suh**
8:40 Introduction: AGFD Young Industrial Scientist Award.

8:45 Understanding the “kokumi” phenomenon and unlocking kokumi technologies. **E. Kreger**
9:15 Concluding Remarks.

Colo. Conv. Ctr. rm 405
ACS Microbiome Research Consortium - When Chemistry Meets the Microbiome: Student Workshop in Career Next Steps Cospons. YCC S. Spicer, *Organizer, Presiding*, H. Kim, T. Wang, *Presiding*
8:00 Introduction
8:10 Building better application materials for jobs in microbiome research. **R. Moore**
8:30 Building Better Application Materials Activity.
8:50 Nailing the interview. **J. Crawford**
9:05 Nailing the Interview Interactive Activity.
9:30 When chemistry meets the microbiome. **K.C. Rees**
9:40 Growing Your Network Q&A Roundtable with Panelists.

Colo. Conv. Ctr. rm 404
Honoring Professor Chi-Tang Ho on the Occasion of His 80th Birth Year R. B. Pegg, S. Sang, L. Yu, *Organizers*, F. Shahidi, *Organizer, Presiding* , J. Wu, *Presiding*
8:00 Introductory Remarks.
8:05 Phenolics and polyphenolics in Food and their metabolites. **F. Shahidi**
8:30 Study of synergy of phenolic compounds to induce antioxidant activitis *in vitro*. **L. Chen**, A. Abdurrahim, V. Mazuraka
8:55 Separation and characterization of free, esterified, and bound phenolics in Georgia pecans. **S.O. Ogundipe**, J. Suh, R.B. Pegg
9:20 Identification of salt-enhancing compounds in cumin spice extracts. **I. Wang**, E. Tello Camacho, D.G. Peterson
9:45 Carbonyl stress as a new mechanistic target of dietary flavonoids for prevention of metabolic disorders. **S. Sang**
10:10 Gut microbiota influence the metabolism and anti-inflammatory properties of ginger polyphenols. **S. Zhang**, Y. Zhao, P. Lee, S. Sang

Food Security: Impact of Climate Change on Agriculture & Tackling World Hunger CCC Spons. AGRO, Cospons. AGFD, ANYL, CEI. ENVR

TUESDAY AFTERNOON
Colo. Conv. Ctr. rm 403
JAFC Best Paper Award T. Hofmann, W. King, *Organizers*, E. Kreger, J. W. Soares, *Presiding*
2:00 Introductory Remarks.
2:10 From bioreactor to cup: Exploring the aroma and flavor of cell culture-based coffee. **H. Rischer**

Colo. Conv. Ctr. rm 405
ACS Microbiome Research Consortium - Modulation of the Gut Microbiome F. Kearns, H. Kim, S. Spicer, T. Wang, M. Yan, *Organizers*, L. Liu, K. Mahalak, *Organizers, Presiding*
2:00 Introduction.
2:05 Metagenomic immunoglobulin sequencing (MiG-seq) exposes patterns of IgA antibody binding in the healthy human gut microbiome. **M. Olm**
2:40 Discovery of a novel link between microbial derived metabolite, 2,3-dihydroxypropane-1-sulfonate (DHPS), and cryptic sulfur metabolism in the human gut associated with metabolic dysregulation. **C. Christopher**, A. Zaparte, L. Rice, K. Jones, Z. Vickery, L. Richey, C. Arnold, C. Taylor, A. Castille, H. Lin, J. Kirwan, J. Apolzan, C. Ellis, K. Morgan, D. Welsh, S.R. Campagna
3:05 Butylated hydroxyanisole does not significantly affect the human gut microbiome ex vivo. **J.M. Lemons**, A.B. Narrowe, L. Liu, J.A. Firrman, K. Mahalak, A. Baudot, S. Deyaert, P. Van den Abbeele
3:30 Intermission.
3:40 Establishment and evaluation of an *in vitro* model of the small intestinal gut microbiota. **J. Firrman**, L. Liu, K. Mahalak, J.M. Lemons, A.B. Narrowe, G.D. Wu, E. Friedman
4:15 Effects of whey protein isolate on the growth and metabolism of the probiotic Lacticaseibacillus rhamnosus GG. **A. Narrowe**, V. Chetty, L. Liu, J.M. Lemons, K. Mahalak, J.A. Firrman
4:40 Undigested glycated lentil proteins modulate the gut microbiota profile but not the metabolites *in vitro*. **R. Boachie**, E. Capuano, T. Oliviero, C. Udenigwe, V. Fogliano
5:05 Revealing the mechanism of food-grade-carrageenan-induced harmful effects: Gut bacteria are the keys. **R. Ji**, H. Xiao
5:30 Concluding Remarks.

Colo. Conv. Ctr. rm 404
Honoring Professor Chi-Tang Ho on the Occasion of His 80th Birth Year S. Sang, F. Shahidi, L. Yu, *Organizers*, R. B. Pegg, *Organizer, Presiding*, J. Suh, *Presiding*
2:00 Introductory Remarks.
2:05 Assessing the anti-inflammatory activity of Georgia pecans. **R.B. Pegg**, P. Greenspan
2:30 Revisiting the chemical diversity of organic crops. **J. Suh**, J. Kaur, T. Coolong, K. Cassity-Duffey
2:55 Ovomucin hydrolysates reduce bacterial adhesion and inflammation in enterotoxigenic Escherichia coli (ETEC) K88-challenged intestinal epithelial cells. **J. Wu**, X. Bao, M. Gänzle
3:20 Withdrawn
3:45 New method for measuring cyanide and cyanogenic glycoside analysis in almonds (*Prunus dulcis*) and almond hulls. **A.E. Mitchell**, L.A. Lerno, E. Doria
4:10 3-MCPD fatty acid formation in edible oils. **L. Yu**
4:35 Bioactivities, bioavailability, and biosynthesis of citrus polymethoxyflavones. **Q. Huang**
5:00 Concluding Remarks.

Colo. Conv. Ctr. Hall D - rm 4
Kenneth A. Spencer Award M. J. Morello, *Organizer*, M. Appell, S. J. Leibowitz, *Organizers, Presiding*
2:00 Introductory remarks

2:15 Green process development for agro-based materials. **H. Cheng**, A. Biswas
2:45 CIS (liquid) to trans (solid) isomerization of jojoba oil in supercritical CO2 catalized by Lewis acid. **Z. Liu**, S. Shah, K. Vermillion, H. Cheng, A. Biswas
3:15 Intermission.
3:35 Quantum computing for natural product structure elucidation. **Y. Tseng**
4:05 Applications of sustainable agro-based bioproducts to remove toxins and improve food safety. **M. Appell**, A. Biswas
4:35 Green processes and bio based polymers. **A. Biswas**, H. Cheng
5:15 Panel Discussion.

VIRTUAL SESSION
General Papers E. Kreger, J. W. Soares, *Organizers, Presiding*
3:00 Introductory Remarks.
3:05 Quantitation of odorants in dried and rehydrated lobster mushrooms. **T. Nguyen**, J.P. Munafo
3:25 Predicting the permissible arsenic (As) concentration limit for irrigation water used in rice cultivation. **D. Mandal**, S. Sengupta, D. Golui, D. Mondal, M.D. Wood
3:45 Permeability prediction in well log using Gaussian random function simulation and machine learning. **S. Tangkin**
4:05 Discerning the content and quality of alcoholic beverages using femtosecond thermal lens spectroscopy. S. Goswami, **D. Goswami**, R. Goswami
4:25 Structure-activity relationship study of dendritic antioxidants. **C.Y. Lee**, B. Agbemade, A. Sharma
4:45 Intermission.
5:05 Sustainable development: Biodegradable packaging with *curcuma longa* L. as an active and patent monitoring. **E. Ribeiro**, F. Gonzaga, R. Almeida
5:25 Nitrates in our daily lives: A review. **A.A. Chetty**, J.J. Lal
5:45 Volatiles derived from Philippine plant species exhibited antimicrobial activity, antioxidative and cytotoxicity using a newly developed microplate-based assay. **G.C. Albarico**, M. Houdkova, I. Doskocil, J. Tauchen, K. Urbanova, E. Tulin, L. Kokoska
6:05 Characterization of the taste profile of Chardonnay marc through taste-guided fractionation. **N. Nguyen**, J.P. Munafo
6:25 Optimization of formulation and processing techniques for the development of meat-based hummus using response surface methodology. **M. Goswami**, R. Kumar, X. M Teng, R. Jadeja, G. Mafi, M. Pfeiffer, V. Pathak, R. Ramanathan

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Food Security: Impact of Climate Change on Agriculture & Tackling World Hunger CCC Spons. AGRO, Cospons. AGFD, ANYL, CEI, ENVR

WEDNESDAY MORNING August 21
Colo. Conv. Ctr. rm 405
Bioproducts From Biomass: Renewable Chemicals & Polymers Financially supported by Food Security: Tackling Hunger Convergent Chemistry Community H. Ngo, B. Sharma, J. Zhang, *Organizers*, M. Sarker, M. P. Yadav, *Organizers, Presiding*
8:00 Introductory Remark.
8:02 High-strength composites from lignin oil and elemental sulfur. K.A. Tisdale, N.L. Kapuge Dona, **R.C. Smith**
8:19 Intermediate oilseeds as potential substitutes in soybean products. **X. Zhao**, D. De la Torre Ugarte, E. Webb, E. Parish
8:36 Utilization of brewer's spent grain for isolation of functional components. **M.P. Yadav**, K. Mainali, B. Sharma, M. Sarker, H. Ngo
8:53 100% biomass-based sustainable polymers from lignin and raw vegetable oils. **H. Chung**, S. Kim
9:10 Phosphonates from vegetable oils: Synthesis and tribological evaluation. **G.B. Bantchev**, M. Lorenzo-Martin, O.O. Ajayi
9:27 Chemometric survey of whole stillages and distillers dried grains with solubles from biofuel production reveals processing-related differences in fermentation metabolites. **J. Zhang**, G. Shurson, C. Chen
9:44 Intermission.
9:59 Identification of an antifreeze albumin protein from wheat flour and insights from molecular dynamics simulation. **Y. Yuan**, M. Smith, H. Krishnan, V. Dia, T. Wang
10:16 Succinylation of zein and gelatin hydrolysates improved their ice recrystallization inhibition activity. **Y. Yuan**, M. Fomich, V. Dia, T. Wang
10:33 Biobased lubricants from non-edible animal fats. **M. Sarker**, H. Yosief, G.B. Bantchev, R.O. Dunn
10:50 Continuous depolymerization of lignin through a high-pressure screw feeding reaction system. **Y. Cui**
11:07 Agricultural biomass based biodegradable films: A sustainable solution to address plastic perils. **S. Janaswamy**
11:24 Nutritional metal organic framework (NuMOF) as novel fortified supplements. **X. Yang**, L. Zhang, R. Langer, A. Jaklenec
11:41 Concluding remark.

Colo. Conv. Ctr. Hall D - rm 4
Elevating Sustainability & Greentech in Agriculture & Plant-Based Foods Financially supported by Food Security: Tackling Hunger Convergent Chemistry Community M. Appell, L. Chen, O. Sadik, Y. Tseng, L. Yu, *Organizers, Presiding*
8:00 Introductory Remarks.

8:05 Whole plant holistic approach: Utilizing superfruits for healthy foods and using the waste for non-food related applications. K. Bratley, E.E. Cable, B. Sylla, K. Streeter, L. Osman, W.L. Weaver, A.G. Ristvey, **V. Volkis**
8:25 Triacylglycerol structure and composition of human milk fat substitute affect the absorption of fatty acids and calcium, lipid metabolism and bile acid metabolism in newly-weaned Sprague–Dawley rats. L. Zhu, **Y. Zhang**, B. Gao, L. Yu
8:45 Post pH-driven green technology for developing polyphenols-enriched plant-based foods. **H. Zhou**
9:05 Marine waste-derived chitosan nanocrystals-Zn composites for PFAS removal from water. **X. Jia**, **Q. Wang**
9:25 Enhancing emulsifying properties of lentil protein fibrils at pH 3.0 through EGCG mediation and its related mechanism. **X. Yan**, Z. Zeng, L. Chen
9:45 Intermission.
10:15 Evaluation of soybean [*glycine Max* (L.) Merrill] genotypes for salt tolerance in eastern Ethiopia. **A. Ngusse**, A.G. Hailu
10:35 Tuning particle size and morphology in polyelectrolyte complex coacervate microparticles. **N. Devi**
10:55 Withdrawn
11:15 Evaluation of roasting temperature influence on the characteristics of cottonseed butter. **Z. He**, S. Rogers, S. Nam, K. Klasson, O.M. Olanya

Colo. Conv. Ctr. rm 403
General Papers E. Kreger, J. W. Soares, *Organizers, Presiding*
8:00 Welcome and Introduction.
8:05 Elemental palette: Ionomic profiling across 500 diverse food samples. **J.M. Chaparro**, R.R. Jones, J.C. Evans, M. Gruszcynski, M. Read, S.B. Mitchell, M. Odenkirk, C.D. Broeckling, T. Shafizadeh, S. Watkins, J. Prenni
8:23 Characterization of flavor-protein interactions in model aqueous pea protein solutions. **S. Almquist**, E. Tello Camacho, D.G. Peterson
8:41 Quality assessment of soybean oil available in Bangladesh. **Z. Nasreen**, M. Hossain, M. Alom, M. Jahan
8:59 Withdrawn
9:17 Agri-waste-based sustainable biofertilizers and biopesticides from lignin. **J. Bhaumik**, R. Kaur, A. Pujari, K. Gogde
9:35 Alternaria toxins quantification in America's food industry. E. Capraro, **X. Fu**, K. Du, L. Hunter, A. Savage, C. Mujahid, T. Bessaire
9:53 Intermission.
10:08 Illuminating food science: unveiling stability with light scattering techniques. **F. Shen**
10:26 Withdrawn
10:44 Sustainable antimicrobial packaging films from agro-residue. **J. Bhaumik**, S. Kirar, D. Mohne, S. Goswami
11:02 Polymeric nanodelivery platform with phytohormones to improve crop growth toward sustainable agriculture. **E.A. Davidson**
11:20 Investigating the impact of western flower thrips attack on pepper plants: Insights into physiochemical changes and potential applications. **T. Belwal**, D.L. Kerns, B.S. Patil
11:38 Withdrawn

Colo. Conv. Ctr. rm 404
Processing & the Storage Induced Toxins
Financially supported by Food Security: Tackling Hunger Convergent Chemistry Community L. Jackson, A. E. Mitchell, L. Yu, *Organizers, Presiding*
8:00 Opening Remarks.
8:05 Impact of processing on formation of acrylamide in food. **V. Gökmen**
8:35 Agronomic and genetic approaches, including CRISPR, to reducing acrylamide formation in wheat products. **N. Halford**, N. Kaur, N. Brock, S. Musa
9:05 Analysis and kinetic study of furan contents in various roasted nuts. **K.G. Lee**
9:35 Recent occurrence data on process contaminants in the US food supply and strategies for their mitigation. **V. Incorvati**, E. Abt, L. Robin
10:05 Intermission.
10:20 Analysis of MCPD and glycidyl esters in infant formula and other compound foods: Recent updates from the U.S. Food and Drug Administration. **J. Beekman**, S. Popol, I. Yourick
10:50 Sub-chronic toxicity study of individual and combined oxidized triacylglycerol, 3-chloro-1,2-propanediol esters and aldehydes in 90-day mouse model. **B. Gao**, C. Wang, M. Zhang, H. Zhu, W. Zheng, Y. Luo, L. Yu
11:20 Data delivery from the US-EPA Center for Computational Toxicology and exposure to support food toxin researchers. **A.J. Williams**, J. Gregory, C. Erik, V. Tkachenko

Colo. Conv. Ctr. Hall D - rm 3
Waste Upcycling, Indoor Farming & Sustainable Agriculture Financially supported by Food Security: Tackling Hunger Convergent Chemistry Community K. R. Cadwallader, X. Du, Y. Yin, *Organizers, Presiding*
8:00 Introductory Remarks.
8:05 Upcycling grape pomace waste into food ingredients with solid-state fermentation. **D. Salta**, D. Wang, X. Du
8:35 Upcycling soybean hulls: A novel material for biodegradable packaging films and raspberries preservation. **S. Regmi**, S. Janaswamy
9:05 Withdrawn
9:35 Intermission.
10:00 Valorization of whey proteins via redox-mediated electrodialysis. **A. Aguda**, N. Kim, J. Elbert, X. Su
10:30 Water soluble sodium-carboxymethyl cellulosic residue from corn biomass. **S. Rijal**, S. Subramanian, S. Janaswamy
11:00 Coffee and cacao byproducts as sustainable carbon sources for baker's yeast growth. D. Urbina, L.

Vesga, O. Saavedra, C. Blanco-Tirado, M.Y. Combariza, **S.C. Mendez**

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WEDNESDAY AFTERNOON

Colo. Conv. Ctr. Hall D - rm 4

Elevating Sustainability & Greentech in Agriculture & Plant-Based Foods Financially supported by Food Security: Tackling Hunger Convergent Chemistry Community M. Appell, L. Chen, O. Sadik, Y. Tseng, L. Yu, *Organizers, Presiding*

2:00 Introductory Remarks.

2:05 *Bactris gasipaes* epicarp carotenoid-rich emulsion: A circular economy approach. J. Martínez-Girón, Y. Baena, L. Ordóñez-Santos, **C. Osorio Roa**

2:25 Leveraging plant proteins and polyphenols for enhanced functionality of emulsion-based foods. **K. Ho**

2:45 Standard-based tools toward the goals of food security. **Z. Xie**

3:05 Influence of polysaccharide addition on the cohesiveness of plant-based meat analogue. **M. Li**, T. Wu

3:25 Intermission.

3:45 Protein complexation as a strategy for enhancing the nutritional and functional effects of blueberry polyphenols. M. Symcox, A. Rodriguez-Mateos, S. Johnson, **C. Van Buiten**

4:05 Afoot: Amino-acid-based, food and agricultural-targeted, organic nanozyme for allergic biomolecule detection in food. **D. Lee**, M. Kamruzzaman

4:25 Chemical compositions of edible spice extracts & their potentials in suppressing the SARS-CoV-2 spike protein-ACE2 binding, inhibiting ACE2, and scavenging free radicals. **H. Wu**, L. Yu

4:45 Seed priming with nitrogen-doped carbon dots enhances production, reduces pungency, and improves the postharvest quality and storability of onion bulbs. **D. Jha**, J. Singh, B.S. Patil

Colo. Conv. Ctr. rm 403

General Papers E. Kreger, J. W. Soares, *Organizers, Presiding*

2:00 Welcome and Introduction

2:05 Withdrawn

2:23 Green pH-based approach for solubilizing curcumin molecules into delivery systems. **X. Gong**, H. Zhou, A. Suryamiharja, K. Adhikari

2:41 Solution is in sourdough: harnessing microbial diversity for unique chemical composition of bread. **E. Keohane**, J.M. Chaparro, M. Odenkirk, A. Vaniya, J. Wee, C. Van Buiten, J. Prenni

2:59 Effect of lactic acid bacteria fermentation on volatile compounds, α-dicarbonyl compounds, and antioxidant activity of Robusta coffee beans. **S. Park**, K.G. Lee

3:17 Functional Plant protein fibers obtained by microfluidic spinning technology: an insight into the fabrication, characterization, and mechanism. R. Li, Y. Feng, J. Wang, L. Gong, J. Liu, **H. Zhang**

3:35 AI-driven enzyme discovery: transforming the fight against food contaminants. **D. Zhang**, Y. Tian, A. Wu, Q. Hu

3:53 Intermission.

4:08 Withdrawn

4:26 Advancing Disinfection: Acetylperoxyborate powders as a novel alternative to liquid peracetic acid formulations. **V. Pandit**, S. Agarwal, Y. Sahoo

4:44 Improving astronaut diets in space: Enhanced preservation and nutrition through plasma-treated peas. **L. Chen**, Y. Chou, Y. Ting

5:02 New type of pH adjusted casein extrudate. **M.J. McAnulty**, B. Plumier, A.L. Miller, P. Tomasula

5:20 Use of hydrogen sulfide to increase plant growth and harvest yields. **N.B. Bowden**

Colo. Conv. Ctr. rm 404

Processing & the Storage Induced Toxins Financially supported by Food Security: Tackling Hunger Convergent Chemistry Community L. Jackson, A. E. Mitchell, L. Yu, *Organizers, Presiding*

2:00 Ethyl carbamate: A feed toxin dilemma in distillers grains co-products. **S.L. Crain**, R.T. Coffey

2:30 Formation of chemical byproducts in foods due to nonthermal processing technologies and chemical treatments. **X. Fan**

3:00 Differential disposition of deoxynivalenol in nursery and grow-finish pigs under sulfonation-based mitigation treatments revealed by metabolomic profiling. **W. Mosher**, D. Yao, M. McGhee, D. Giesting, C. Chen

3:30 Determination of patulin in apple juice and apple-derived products using a robotic sample preparation system and LC-APCI-MS/MS. **K. Zhang**, L. Zhang

4:00 Intermission.

4:15 Bacterial endotoxin lipopolysaccharide increases antiinflammatory tristetraprolin and proinflammatory tumor necrosis factor and cyclooxygenase 2 gene expression in mouse macrophages. **H. Cao**

4:45 Evaluating the release of nanomaterial hazards from food packaging using advanced analytical techniques. **T. Yang**

5:15 Transfer of toxic elements to beverages from processing aids used during filtration treatments. **L. Jackson**

5:45 Concluding Remarks.

Colo. Conv. Ctr. Hall D - rm 3

Waste Upcycling, Indoor Farming & Sustainable Agriculture Financially supported by Food Security: Tackling Hunger Convergent Chemistry Community K. R. Cadwallader, X. Du, Y. Yin, *Organizers, Presiding*

2:00 Introductory Remarks.

2:05 Enhanced wound healing efficacy of electrospun porous bilayer nanofibrous fish collagen/PCL bio-composite scaffolds with covalently linked chitooligosaccharides. **S. Moon**, W. Jung, P. Chandika

2:35 Molecular Networking LC-HRMS as a tool for discovering novel potential bioactives in Bell pepper. **J. Redwine**, C. Matias Sainz, W. de Bruijn

3:05 Impact of salinity stress on growth, aroma, and gene expression of hydroponic fennel (*Foeniculum*

vulgare Mill.). **J. Liu**, A. Sumner, A. Harris, W. Wei, B. Bargmann, D. Haak, Y. Yin
3:35 Intermission.
4:00 Comparison of physiochemical properties of lettuces from open field and various hydroponic conditions. E. Kwock, G. Niu, **X. Du**
4:30 Controlled environment agriculture: Supplemental blue and UV-B light modulates tomato phenolic compounds and antioxidant activity in a variety-dependent manner. **S. Bhattarai**, D. Jha, S. Zhen, B.S. Patil
5:00 Flavor composition and shelf-life of cherry tomatoes (*Solanum lycopersicum* var. cerasiforme) grown in field and controlled environment. **I. Gutierrez**, J. Eifert, S.F. Okeefe, K. South, M. Evans, Y. Xu, T. Kuhar, Y. Yin

VIRTUAL SESSION
Virtual Graduate Students Symposium in Asia-Pacific Region on Agricultural & Food Chemistry **D**. Ren, C. Zheng, *Organizers, Presiding*, J. Hou, *Presiding*
6:30 Opening.
6:33 Energy status regulated umami compound metabolism in harvested shiitake mushrooms (*Lentinus edodes*) with spores triggered to release. **R. Xia**, H. Xu, G. Xin, Z. Hou, M. Yan, Y. Wang, G. Qian, Y. Qiao
6:46 Analytical strategies for detecting low molecular weight toxicants in food matrices by MALDI-TOF MS. **X. Zeng**, Y. Wang, Z. Xu
6:59 Study on the hypolipidemic effect of lotus seed resistant starch and sodium lactate regulating intestinal flora and metabolism in hyperlipidemia rats. **L. Liu**, Z. Guo, B. Zheng, H. Zeng, Y. Zhang
7:12 *Bifidobacterium lactis* Probio-M8 relieved acute Respiratory tract infections in children possibly by modulating the gut microbes and metabolites. Y. Li, **X. Shi**, T. Ma, W. Hu, H. Jin, H. Zhang, M. Liong, Z. Sun
7:25 Predicting *Lactobacillus delbrueckii* subsp. *bulgaricus-Streptococcus thermophilus* interactions based on a highly accurate semi-supervised learning method. **S. Yang**, M. Bai, W. Liu, Z. Sun
7:38 Super antibacterial capacity and cell envelope-disruptive mechanism of ultrasonically grafted n-Halamine PBAT/PBF films against *escherichia coli*. **X. Zhang**, M. Guo
7:51 Spoilage mechanism of effctor protein Hap secreted by *Aeromonas salmonicida* on chilled meat. **L. Shao**, H. Wang
8:04 Screening of probiotics producing biofilm and evaluation of their probiotic properties. **Y. Liu**, Y. Liu, J. Cao, H. Yi
8:17 Simple and effective probiotic single-cell encapsulation system based on milk exosomes. **H. Linlin**, Y. Liu, J. Cao, Y. Liu, H. Yi
8:30 Effects of psyllium husk and *Ligilactobacillus salivarius* Li01 in relieving loperamide induced constipation and regulating metabolism. **L. Xu**
8:43 Identification, characterization, and receptor binding mechanism of new Umami peptides from traditional fermented soybean paste (Dajiang). **K. Cao**, F. An, J. Wu, S. Ji, Y. Rong, Y. Hou, X. Ma, W. Yang, L. Hu, R. Wu
8:56 Construction of interface-enhanced curcumin-loaded nanostructured lipid carriers and their multi-responsive microspheres. **D. Liu**, L. Zou, C. Li, J. Feng, J. Zhang
9:09 Structure and antioxidant activity analysis of the different black beans protein hydrolysates. **L. Li**, N. Zhang, Y. Yang, C. Ma, B. Wang, X. Bian, G. Zhang
9:22 Effect of subzero temperatures on the properties and structure of soy protein isolate emulsions. **H. Hu**
9:35 Role and mechanism of three bile salt hydrolases in bile tolerance of *Lactobacillus acidophilus* ATCC 43121. **H. Wu**
9:48 Emulsifying properties of Maillard reaction products from brewer's spent grain protein and gum arabic. **M. Kim**, K.G. Lee

Agrochemical Residue Analytical Methods & Radiolabeled Metabolism Studies: Regulatory Requirements/Methodologies, Execution & Challenges Spons. GRO, Cospons. AGFD, ANYL, ENVR
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THURSDAY MORNING August 22
Colo. Conv. Ctr. rm 404
Elevating Sustainability & Greentech in Agriculture & Plant-Based Foods Financially supported by Food Security: Tackling Hunger Convergent Chemistry Community, M. Appell, L. Chen, O. Sadik, Y. Tseng, L. Yu, *Organizers, Presiding*
8:00 Introductory Remarks.
8:05 Characterization of glandless cottonseed protein in fortified beverages. **H. Cao**, K. Sethumadhavan, H. Cheng
8:25 Re-thinking use of salicylic acid-based poly(anhydride-ester)s: From biomedical to agricultural applications. **V. Batiz**, M. Reis Nogueira de Lima, G. Regalado, L. Safi, T. Eulgem, K. Uhrich
8:45 Withdrawn
9:05 Protein-phenolic interactions in plant-based foods. **E. Capanoglu**, D. Gunal-Koroglu
9:25 Intermission.
9:55 Upcycling protein-rich agri-food resources to produce novel materials for health enhancement. **C. Udenigwe**
10:15 Study the molecular structure and gelling properties of dry fractionated pea protein by air classification. **S.M. Kottage**, A.G. Samaranayaka, P. Bhowmik, L. Chen
10:35 Interactions between oat protein isolate and high methoxyl pectin and their potential applications as nutraceutical delivery systems. **C. Yang**, Y. Qiao, H. Hu, A. Li, J. Wang

10:55 Use of zein-based assemblies for encapsulating, protecting and delivering bioactive components. **L. Liang**

Colo. Conv. Ctr. rm 405
General Papers E. Kreger, J. W. Soares, *Organizers, Presiding*
8:00 Welcome and Introduction.
8:05 Pulse protein hydrolysates exhibited ice recrystallization inhibition activity after immobilized metal affinity separation. **T. Wang**, J. Saad, V. Dia, M. Longo Martins
8:23 A water soluble protein fraction from black soldier fly larvae has strong antifreezing activity. **T. Wang**, M. Fomich, V. Dia, H. Krishnan
8:41 Suggested pathways to waterpipe tobacco reference products. **J.H. Lauterbach**
8:59 Curcuminoids analysis of turmeric roots and dietary supplements. **D. Luthria**
9:17 Investigating interaction of purple wheat anthocyanin extract with ferulic acid or resveratrol for improving product stability. **E.M. Abdelaal**, T.H. Gamel
9:35 Continuous flow high-pressure homogenization's impact on grapefruit juice quality: preserving nutrition and reducing furanocoumarins. **J. Adhikari**, K. Adhikari, R.K. Singh, B.S. Patil
9:53 Intermission.
10:08 High fried food consumption and acrylamide raises nonalcoholic fatty liver disease through energy disorders and PGE2-PPARα pathway. **X. Wan**, X. Liu, J. Jiao, Y. Zhang
10:26 Habitual daily intake of fried foods raises transgenerational inheritance risk of heart failure through Notch1-triggered apoptosis. **a. wang**, **Y. Zhang**
10:44 Applying the idea of directed revolution in industrial biosynthesis: Flexible production of fermentation products. **N. Liu**
11:02 μBites: The chemo-bio hybrid process to generate next generation food ingredients from waste polymers. **L.N. Jayakody**
11:20 Nanoemulsion with *Lactobacillus*-derived exopolysaccharide potentiates the antimicrobial activity of eugenol to protect fresh produce against foodborne pathogens and biofilms. **S. Balyan**, V. Dadwal, B.S. Patil

THURSDAY AFTERNOON
VIRTUAL SESSION
Virtual Graduate Students Symposium in Asia-Pacific Region on Agricultural & Food Chemistry D. Ren, C. Zheng, *Organizers, Presiding*, X. Yu, *Presiding*
6:30 Opening.
6:33 Characterizing different probiotic-derived extracellular vesicles as a novel adjuvant for immunotherapy. **Y. Huang**, P. Li
6:46 Effect of chlorogenic acid on lotus seed starch gelatinization behavior and complexation mode during microwave treatment. **X. Jiang**, B. Zheng, X. Lu
6:59 Metabolite fingerprints identification of Citri Reticulatae Pericarpium with different aging years using feature-based molecular networks and metabolomics. **k. Xu**, Z. Yang, Y. Wang, H. Han, F. Meng, B. Wang
7:12 Investigating the interaction and antimicrobial mechanism of α-lactalbumin-carvacrol/thymol complexes. **M. Diao**, R. Zhou, Z. Li, T. Zhang
7:25 Combined analysis of horse milk fat differences based on transcriptomics and metabolomics techniques. **X. Li**
7:38 Ursolic acid protects against chronic alcohol consumption-induced fatty liver disease in mice. **J. Qiu**, S. Li
7:51 Structure and digestive characteristics of Butyrylated rice starch with different degree of substitution. **Q. Wu**, N. Zhang, **Z. Xu**, **Y. Yang**, C. Ma, X. Bian, **B. Wang**, G. Zhang
8:04 Preparation and stability analysis of cannabidiol microcapsules. **R. Yu**, Z. Jiang
8:17 Effect of wheat aleurone on lard emulsions during in vitro digestion. **X. Diao**, C. Li
8:30 Dynamic changes of gut microbiota following short-term, high-dose probiotic consumption. **X. Shen**, H. Jin, F. Zhao, Z. Sun
8:43 Identification of umami peptides based on peptidomics and virtual screening from strengthened fermented soybean paste. **G. Pan**, **J. Jiang**, **F. An**, **J. Wu**, **R. Wu**
8:56 Optimization of ultrasound-assisted extraction of fatty acids from royal jelly and its effect on the structural and antioxidant property. **X. Yu**, S. Li, S. Peng, L. Tao, F. Hu
9:09 Red, firm, non-exudative and pale, soft, exudative pork have different in vitro digestive properties of protein. **S. Li**, C. Li
9:22 *Lactobacillus rhamnosus* ZJUIDS07 ameliorates type 2 diabetes in mice in association with modulation of gut microbiota. **Z. Wu**, J. Gao, D. Ren
9:35 NMN relieves progression of alcoholic liver disease via a hamp-involved mechanism in mice. **F. Cao**, X. Ge, S. Li
9:48 Recent development on anti-obesity effects of postbiotics. **J. Zhang**, J. Hou
10:01 KCl enhances the germination of superdormant *Clostridium perfringens* spores. **Q. Xiao**

ABSTRACTS FOR PRESENTATIONS IN THE AGFD TECHICAL PROGRAM

SUNDAY MORNING August 18
Sustainable Agriceuticals

Lactobacillus helveticus ZJUIDS12 rescues alcohol-related liver disease via a Clostridium butyricum-regulated Reg3γ pathway in mice Qinchao Ding[1], Feiwei Cao[1,2], Shanglei Lai[3], Songtao Li[2], **Daxi Ren**[1], dxren@zju.edu.cn. (1) Zhejiang Univ. Institute of Dairy Science, Hangzhou, Zhejiang, China(2) Zhejiang Chinese Medical Univ. School of Public Health, Hangzhou, Zhejiang, China(3) School of Life Science, Zhejiang Chinese Medical Univ., Hangzhou, China Alcohol-related liver disease (ALD) has become a serious public

health issue worldwide. Emerging evidence showed the therapeutic practicability of probiotics supplementation on ALD by interfering with the gut-liver axis. This study investigated the protective role of Lactobacillus helveticus ZJUIDS12 (hereafter Z12) on hepatic steatosis and liver injury in an ALD model established by feeding mice with Lieber-DeCarli liquid alcohol diet. Z12 (10^9 CFU/day) administration significantly reversed alcohol-induced hepatic steatosis and liver injury in ALD mice, along with the improvements of liver oxidative stress and inflammation. Alcohol-impaired small intestine barrier, -downregulated barrier-related genes (Zo-1, Occludin, and Claudin-1) and antimicrobial peptide Reg3γ expressions in intestinal epithelium, and -increased plasma endotoxin and fecal albumin were obviously rescued by Z12 intervention. The above beneficial roles of Z12 were abolished in ABX-treated mice, indicating a gut microbiota-involved mechanism in Z12-protected ALD. Intestinal microbiome and 16s rDNA analysis showed that Z12 treatment robustly restored alcohol-reduced proportion of Clostridium sensu stricto 1, which was positively associated with Reg3γ up-regulation. Supplementing ALD mice with Clostridium butyricum ATCC 19398 (hereafter C.B.), a representative strain of Clostridium genus, as well as its metabolite butyric acid exhibited identical protection as Z12 did. Mechanistical investigations revealed that either C.B. and its metabolite butyric acid or Z12-protected ALD was markedly blocked in Reg3$\gamma^{-/-}$ mice. Heat-inactivated Z12 still ameliorated ALD as Z12 did. These beneficial protective effects could be replicated in Z12-derived exopolysaccharides administrated ALD mice. Our present study suggests that Z12 and its postbiotics attenuate chronic alcohol-induced hepatic steatosis and liver injury through a Reg3γ-dependent pathway via promoting butyric acids production by C.B. in mice. Our findings highlight utilizing probiotics and postbiotics as promising strategies for the treatment of ALD.

Regulation and mechanism of exopolysaccharide produced by Bifidobacterium. infantis E4 on immunomodulatory effect of intestinal mucosa in immunocompromised mice **Bailiang Li**, 15846092362@163.com. College of Food Sci., Northeast Agricultural Univ., Harbin, Heilongjiang, China Intestinal mucosa plays an important role in immune regulation, and damage to it may cause intestinal homeostasis disorders and even a variety of diseases. The metabolites exopolysaccharides (EPS) of Bifidobacterium perform anti-inflammatory, antibacterial, and immunomodulatory effects. In this study, firstly, Bifidobacterium was isolated from the feces of healthy infants aged 6 to 12 months, and the comprehensive ability of gastrointestinal fluid tolerance, adhesion, antimicrobial capacity, and protection of intestinal epithelial cells was determined. Secondly, the ability of carbohydrate metabolism was further investigated by genomics. Thirdly, EPS was isolated and purified and its structure was analyzed. Fourthly, the immunomodulation and barrier repair effects of EPS were investigated by RAW 264.7 and IEC-6 cells in vitro. Fifthly, the effects of EPS on immune regulation and intestinal barrier relief were investigated in immunocompromised mice induced by cyclophosphamide (CTX). The results showed that the overall score of B. infantis E4 was the highest, which was used for follow-up experiments. The genome showed the existence of a synthesis gene cluster and the complete synthesis pathway of EPS. Three components, EPS-1, EPS-2, and EPS-3, were isolated and purified, and the yield of EPS-1 and EPS-2 was higher than that of EPS-3. Both EPS-1 and EPS-2 possessed absorption peaks including C-H and C=O groups and appeared a triple helix structure. In vitro cell experiments showed that for both EPS-1 and EPS-2, the paracellular permeability decreased, and the transmembrane resistance value of IEC-6 cells and the mRNA expression of cell tight junction proteins increased. Animal experiments showed that the intestinal tissue lesions induced by CTX were alleviated and intestinal mucosal immunity was regulated by EPS-1 and EPS-2. This effect was mediated by up-regulation of TLR4/NFκB/MAPK signal-related genes, J-chain, and PIGR protein expression in the ileum. In addition, gut microbiota and their metabolites were modulated by EPS-1 and EPS-2. In summary, the B. infantis E4 performed superior probiotic properties and EPS-producing capacity. EPS-1 and EPS-2 glucoside bonds containing 1, 4-glucose and 1, 2-mannose played an active role in exerting biological activity. EPS1 and EPS2 exhibited immunomodulatory and intestinal mucosal barrier-relieving effects and had the potential to regulate organismal health.

Characterization and quantification of antimicrobial metabolites produced by lactic acid bacteria against canine periodontal pathogens **Kun Ho Seo**, bracstu3@gmail.com. Konkuk Univ., Gwangjin-gu, Seoul, Korea (the Republic of) Antimicrobial metabolites from lactic acid bacteria (LAB), which are crucial for combating chronic diseases by suppressing pathogens, have rarely been studied for their efficacy against canine periodontal bacteria using food-derived LAB. This research explored the antimicrobial activity of LAB metabolites against Campylobacter rectus, Porphyromonas cangingivalis, and Porphyromonas gulae. LAB strains were isolated from two fermented food sources: kefir, a dairy product, and kimchi, a fermented vegetable. The study characterized and analyzed the antimicrobial potency of various LAB metabolites, including organic acids and exopolysaccharides (EPSs). All LABs produced lactic acid at 24.97 ± 2.75 mg/ml, exhibiting significant antimicrobial activity. With the exception of L. kefiranofaciens DN1, the EPS generated by other LABs significantly hindered C. rectus ($p < 0.05$). Typically, the EPSs from LAB contained glucose and galactose. In particular, EPS of L. plantarum DY8 with glucose, galactose, and mannose (1.21 : 1.00 : 1.14) showed the greatest antimicrobial activity. Antimicrobial metabolites including lactic acid and EPS from LAB were produced and exhibited excellent antimicrobial activity against periodontal pathogens. The results suggest the potential of LAB metabolites in the treatment and prevention of canine periodontal diseases.

10-Hydroxy-2-decenoic acid alleviates okadaic acid-induced tau hyperphosphorylation in SH-SY5Y neuroblastoma cell and mouse model of Alzheimer's disease Lingchen Tao, Kangli Wang, Xinyu Yu, Guozhi Zhang, **Shanshan Li**, lishanshan@zju.edu.cn, Fuliang Hu. Zhejiang Univ., Hangzhou, Zhejiang, China Tau protein hyperphosphorylation is recognized to be associated with the pathogenesis of Alzheimer's disease. Royal jelly has been reported that can alleviate Alzheimer's disease induced by a high fat and cholesterol diet. However, the key components in royal jelly contributing to this positive effect has not been explored. The aim of this study was to investigate the effects of the specific fatty acid in royal jelly (10-Hydroxy-2-decenoic acid) on the okadaic acid-induced tau hyperphosphorylation and its underlying mechanisms in vivo and in vitro. Results showed that 10-HDA can alleviate okadaic acid (OA)-induced tau protein hyperphosphorylation in SH-SY5Y neuroblastoma cell and mouse model of Alzheimer's disease. 10-HDA improved the cognitive function which ascribed to the increased neurotransmitter GABA level in OA-treated mice. Simultaneously, 10-HDA also inhibited the over-activated neuroglia cells to reduce the Aβ burden of brain. Transcriptomic analysis revealed that 10-HDA play a neuroprotective role via regulating NF-κB and mTOR signaling pathways, indicating that 10-HDA alleviates OA-induced tau hyperphosphorylation by anti-inflammation activity. 10-HDA may be a promising agent for Alzheimer's disease.

Enhanced gut microbiota delivery of Faecalibacterium prausnitzii through layer-by-layer encapsulation with riboflavin-conjugated sodium alginate and glycol chitosan **Mingfei Yao**, mingfei@zju.edu.cn, Bo Qiu, Lanjuan Li. State Key Laboratory for Diagnosis and Treatment of Infectious Diseases, National Clinical

Research Center for Infectious Diseases, Zhejiang Univ., Hangzhou, Zhejiang, China Faecalibacterium prausnitzii (F. prausnitzii) has a variety of biological functions suitable for a potential next-generation probiotic. However, its extreme sensitivity to oxygen and digestive fluids has so far limited its application. Riboflavin (Rib) can support the growth of F. prausnitzii in oxygen environments, and layer-by-layer self-assembly serves as an effective encapsulation method to shield probiotics from adverse conditions. Therefore, in this study, we evaluated the encapsulation of F. prausnitzii with a novel probiotic capsule synthesized from riboflavin-conjugated sodium alginate (Rib-Alg). The results showed that Rib could be successfully conjugated to sodium alginate (Rib-Alg), with a grafting ratio of ~4.35%. Then, F. prausnitzii was encapsulated by using glycol chitosan (GC) and Rib-Alg by a layer-by-layer self-assembly method, forming a protective shell with a thickness of approximately 18.46 nm. Encapsulation did not adversely affect the growth of F. prausnitzii, however, it significantly enhanced F. prausnitzii's resistance to oxygen and digestive fluids. By using an in vitro intestinal monolayer model, encapsulated F. prausnitzii was shown to have improved mucoadhesive properties. Furthermore, encapsulated F. prausnitzii exhibited a longer duration of colonization than the nonencapsulated F. prausnitzii in the colon of rats. Our results indicate that encapsulation with GC and Rib-Alg could allow F. prausnitzii to overcome its limitations of susceptibility to oxygen and digestive fluids, and enhance its mucoadhesion and colonization, allowing realization of its potential as an orally administered probiotic.

Effect of polyphenol extract-derived postbiotics on hindlimb-immobilized mice **Hyunsook Kim**[1], hyunsk15@hanyang.ac.kr, E Seul Kim[1], Yejin Jung[1], Seunghyeon Jung[1], Hye-Young Youn[2], Hyeon-Jin Kim[2], Kun Ho Seo[2]. (1) Food and Nutrition, Hanyang Univ., Seongdong-gu, Seoul, Korea (the Republic of)(2) Konkuk Univ., Gwangjin-gu, Seoul, Korea (the Republic of) Kefir lactic acid bacteria (LAB) may effectively convert citrus pomace extract (CPX) and whey (WHE) into a biologically potent product (CPB). To determine the effect of CPB on sarcopenia, C57BL/6J mice were hindlimb-immobilized for 2 weeks and orally administered on a high-fat (HF) diet for another 3 weeks. CPB was compared to oral administrations of saline (CON) and creatine. CPB ameliorated immobilization-induced sarcopenia by restoring grip strength and muscle weight. In conclusion, the kefir LAB-derived bioconversion of WHE and CPX may be a useful way to treat sarcopenia.

Antibacterial mode of action of a bacteriocin derived from lactic acid bacteria and its modulation effect on intestinal inflammation **Ping Li**, ping-biology@outlook.com. College of Food Sci. and Biotechnology, Zhejiang Gongshang Univ., Hangzhou, Zhejiang, China Numerous strains of lactic acid bacteria (LAB) exhibit excellent antimicrobial properties and have been discovered to possess beneficial regulatory effects on intestinal inflammation. Lactobacillus plantarum ZJ316, was initially isolated from fecal samples taken from healthy newborns in our laboratory. It has shown to effectively inhibit pathogenic microorganisms and alleviate DSS-induced intestinal inflammation in mice. However, the specific functional components responsible for these effects still remain largely unknown. Bacteriocins, which are peptides or proteins synthesized by bacterial ribosomes, have gained significant attention in recent years due to their potent antimicrobial activities. Within L. plantarum ZJ316, a specific two-peptide class IIb bacteriocin named Plantaricin NC8 (PLNC8) has been identified, displaying high efficacy against pathogenic microorganisms such as Salmonella enterica, Escherichia coli, and Listeria monocytogenes.In this study, we aim to uncover the antibacterial mechanism of PLNC8 and explore its modulation effect on intestinal inflammation. We constructed plnc8 gene knockout and gene complementation strains, and utilized a combination of in vitro intestinal simulation experiments, in vivo animal models, and multi-omics techniques to elucidate the regulatory effects of PLNC8 on gut microbiota, microbial metabolism, and its proactive function on the intestinal epithelial barrier. This integrated approach allows for a comprehensive analysis of the role of lactic acid bacteria, functional factors, and their impact on intestinal health regulation.

SUNDAY AFTERNOON
Sustainable Agriceuticals

Transcriptomic analysis of Taihe black-boned silky fowl leg muscles under different farming models **Xuan Huang**, huangxuanll@zju.edu.cn, Yuting Tan, Chunhui Xu, Yunyan Huang, **Zhaozheng Yin**, yzhzh@zju.edu.cn. college of animal sciences, Zhejiang Univ., Hangzhou, Zhejiang, China The Taihe black-boned silky fowl, native to Taihe, Jiangxi Province, is acclaimed for its unique set of ten characteristics and its celebrated "food as medicine" value. Our study aimed to elucidate the molecular mechanisms influencing the growth and meat quality of this breed under two primary rearing methods: indoor caging and outdoor free-range farming. We conducted a comparative analysis of the meat quality and transcriptomic data of the leg muscles in 150-day-old Taihe black-boned silky fowls from both rearing environments. The findings revealed that the free-range fowls exhibited superior muscle fiber diameter, pH levels, tenderness, and water retention capacity compared to their caged counterparts. Notably, our functional pathway analysis highlighted the significant impact of the G-protein-coupled receptor signaling pathway and PPAR signaling pathway on muscle development and quality in the free-range reared fowls. Additionally, we identified several key genes—FABP1, LPL, FABP4, ACSL1, and PLIN2—that are closely linked to meat quality, paving the way for future research in genetic and nutritional interventions for meat quality improvement. Considering the implications for animal welfare and operational efficiency, our research strongly supports the adoption of free-range farming in the rearing of Taihe black-boned silky fowl. This study represents a significant step forward in understanding the functional molecular mechanisms that influence muscle quality in this breed and contributes valuable insights for optimized breeding practices.

Abnormally elevated thyroid antibodies in Hashimoto's thyroiditis patients were positively associated with inflammation and multiple non-hypothyroid symptoms **Jiaomei Li**, jiaomeili90@163.com, Songtao Li, Qingling Huang. Zhejiang Chinese Medical Univ., Hangzhou, Zhejiang, China HasHashimoto's thyroiditis (HT) is an autoimmune disease, characterized by abnormal elevation in thyroid peroxidase antibody (TPO-Ab) and/or thyroglobulin antibody (TG-Ab). Patients have multiple symptoms despite adequate hormone substitution. In the present study, we aimed to quantify the relationship between thyroid antibodies and multiple symptoms, inflammation and health-related life quality. A total of 125 HT patients with clinical euthyroid status and 57 heathy controls were recruited. Clinical parameters were determined by laboratory examination, and the symptoms burden and life quality were obtained by a Hashimoto's Thyroiditis Symptom Questionnaire and a SF-36 Questionnaire, respectively. Compared with healthy controls, multiple extrathyroidal symptoms were significantly more serious in HT patients despite euthyroid status while receiving hormone replacement therapy, mainly including that related to digestive system (abdominal distension, constipation and diarrhea), endocrine system (chilliness, gain weight and facial edema), neuropsychiatric system (forgetfulness, anxiety, depressed, fatigue, insomnia, multiple dreams, irritability and indifferent) and mucocutaneous system (dry skin, pruritus and hair loss). Furthermore, serum TPO-Ab and TG-Ab were both inversely

correlated with health-related life quality of general health and vitality parameters, and positively correlated with pro-inflammatory factors of TNF-α and IFN-γ, as well as severity of abdominal distension, diarrhea, chilliness, forgetfulness and fatigue. Moreover, TG-Ab level was positively associated with depressed, insomnia and indifferent. In conclusion, HT patients suffered from a variety of symptoms, and the elevated thyroid antibodies were inversely associated with health-related life quality and positively associated with inflammation and multiple non-hypothyroid symptoms.

Transcriptomic and metabolomic analysis of Guyuan chicken breast muscles at different developmental stages Haiyang Zhang, **Xuan Huang**, huangxuanll@zju.edu.cn, Yuting Tan, Yunyan Huang, Zhaozheng Yin. College of Animal Sciences, Zhejiang Univ., Hangzhou, Zhejiang, China To enhance the meat quality of local chicken breeds with distinct geographical and cultural significance, our study applied transcriptomic and metabolomic techniques to analyze gene expression and metabolic substances in the breast muscles of Guyuan chickens at various developmental stages. By systematically tracking changes in gene expression and metabolite composition across three age phases, we identified 907 differentially expressed genes. These genes indicate potential regulatory elements and signal pathways key to muscle development and meat quality, including IGF2BP1, Myf6, FBXO32, COL22A1, and pathways such as Rap1, mTOR, PI3K-Akt, and Jak-STAT signaling pathways. Metabolomic analysis uncovered 303 distinct metabolites, highlighting potential metabolic markers for muscle growth and meat quality such as Homoanserine, L-Lysine, Glutamine, Glutathione, Leucine, and Histidine. Correlation analysis between gene expressions and metabolic profiles across developmental stages pinpointed pathways significantly influencing growth, development, and quality changes in Guyuan chicken breast muscle, including arachidonic acid metabolism, histidine metabolism, autophagy, and the biosynthesis and degradation of valine, leucine, and isoleucine, as well as glycerophospholipid metabolism. This integrative approach of combining transcriptomic and metabolomic data provides deeper insights into the biological processes driving development and meat quality progression, identifying valuable candidate genes and metabolic biomarkers essential for enhancing chicken meat quality.

Valencia orange peel extract prevents body and adipose weight gain in mice on high-fat diets **Hanna Lee**[1], hanna1.lee@usda.gov, Hana Lee[2], Priscila Alves[1], Yu Wang[2], Wallace H. Yokoyama[1]. (1) Healthy Processed Foods Research, USDA, Albany, California (2) Citrus Research and Education Center, Univ. of Florida, Lake Alfred The U.S. orange juice industry produces about 5 million tons of citrus waste. Orange peels contain bioactive compounds shown to inhibit the hydrolysis of trimethylamine (TMA) containing foods into TMA. TMA is transported in blood from the colon to the liver where it is oxidized to trimethylamine oxide (TMAO). TMAO has been associated with cardiovascular and other metabolic diseases. We fed mice high-fat (HF) diets to induce obesity related metabolic dysfunctions. Carnitine, 3-hydroxy-4-(trimethylazaniumyl)butanoate (C), was included in HF diets (HF+C) as a substrate for TMA formation. The orange peel extract (OPX)was added to the HF+C diet (HFCO) and the HF diet (HFO) to evaluate the ability of OPX to prevent obesity related metabolic dysfunctions. We found that diets containing C, including a low- fat diet, reduced weight gain and adipose weight despite its rapid excretion in urine. OP increased the concentration of C in blood, suggesting it inhibits the metabolism of C to TMA. OP further decreased adipose weight, HPC vs HPCO. The lower adipose weight of C is due to the beta-oxidation of fatty acid acylcarnitines by mitochondria. TMA is reported to reduce intestinal tight junction barrier function. The further decrease of adipose weight by OP may be due to reducing inflammation by improving intestinal barrier function.

10-hydroxy-2(e)-decenoic acid improves nonalcoholic fatty liver disease through activation of the peroxisome proliferator-activated receptor signaling pathway **Xinyu Yu**, yuxinyu@zju.edu.cn, Shanshan Li, Jiayi Bao, Jingyan Li, Lin Wei, Meifei Zhu, Fuliang Hu. College of Animal Science, Zhejiang Univ., Hangzhou, Zhejiang, China Nonalcoholic fatty liver disease (NAFLD) is one of the most prevalence chronic disease worldwide, affecting approximately a quarter of the global population. However, due to the complex and unclear pathophysiological mechanism, there are no specific approved agents for treating NAFLD. 10-Hydroxy-2(E)-decenoic acid (10-HDA), a medium chain fatty acid in royal jelly, exhibits a wide range of bioactive activities, including antioxidant, anti-inflammatory and immune regulation activities. However, the effects on metabolism of 10-HDA and underlying mechanisms have not yet been characterized. In this study, palmitic acid/oleic acid (PO)-stimulated $HepG_2$ cells and high-fat diet (HFD)-induced hamster were used as NAFLD models to evaluated the effects of 10-HDA on the development of NAFLD. The result showed that 10-HDA effectively prevented HFD–induced NAFLD progression by downregulated body weight, liver weight, hepatic injury, lipid accumulation and inflammation. In addition, 10-HDA supplement diminished the lipotoxicity in PO-stimulated $HepG_2$ hepatocytes, evidenced by decreased steatosis, oxidative stress and inflammatory response. In addition, 10-HDA significantly regulated the expression of mitochondrial function and endoplasmic reticulum (ER) stress related genes including PGC1α, TFAM, GRP78 and CHOP of $HepG_2$ hepatocytes and efficiently restrained the oxidative stress and lipid accumulation. Mechanistically, integrated RNA-sequencing analysis showed that 10-HDA ameliorates NAFLD by activating fatty acid oxidation in hepatic peroxisome proliferator-activated receptor (PPAR)-dependent way in vitro. In conclusion, our studies demonstrate that 10-HDA protects against NAFLD progression through activation of PPAR signaling, indicating that 10-HDA has the potential as a dietary supplementation for the prevention of NAFLD.

Effect of molecular weight, conformation and viscosity of water-soluble yellow mustard mucilage on the proliferation of probiotic strains **Chekenna Fletcher**, cfletch6@tnstate.edu, Ying Wu. Food and Animal Sciences, Tennessee State Univ., Nashville Gut health is a crucial part of one's overall health as it can affect many parts of the body. Both probiotics and prebiotics can stimulate the growth of healthy bacteria in the gut. Currently, novel materials are sought as encapsulation agents for probiotics to provide additional health benefits to enhance gut health. Water soluble yellow mustard mucilage (WSM) has prebiotic effects on several probiotic strains including Lactobacillus plantarum, Lactobacillus rhamnosus, Lactobacillus acidophilus, Lactobacillus casei, and Bifidobacterium bifidum. However, due to the low solubility of WSM, its application as an encapsulation ingredient is limited. WSM can be hydrolized into fractions with smaller molecular weight (Mw) to improve solubility. The effect of molecular weight (Mw), viscosity and conformation of WSM hydrolyzed fractions is unclear in terms of their effect on growth performance of the tested probiotic strains. In the current study, WSM were hydrolyzed using pectinase, and the WSM fractions with various Mw were collected to test on the probiotic strains. The results have indicated that the smaller the Mw fractions, the better growth performance of the bacterial strains, which may be due to the better mobility of the WSM molecules thus more bioavailable as a nutrient source. The molecular conformations of WSM showed no effect on the bacterial growth. The viscosity of the WSM fractions were correlated to Mw thus a less viscous solution showed better promoting effect on bacterial strains. This information will help in developing synbiotic products using WSM as a novel carrier to protect the probiotic strains, and meanwhile provide

an energy source for the probiotics. Further studies will be carried out to investigate the encapsulated synbiotic products using WSM, and the corresponding promoting effect on gut health.

ACS Microbiome Research Consortium - Microbiome in Foods, Crops & Agriculture: Building Partnership

2Blades & the unmet need: Leveraging plant immune receptors to improve crop resistance around the world **Brian Rutter**, brutter@umn.edu. 2Blades, St. Paul, Minnesota Our global food systems are under stress, challenged by a growing population, climate change and devastating plant diseases. Ninety-five percent of new population growth will occur in developing countries, such as Africa and Asia, where 80% of the local food is produced by smallholder farmers. These farmers lack the resources available to commercial operations, including infrastructure to mitigate the effects of climate change and advanced technologies for managing pests and diseases. Access to robust, disease-resistant crops is one of the most direct and effective solutions to help these farmers improve their output. 2Blades is non-profit agbiotech company, which for 20 years, has been dedicated to advancing disease resistance in key crops and putting them in the hands of growers, including smallholder farmers in developing countries. 2Blades has developed proprietary resources that facilitate fast-tracking of disease resistance traits. In its hub based at the Univ. of Minnesota, Twin Cities campus, 2Blades is employing these powerful technologies to advance resistance to mycotoxigenic fungi in corn. These fungi contaminate food and feed with potent toxins, resulting in billions of dollars of losses annually and serious impacts on human and animal health.

Mycotoxin contamination to wheat grain predicted by microbiome colonization patterns early in the growing season **Briana K. Whitaker**[1], briana.whitaker@usda.gov, Martha M. Vaughan[1], Susan P. McCormick[1], Talon Becker[2]. (1) Mycotoxin Prevention & Applied Microbiology, USDA-ARS, Peoria, Illinois (2) Crop Science Research and Education Center, Univ. of Illinois Urbana-Champaign, Urbana-Champaign, Illinois Fusarium head blight (FHB) is a devastating disease of wheat that affects both small grain yield and quality via contamination with mycotoxins. FHB has traditionally been managed with integrated control strategies (e.g., fungicides, tilling), but this has led to a proliferation of fungicide-resistant pathogens and soil erosion. Microbial biocontrols are one possible alternative management strategy for FHB. However, translation of promising strains from the lab to the field is hampered by our lack of understanding on the colonization of crop microbiota across plant development and tissue types. To tackle this dilemma, we planted three varieties of wheat in replicated field plots at two locations in Illinois. The fungal microbiome was analyzed across five developmental timepoints in wheat leaves and heads and in the corn debris left over from the previous growth season. Fungal microbiome composition varied strongly by tissue type, though 4% of taxa were shared in common across all three tissue types and 12% were shared between at least two tissue types. Within locations, there was a clear trajectory in microbiome composition across the developmental timepoints – with microbiota from earlier in the season seeding the microbial community in later portions of the season. In addition, microbiome composition was most significantly affected by host variety in wheat heads, where FHB disease onset occurs. Lastly, a generalized linear latent variable modelling approach revealed specific microbial colonizers associated with reductions in mycotoxin content and pathogen load. Specifically, Cryptococcus, Hanaella, and Epicoccum colonizers to wheat heads were associated with reduced mycotoxin concentrations, while Sporidiobolus and Kabatiella colonizers to corn debris early in the growing season were associated with reductions in disease – potentially indicating an early intervention strategy for the control of disease and mycotoxins. Our research highlights the potential for applications of biocontrol strains targeted to specific tissue types and developmental time periods in the wheat growth cycle, with implications for pre-harvest control of mycotoxin contamination and food safety.

Field inoculation with beneficial mycorrhizal fungi as a tool for sustainable agricultural practices **Stefanie Lutz**[1,2], stefanie.lutz@agroscope.admin.ch, Natacha Bodenhausen[3], Alain Valzano-Held[1,2], Klaus Schlaeppi[4], Marcel Van der Heijden[1,2]. (1) Dept. of Plant and Microbial Biology, Univ. of Zurich, Switzerland(2) Dept. of Agroecology and Environment, Agroscope, Zurich, Switzerland(3) Dept. of Soil Sciences, Research Institute of Organic Agriculture FiBL, Frick, Switzerland(4) Dept. of Environmental Sciences, Univ. of Basel, Switzerland Global demand for food continues to rise as a result of population growth. However, higher crop yields often come at the expense of the environment. Alternative solutions to mineral fertilisers and pesticides that reduce the environmental impact of agricultural production are urgently needed. Arbuscular mycorrhizal fungi (AMF) play a crucial role in this context, as they can enhance plant nutrient uptake and reduce plant stress. However, large-scale field inoculation trials with AMF are lacking, and to date the success of AMF inoculation in agricultural fields remains unpredictable due to high context dependency. We conducted on-farm experiments in 54 fields in Switzerland and quantified the effects on maize growth. The growth response to AMF inoculation was highly variable, ranging from -12% to +40%. Using only a few soil parameters and mainly indicators of the soil microbiome, we were able to successfully predict 86% of the variation in plant growth response to inoculation. The abundance of pathogenic fungi, rather than nutrient availability, was the best predictor of AMF inoculation success (33%). Our results will help to improve the reliability of field inoculations. As a result, AMF inoculation can become a powerful management option and thus an integral part of agricultural sustainability.

Exploiting the potential of the plant microbiome: The role of biobanks and supporting infrastructure **Matthew Ryan**, m.ryan@cabi.org. CABI, Egham, Surrey, United Kingdom Plant microbiomes are the microbial communities essential to the functioning of the phytobiome—the system that consist of plants, their environment, and their associated communities of organisms. A healthy, functional phytobiome is critical to crop health, improved yields and quality food. However, crop microbiomes are relatively under-researched, and this is associated with a fundamental need to underpin phytobiome research through the provision of a supporting infrastructure. The UK Crop Microbiome Cryobank (UKCMC) project is developing a unique, integrated and open-access resource to enable the development of solutions to improve soil and crop health. Six economically important crops (Barley, Fava Bean, Oats, Oil Seed Rape, Sugar Beet and Wheat) are targeted, and the methods as well as data outputs will underpin research activity both in the UK and internationally. This manuscript describes the approaches being taken, from characterisation, cryopreservation and analysis of the crop microbiome through to potential applications. We believe that the model research framework proposed is transferable to different crop and soil systems, acting not only as a mechanism to conserve biodiversity, but as a potential facilitator of sustainable agriculture systems.

Microbiomes and plant health **Matthew Bakker**, Matthew.Bakker@umanitoba.ca. Microbiology, Univ. of Manitoba, Winnipeg, Canada Plants host diverse communities of microorganisms in association with tissue surfaces and even internally within roots, stems and leaves. Over the past decade, scientists have made great strides in profiling and describing these

communities and some of the forces that shape them. There is great hope that as our understanding of plant-associated microbiomes improves further, it will become possible to manage these microbiomes in ways that promote plant health or increase productivity. Thus, the next generation of tools and inputs for agriculture may be tied to impacts on microbiomes. This presentation will describe mechanisms and examples of microbiome-mediated impacts on plant health, including efforts to situate and understand plant pathogens as members of microbiomes. For example, a microbiome perspective highlights the many interactions that plant pathogens have with other microorganisms.

Fusarium Identification, from morpho-based to genomic era **Imane Laraba**, imane.laraba@agr.gc.ca. Gouvernement du Canada Agriculture et Agroalimentaire Canada, Ottawa, Ontario Fusarium is a species-rich ubiquitous group of filamentous fungi known to occupy a wide range of biological niches and survive under diverse pressures in terrestrial and aquatic ecosystems. The host range of this genus spans an impressive array of species with an impact on agriculture, forestry, human and animal health, and the food industry. While one species used to produce Quorn mycoprotein for human consumption presents enormous opportunities for the food industry, many others pose major threats. Several species can cause life-threatening infections in immune-compromised humans and other animals, but also recently fatal fungal meningitis outbreaks in patients who underwent epidural anesthesia procedures for cosmetic surgeries. Numerous other species are prominent mycotoxigenic plant pathogens with significant negative impacts on the agricultural economy and food safety worldwide. The Fusarium taxonomic landscape has changed dramatically over the past two decades, largely due to the introduction of phylogenetic species recognition, creating a huge gulf between morphological and genomic species recognition and rendering an accurate identification of etiological agents associated with any disease a challenging task. To foster clear scientific communication and accurate identification and reporting of etiological agents essential for plant, animal, and human disease management this talk will discuss the process of profiling Fusaria present in the environments from the morpho-based to genomic era.

Microbial community composition changes during active viral infection in reared crickets **Kristin R. Duffield**[1], kristin.duffield@usda.gov, Bienvenido Tibbs-Cortes[2], Ellie Putz[2], Bert Foquet[3], Jose Luis Ramirez[1]. (1) Crop BioProtection Unit, USDA-ARS-NCAUR, Peoria, Illinois (2) Infectious Bacterial Diseases Research, USDA-ARS-NRDC, Ames, Iowa (3) McGuire Center for Lepidoptera and Biodiversity, Univ. of Florida, Gainesville Despite decades of focus on field crickets (family: Gryllidae) as a model organism and popular commodity in the food and feed industry, we know little about the composition of their core microbial communities. Additionally, the connection between microbial composition and health and disease is increasingly appreciated across numerous taxa, including insects. In the present study, we characterized the composition of bacterial and fungal microbial communities within the economically important Gryllodes sigillatus cricket using 16S rRNA gene and nuclear ribosomal internal transcribed spacer (ITS) amplicon sequencing. To understand how microbial composition shifts during active viral infections, we characterized these microbial communities across two distinct populations: one that was diseased and suffering from an active infection with Cricket Iridovirus (CrIV) and one that was apparently healthy with low levels of CrIV (i.e., a covert infection). We found clear evidence for sex-dependent microbial community structures, where males and females exhibited different alpha and beta diversities in their bacterial community structures. Furthermore, we found shifts in microbial community structure between healthy and diseased crickets. These patterns will be discussed as well as their significance towards improving the health of reared crickets for use in sustainable agriculture.

SUNDAY EVENING 7PM
General Posters
Note – the first 25 posters also appear at Monday Evening's Sci-Mix

01 Effects of unsaturation and polar compounds of vegetable oils on the properties of sunflower wax oleogels **Hong-Sik Hwang**, hongsik.hwang@usda.gov, Sanghoon Kim, Jill K. Winkler-Moser. USDA, Agricultural Research Service, National Center for Agricultural Utilization Research, Peoria, Illinois Highly saturated fats such as animal fats, palm oil, and fully hydrogenated oils are used in the food products that need solid fats for their desired characteristics. However, these fats are known to be associated with health problems such as cardiovascular disease, raised low-density lipoprotein (LDL) cholesterol levels, and hypertension. Oleogels, which are prepared with healthy oils such as vegetable oils and fish oils, have drawn great interest as alternatives to conventional solid fats. Understanding the factors affecting physical properties (especially, gel strength) of oleogels is very important for the application of oleogels in food products. However, the factors affecting the properties of oleogels have not been fully understood at the present moment, and many studies reported contradictory results. For example, previous studies on the effects of unsaturation and polar compounds of oils on the physical properties of oleogels reported inconsistent results, presumably, due to different experimental conditions, gelling agents, and compositions of oils. In this study, twelve vegetable oils as well as these oils where polar compounds were removed were used to conduct a systematic study for the effects of unsaturation of oils and polar compounds. Oleogel samples were prepared with 3 and 7% sunflower wax (SW). This study revealed a trend that oils with higher unsaturation produced oleogels with lower gel strength, which may be attributed to the lower viscosity of highly unsaturated oils. Gel strength increased after removing polar compounds in oil indicating that they negatively affected the gel strength. All the samples in this study had platelet shape of SW crystals regardless of the kind of oil and the presence of polar compounds. Solid wax content values were similar for all the samples indicating that it was not the factor for gel strength and melting properties of oleogels.

02 Performance comparison of the new type II version milk MIoBS ELISA kits with their current version, using commercial and spiked foods **Chung Cho**, chung.cho@fda.hhs.gov, Rakhi Panda, Prasad Rallabhandi. US FDA, College Park, Maryland The US Food and Drug Administration (FDA) enforces the allergen labeling requirements of the Food, Drug and Cosmetic Act (FD&C Act), which includes major food allergens such as milk. Enzyme-linked immunosorbent assay (ELISA) methods are commonly used to detect and quantitate milk in foods. Recently, Morinaga Institute of Biological Science, Inc. (MIoBS) replaced their current Milk ELISA kit with its new Type II version, containing a modified extraction buffer. To employ this new kit for regulatory use, a single-lab validation at Level II was performed using the FDA's validation guidelines. In addition, the Type II kit's performance was compared to the current milk ELISA kit. In this study, two matrices including dark chocolate (DC) and orange juice (OJ), spiked at 0, 5, 25, and 50 ppm milk, along with four different commercial cookie (C) products: one as a matrix matched blank (no milk), and other with an unknown incurred milk content, were used. These samples were analyzed with both milk ELISA kits. Both kits performed consistently well in spiked DC and OJ samples with less than 10% difference from the known amount of milk, even though some statistical differences

between the kits were observed with C25, C50, and OJ25 samples. For blank cookie, as expected, no milk was detected. In C1 sample, both ELISA kits detected similar level of milk consistently. Besides C1, with C2 and C3 samples, both kits detected much higher amount of milk > 1,500 ppm reliably; however, statistical analysis showed differences in detection responses between the kits ($p < 0.05$). These observed differences at higher milk concentrations could be a result of minor variations in their extraction efficiency, due to extraction buffer component differences between the two kits. Overall, both ELISA kits performed satisfactorily to meet the criteria set by the FDA's validation guidelines.

03 Progress of chiral flavor substances in alcoholic beverages **Yifeng Dai**, yfdai3@gzu.edu.cn. Food Science and Technology, Guizhou Univ., Guiyang, Guizhou, China There are many chiral flavor substances in alcoholic beverages. Previous studies have shown that different stereoisomers of these chiral substances may have different effects on the flavor of alcoholic beverages. The concentration of each of the stereoisomers is closely related to the quality and authenticity of alcoholic beverages. This work reviews the chiral flavor substances recently detected in alcoholic beverages with respect to their flavor characteristics, thresholds, and distribution profiles. Hopefully, this review will provide a reference for further studies of chiral flavor substances in alcoholic beverages.

04 Fate and transport of manganese oxide nanomaterials in capsicum annum L plants **Sharif Uddin Ahmed**, sahmed5@miners.utep.edu, Yuqing Ye, Kenneth Flores, Jorge L. Gardea-Torresdey, Jose Angel Hernandez-Viezcas. Chemistry and Biochemistry, The Univ. of Texas at El Paso Localized application of Nanomaterials (NM) has demonstrated vast potential to improve agricultural production, when compared to the current use of fertilizers and pesticides. Nevertheless, it is crucial to understand the fate and transport of NM in the plant. In this study we foliarly applied Manganese (III) Oxide NM to Capsicum annum L. plants and evaluated its concentration and in-situ particle size, using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) and ICP-Mass Spectroscopy (ICP-MS) in single particle (sp) mode. We measured the total manganese content in the plants using acid digestion and ICP-OES, and found the NM presence in plant tissues through enzymatic digestion and sp-ICP-MS. The results demonstrated a noteworthy increase in manganese levels in NP-treated plants compared to controls, indicating a direct uptake of nanoparticles by the plants. Manganese NM size was reduced from the leaves (34nm) to the shoot (23nm) showing an internalization of the NM, which suggests the potential to modulate nutrient release in the plant.

05 Evaluating acidity levels in packaged coffee to enhance product label accuracy **Abdulhakim Sharaf Eddin**, alarrab_sh@yahoo.com, Salam Ibrahim, Tahl Zimmerman. North Carolina Agricultural and Technical State Univ., Greensboro **Purpose:** Numerous coffee products are marketed as low-acid coffee, and yet only a few studies have investigated the acidity levels of hot-brewed coffees that claim to be low in acidity. Additionally, some coffee packaging labels include claims of the product being acid-free. In this context, the objective of the present study was to examine and compare the differences in acidity levels across various packaged coffee products. Additionally, the results will serve as a benchmark to support enhanced decision-making in coffee product development and a resultant standard for use on packaging labels of low acid or acid-free coffee. **Methodology:** Eleven samples of ground dark roasted coffee were purchased from a local grocery store (Greensboro, North Carolina). The coffee samples were given codes as XL. The coffee samples were brewed using a drip coffee maker by following the guidelines on the package for coffee grounds to water ratio for each sample. The pH values of each coffee sample were measured in triplicate. The total concentration of dissolved substances (TDS) was measured using a refractometer. **Findings:** The pH measurements for coffee samples showed a low acidity in sample XL96 (pH 5.74) which was significantly different ($P < 0.05$) compared to other samples. The higher acidity was observed in samples XL10, XL65, XL98 (pH 4.96, 4.99, and 5.02) respectively. The pH values for the rest of samples range between (pH 5.10 - 5.28). For TDS of brewing coffee samples. The highest TDS was observed in sample XL10 with a value of (2.7%), and the lowest TDS was in sample XL21 with a value of (1%). Most coffee samples exhibited a TDS range between (1.4-2%). **Conclusion** In this study, the pH and TDS values of different commercial packaged coffee products sold in retail stores in North Carolina were evaluated in order to investigate the accuracy of the information on some coffee products labeled as low acid or acid-free. The results thus serve to emphasize the need to establish a reliable set of standards for the labeling of low acid coffee in packaged coffee products. This new standard for low acid coffee should reference the medical definition of critical pH, include a standardized method for measuring pH, and clear information regarding acidity levels on all packaging labels as well as demonstrable assurance from the industry regarding compliance with this new standard.

06 Covalent immobilization of lactase via amine-epoxide reaction on vapor-deposited polymer thin films: A kinetic study **Felicia Fianu**[1], ffelicia@vt.edu, Junxing Chen[2], Wei Sun[2], Yifan Cheng[1]. (1) Food Science and Technology, Virginia Polytechnic Institute and State Univ., Blacksburg (2) Biochemistry, Virginia Polytechnic Institute and State Univ., Blacksburg The rapid growth of the U.S. Greek yogurt market, surging from 1-2% in 2004 to 40% in 2015, has led to substantial lactose-rich acid whey as byproduct. Utilizing lactase enzyme to convert this waste into valuable products has emerged as a promising solution. Covalent immobilization, securing enzyme molecules, enables reusability and prevents product contamination. While immobilization of lactases has been shown to improve their pH and temperature tolerance, undesired reactions enzyme-substrate interactions can reduce enzyme activity. iCVD is a dry, solventless synthesis platform for depositing polymer thin films with precise control over surface chemistry, suitable for heat- or solvent-sensitive substrates. This study introduces an innovative method using iCVD to create high-quality polymer coatings designed for lactase immobilization via amine-epoxide ring-opening bioconjugation. A polymer made of Glycidyl Methacrylate, which provides epoxide functional groups for bioconjugation with the amines of lactases, was successfully synthesized using iCVD. Lactase expressed from Escherichia coli type BL21 was used in this study. FTIR characterization and SEM were conducted to confirm the retention of functional groups of the iCVD coatings and elucidate the surface morphology and distribution of lactase after immobilization, respectively. Activities of immobilized lactases were tested with ortho-Nitrophenyl-β-galactopyranoside as substrate using a high-throughput 96-well plate assay and compared with activities of surface-free lactases. An immobilization yield of 41% was achieved under 37^{o}C and incubation time of 24hours, resulting in a surface lactase density of 2.5 mg/mm^2. The immobilized lactase exhibited a Michaelis-Menten constant, Km of 8.2mM and a turnover number, kcat of 2.2s^{-1}. In contrast, free lactase exhibited a much lower Km of 0.5mM and a higher kcat of 6.4s^{-1}. Preliminary results suggest that while immobilization via amine-epoxide conjugation may hold potential for enhancing reusability, both binding affinity and reaction rates were negatively affected by this particular immobilization chemistry. This may be caused by that fact that epoxide groups almost indistinguishably react with the amines on lactase, resulting in a nearly random orientation of the enzymes once immobilized. Future work will explore site-specific immobilization to increase the

accessibility of active site and to reduce interference caused by undesirable enzyme-polymer interactions.

07 Performance comparison of the new type II Egg MIoBS ELISA kit with its current version for FDA's regulatory purposes **Prasad Rallabhandi**, prasad.rallabhandi@fda.hhs.gov. Health & Human Services, US FDA, College Park, Maryland Egg was specified as one of the major food allergens by the Food Allergen Labeling and Consumer Protection Act (FALCPA) of 2004. In the US, egg allergies affect around 0.5 - 2.5% of young children, and 0.6% of adults. Since there is no cure for egg allergy, avoidance of egg in the diet is the only option for susceptible individuals. The US FDA enforces FALCPA labeling requirements on all commercial food products containing egg. Presently, FDA uses Enzyme-linked Immunosorbent Assay (ELISA) kits for enforcement activities. Recently, Morinaga (MIoBS) replaced their current Egg ELISA kit, with a Type II kit that uses an updated version of the extraction buffer. To ensure that the Type II Egg ELISA kit is suitable for regulatory use, a single-lab validation was performed following the FDA's validation guidelines. Besides validation, the Type II kit's performance was also compared with its current version. Rice flour (RF) spiked with 5, 25, and 50 ppm of egg, along with three different types of commercial noodles and cookie products, including a blank (no egg) for each matrix, were analyzed using both Type II and the current versions of MIoBS Egg kit. In RF samples, the recovery values (ppm) ranged around 96 - 100% levels of the spiked egg and showed no significant statistical differences between the kits. With noodles and cookie samples, both Type II and the current Egg ELISA kits consistently quantitated egg at all serial-diluted analytical concentrations. However, at high egg concentrations, despite having a reliable egg detection in samples by both kits, there were statistical differences ($p < 0.05$), probably due to variations in the extraction buffer composition used by these kits. Overall, both kits performed satisfactorily by meeting the set criteria of FDA's validation guidelines.

08 Recovery of Polyhydroxyalkanoates from Haloferax mediterranei utilizing glycerol waste **Fujunzhu Zhao**[1], fzhao179@vt.edu, Md Sazzadul Haque[2], Haibo Huang[1,2], Zhiwu Wang[2]. (1) Dept.of Food Sci. & Tech., Virginia Polytechnic Institute and State Univ., Blacksburg (2) Dept.of Biological Systems Engineering, Virginia Polytechnic Institute and State Univ., Blacksburg Environmental concerns about petroleum-derived plastics necessitate the need for eco-friendly plastic alternatives. Polyhydroxyalkanoates (PHAs), biodegradable polymers produced via microbial fermentation, emerge as a promising solution but are hindered by their high production costs compared to petroleum-based counterparts. This challenge can be addressed by using food waste as a fermentation substrate and employing cost-effective processing technologies to recover PHAs. Haloferax mediterranei, halophilic archaea, is known for its ability to convert waste glycerol into Poly(3-hydroxybutyrate-co-3- hydroxyvalerate) (PHBV), a type of PHA. The objective of this study is to develop a high-pressure homogenization (HPH)-based process to recover PHBV from Haloferax mediterranei utilizing glycerol waste as feedstock. The fermentation broth containing Haloferax mediterranei was processed with HPH at 100, 200 and 300 bars for varying passes. The results showed that the recovered PHBV had a purity of 80.4±3.5%. Furthermore, the efficiency of recovery was influenced by the pressure and the number of HPH cycles, with recovery rate ranging from 61.2±1.8% to 85.7±0.5%. The properties of the extracted polymers are investigated by X-ray diffraction and differential scanning calorimetry. To conclude, this research provided valuable insights into production and recovery of PHBV using glycerol waste as a feedstock.

09 Effect of cooking conditions on chickpea flour functionality and its protein physicochemical properties **Shan Hong**[1], shanhong@ksu.edu, Ruoshi Xiao[1], Gengjun Chen[1], Yi Zhu[2], Antonio Garay[2], Jun Yang[2], Yixiang Xu[3], Yonghui Li[1]. (1) Grain Science and Industry, Kansas State Univ., Manhattan (2) Research & Development, PepsiCo Inc, Plano, Texas (3) Healthy Processed Foods Research Unit, USDA-ARS Western Regional Research Center, Albany, California Chickpea is an important food legume that usually undergoes various processing treatments to enhance nutritional value and functional properties. This study aimed to investigate the effects of different cooking conditions on physicochemical, structural, and functional properties of chickpea, especially its protein macromolecules. Kabuli chickpea seeds were processed by water cooking at different temperatures (63, 79, 88, and 96 °C), followed by evaluating flour solubility, water holding capacity (WHC), pasting property, as well as the total protein profile and fractionated protein distributions. Cooking treatments significantly decreased flour solubility (from 39.45 to 25.21 g/100g flour) and pasting viscosity (peak and final viscosities, from 1081 to 300.5 cP and 1323 to 532 cP, respectively), whereas increased WHC (from 0.862 to 1.144 g H_2O/g flour) of chickpea flour ($p < 0.05$). These behaviors were enhanced by increasing cooking temperature. Meanwhile, cooking induced significant change of chickpea proteins, modifying the albumin and globulin fractions of chickpea protein to display glutelin-like behavior. The current study provides potential approaches for manipulating chickpea flour functionalities (e.g., solubility, viscosity, water holding capacity) to address the process and product challenges and favor product innovation.

10 Measurement of urinary sulfate in domestic swine by conductometric titration and ion chromatography **Linda D. Schultz**, schultz@tarleton.edu, Levi C. Jackson, Rajani Srinivasan. Chemistry and Physics, Tarleton State Univ. College of Science and Mathematics, Stephenville, Texas A recent USDA publication noted that the US is the world's third-largest producer and consumer of pork and pork products. In addition to their economic importance, pigs are frequently used as models in human disease states and as a source of donor tissue for some surgical procedures. Therefore, it is essential that their physiology should be well-understood and their health frequently monitored. A noninvasive technique for diagnosis and evaluation of many disease states in humans and domestic animals is urinalysis. Sulfate is the third most abundant anion in mammalian body fluids, yet urinary sulfate is seldom measured because urine is a complex mixture containing numerous potentially interfering substances. The best standard method currently available for analyzing aqueous solutions is ion chromatography. However, this method requires expensive instrumentation, highly trained personnel, and is not readily available in many locations. The goal of this research project was to examine the suitability of conductometric titration as a simple, readily available, inexpensive alternative method of measuring sulfate concentration in pig urine. Results were monitored by ion chromatography. Previous studies in our lab have been promising, but produced inconsistent results, so more extensive sample handling procedures were implemented.

11 Enhancing the functionality and gut fermentability of insoluble dietary fibers from oat husks via subcritical water treatment **Jung Mun Yang**, journeyg@vt.edu, Xuanbo Liu, Hongchen Shen, Haibo Huang. Food Science and Technology, Virginia Polytechnic Institute and State Univ., Blacksburg Oat husks, as residual byproducts of oat processing, present low value and environmental challenges. These lignocellulosic residues are rich in cellulose, hemicellulose, and lignin, offering potential to be used as dietary fibers. However, oat husks, like most lignocellulosic materials, have poor functionality and gut fermentability. This study aims to apply subcritical water treatment to modify the structural and

chemical properties of oat husks to enhance their functionality and gut fermentability. Oat husks were treated with subcritical water with different temperatures ranging from 130 °C, 160 °C, and 190 °C, with durations between 1 to 2 hours, and employing different solvents (water, 2% citric acid, 2% sodium hydroxide) to obtain different oat fibers. The yields, chemical and structural properties, functionality, and fermentability of the resulting fiber were thoroughly characterized. The results indicated that increasing the treatment temperature reduced cellulose content from 14.7% to 8.9% and hemicellulose content from 31.6% to 0.9% in insoluble dietary fibers. In addition, in-vitro fermentation experiments were conducted to gauge the fermentability of treated fibers from oat husks. Quantitative analysis of short-chain fatty acids, including acetic acid, propionic acid, and butyric acid, produced during fermentation was performed. Total SCFAs of treated samples increased from 32.7 mM/g to 63.3 mM/g, compared to untreated samples after 48-hour fermentation, and it demonstrated slow fermentability, potentially beneficial for preventing certain intestinal diseases, such as cancer and inflammatory bowel disease. Overall, the results suggest that subcritical water treatment offers a viable strategy for maximizing the utilization of oat husks and reducing environmental impact.

12 Differences in the metabolic content of two cecropia species from Tabasco, Mexico Eric Jaziel Medrano Sanchez[1], **Carlos Ernesto Lobato Garcia**[1], carlos.lobato@ujat.mx, Abraham Gomez Rivera[1], Ammy Joana Gallegos Garcia[2], Manases Gonzalez Cortazar[3]. (1) Academic Division of Basic Sciences, Univ. Juarez Autonoma de Tabasco, Cunduacán, Mexico(2) Univ. Popular de la Chontalpa, Cardenas, Tabasco, Mexico(3) Centro de Investigacion Biomedica del Sur, Xochitepec, Morelos, Mexico The Cecropia genus is widely used in traditional medicine in Mexico. Particularly in the state of Tabasco, it is used for the treatment of diabetes. However, in traditional medicine there is not a proper distinction between the species of this genus, which can lead to an inappropriate use. The objective of this work was to analyze the metabolic content of Cecropia species collected in the five sub-regions from Tabasco, México through specific analytical techniques. Taxonomic identification allowed us to distinguish between two collected species: Cecropia peltata (**Cp1**-**Cp4**) and Cecropia obtusifolia (**Co5**). The use of spectrophotometric techniques demonstrated that the **Cp4** extract (C. peltata from the Ríos sub-region) presented the highest values in total polyphenols content (TPC; 155 ± 9.1 mg GAE/g E) and total flavonoid content (TFC; 724 ± 22.2 mg RE/g E). A metabolic analysis employing High-Performance Liquid Chromatography, showed the presence of four chemical markers which are representative for the Cecropia genus: Cholorogenic Acid (**1**), Isoorientin (**2**), Orientin (**3**) and Vitexin (**4**). See Figure 1. However, the five samples exhibited variations in the concentrations of these chemical markers. Thus, it was found that **Cp3** (C. peltata from the Pantanos sub-region) presented the highest concentrations of Chlorogenic Acid (39.8 ± 2.3 mg/g) and Isoorientin (51.5 ± 2.9 mg/g), **Cp4** of Orientin (49.9 ± 0.6 mg/g) and **Cp2** (C. peltata from the Chontalpa sub-region) for Vitexin (6.2 ± 0.2 mg/g). These results show the importance of the study of species belonging to the same genus collected in different regions, where biotic and abiotic factors can influence the production of specific groups of metabolites.

13 Stability tests of the nitrogen radical containing 2,2-diphenyl-1-Pirylhydrazyl (DPPH) in different conditions **Ying Hu**[1], yhu@calbaptist.edu, Ryan Rebelo[1], Nicolas Rojas[1], Erik J. Sorensen[2]. (1) California Baptist Univ., Riverside, California (2) Princeton Univ., New Jersey DPPH is a commonly used organic compound in the antioxidant activity test in food science. Due to its instability, DPPH solution must be freshly prepared daily in the testing. The stability of this compound was investigated with heat, under light in different solvents. Photochemical study shows that DPPH reacts in different rates with different organic solvents such as methanol, acetonitrile, dichloromethane, diethyl ether, and DMSO. Different light sources were tested. NMR shows the product is 1,1-Diphenyl-2-picrylhydrazine (DPPH-H), the reduced form of DPPH. The results show possible optimization of the DPPH antioxidant assay.

14 Effect of sorghum grains in kombucha fermentation **Faith Zillinger**, faithz@ksu.edu, **Utku Uysal**, uysal@ksu.edu, **Umut Yucel**, yucel@ksu.edu. Food Science Institute, Kansas State Univ., Manhattan Kombucha is a popular and health-beneficial food product traditionally obtained by the fermentation of tea by a symbiotic culture of bacteria and yeast (SCOBY). Alternatively, sorghum can be used as an alternative fermentation source to produce kombucha. Although sorghum has health-beneficial properties due to its phenolic content, its food applications are limited due to several constraints related to flavor attributes and digestibility. The objectives of this research were to obtain kombucha using three different sorghum grains (white, red waxy, and sumac) and characterize their chemical properties.
The sorghum grain was ground in a high-shear Corning blender to a particle size of 100-150 µm. The sorghum tea was obtained by mixing ground sorghum (200 g) with a sugar solution (1000 g, 20 wt%) and boiling for 5 minutes. The mixture was cooled by adding water (2000 g), and the SCOBY was introduced and left to ferment at 29 °C for 9 days to obtain kombucha. Aliquots of samples (20 mL) were collected on days 0,2,4,7, 9 for analysis. The fermentation progress was followed by measuring pH, brix, and color. The flavor profile of the kombucha samples was determined by headspace solid micro-extraction (HS-SPME) coupled with gas chromatography-mass spectrometry (GC-MS). The total phenolic content (TPC) was analyzed using the Folin-Ciocalteu Assay. All experiments were performed in triplicate and analyzed for significance using ANOVA. Type of grain and fermentation had significant effects ($p<0.05$) on all variables. The average pH changed from 4.1 at day 0 to 3.1 at the end of fermentation on day 9. The color of all the samples grew darker from day 0 to 9. Lightness (ΔL) decreased from 76.11 to 63.32 for the darkest grain, Sumac. The number of flavor-active compounds significantly increased throughout the fermentation period. For example, red waxy sorghum, 20 major volatile compounds were identified on day 0, and 59 major volatile compounds were identified on day 9. Among others, all samples contained compounds such as alcohols, acids, aldehydes, and esters. Some of the most-predominant compounds include: ethanol, acetic acid, nonanal. TPC increased 50 times with fermentation, being highest in white sorghum grain due to microbial activity to separate flavonoids from their glycosides. Fermentation can help with improving the flavor profile, and sorghum kombucha can serve as an alternative sorghum product with health-benefits and desirable sensory attributes.

15 Evaluating the effects of natural antioxidants on the quality and stability of refined canola oil during deep frying **Tamany M. Alanezi**, Tamany.alanezi@gmail.com. Dept.of Animal Science, Food and Nutrition, Southern Illinois Univ. System, Carbondale, Illinois Deep frying is a process where food is submerged in hot oil, resulting in the formation of oxidants and undesirable compounds. Synthetic antioxidants (e.g. butylated hydroxytoluene (BHT)) are the most preferred option by the food industry, however there is a growing awareness about the use of natural antioxidants as alternatives to the synthetic ones. This research examines the chemical qualities of oil during deep frying, focusing on parameters such as acid value (AV), free fatty acid count (FFA), p-anisidine number (p-AV), peroxide value (PV), total oxidation value (TOTOX), viscosity, total polar compounds (TPC), and fatty acid composition. The canola and olive oil blends (95:5 (v/v); CAO) were mixed with BHT at 0.2% (w/v) or one of the following natural antioxidants (turmeric oil (TUR), basil oil (BAS), rosemary oil

(ROS), and oregano oil (ORE)) at 0.5% (w/v) and then used to fry falafel at 175 ± 5 C for 20 min for a total of 12 h (36 cycles). At the of the last frying cycle, oil samples were collected and stored at -20°C until analyses. Our results suggest that oils supplemented with natural antioxidants and BHT exhibit lower increases in various parameters associated with oil degradation compared to control samples. Specifically, turmeric and oregano oils emerge as the most effective natural antioxidants in stabilizing oils during frying. Moreover, frying significantly decreased the percentages of linoleic acid (C18:2) and linolenic acid (C18:3) and increased the percentage of trans-C18:1 in all oil samples, but the effect was least with the TUR, BAS, and BHT. In conclusion, our research supports the

16 Characterization and discrimination of yerba santa by NMR-based metabolomic approach **Jianping Zhao**[1], jianping@olemiss.edu, Mei Wang[2], Gloria Hervey[2], Seethapathy Saroja[1], Joseph Lee[1], Roy Upton[3], Ikhlas Khan[1]. (1) National Center for Natural Products Research, Univ., Mississippi (2) USDA-ARS Natural Products Utilization Research Unit, Univ., Mississippi (3) American Herbal Pharmacopoeia, Soquel, California Yerba santa, meaning “holy weed” or “sacred herb” in Spanish, is the common name for several plants of the Eriodictyon genus. Yerba santa is native to western North America distributing in California, southern Oregon, Utah, Arizona, and northern Mexico. The leaves, stems, and flowers are eaten or made into tea, decoction, or poultice by many indigenous tribes. They are highly valued and have historically been used for medicinal purposes to treat asthma, upper respiratory infections, allergic rhinitis, and other disorders. The three most commonly used yerba santa are E. californicum, E. trichocalyx, and E. angustifolium. They are traditionally used for the same purpose without differentiation. The constituents of yerba santa species have been sporadically studied so far. The differences in chemical composition among yerba santa species are still not revealed clearly. NMR spectroscopy is one of the most powerful chemical analytical tools, and it is widely used for characterization and structure determination of natural products. The universal detection property of NMR can allow an unbiased overview of the sample composition. This study investigated 145 yerba santa samples from 8 Eriodictyon species using NMR combined with chemometric analysis. Significant metabolite variations within and between the different species were observed. The species-specific chemo-fingerprint patterns for the different Eriodictyon species were determined and discussed.

17 Got lead? An analytical approach to the determination of trace metal concentrations in insulated cups **Victoria Hennick**, vmh12@students.uwf.edu. Chemistry, Univ. of West Florida, Pensacola, Florida, US One brand-name cup craze after another has caused consumers all over the US and beyond to buy these insulated cups in a frenzy. They have become quite popular with their bright colors, lasting insulating capabilities and convenience. Recently, some insulated cup owners have claimed that the popular items are testing positive for lead. The companies deny these claims, but we received a positive result for lead upon testing the cups with a lead-detecting swab. In this experiment, we aim to determine the actual concentration of lead, chromium, iron and nickel in several beverages after remaining in different insulated cups for a specified amount of time. The cup brands include Stanley, Hydroflask, Yeti and Tervis. The beverages to be tested include room-temperature water, hot water, coffee and tea. Standards of these liquids will be made without exposure to the cups to determine a baseline. Duplicate samples of each of the beverages from all of the cups will be run against a known trace metal containing standard using Inductively Coupled Plasma - Optical Emission Spectroscopy (ICP-OES).

18 Performances of non-meltable, reusable and biodegradable stationary cooling media “jelly ice cubes” **Jiahan Zou**[1,2], jhzou@ucdavis.edu, Yucen Xie[1], Xiran Li[1], Gang Sun[2], Luxin Wang[1]. (1) Dept.of Food Sci. and Tech., Univ. of California Davis, Davis, California, US(2) Dept. of Biological and Agricultural Engineering, Univ. of California Davis, Davis, California, US Temperature fluctuations, quality degradation, and microbial cross-contamination lead to substantial economic losses in the food industry. This study introduces Jelly Ice Cubes (JICs), an innovative cooling agent offering sustainability, non-melting, reusability, and biodegradability, aimed at extending seafood shelf life. Drawing on circular economy concepts, this interdisciplinary research combines soybean protein hydrolysate (SPH), an agricultural by-product, with gelatin to create protein-hydrogel-based JICs. The mechanical properties of various Gel/SPH hydrogels versus pure Gel hydrogels were evaluated to determine their suitability for JIC applications, with or without crosslinking. Results indicated that incorporating SPH, with its smaller protein sizes, reduced the hydrogels' mechanical strength. Nonetheless, testing JICs for seafood preservation effectiveness showed that JICs maintained seafood quality without significant alteration, outperforming traditional ice cooling. The development of JICs marks a crucial step towards environmentally friendly temperature management in the food sector, offering a promising strategy to minimize food loss and waste.

19 In vitro fermentation shows polyphenol and fiber blends have an additive beneficial effect on gut microbiota states **Jordan A. Whitman**[1], jordan.a.whitman2.civ@army.mil, Laurel A. Doherty[1], Ida Pantoja-Feliciano[1], Kenneth Racicot[1], Danielle Anderson[2], Katherine Kensil[2], J P. Karl[3], Glenn R. Gibson[4], Jason W. Soares[1]. (1) Soldier Performance Division, US Army Combat Capabilities and Development Command Soldier Center, Natick, Massachusetts (2) Combat Feeding, US Army Combat Capabilities and Development Command Soldier Center, Natick, Massachusetts (3) Military Nutrition, US Army Research Institute of Environmental Medicine, Natick, Massachusetts (4) Food and Nutritional Sciences, Univ. of Reading, United Kingdom Polyphenols and fermentable fibers have shown favorable effects on gut microbiota composition and metabolic function. However, few studies have investigated whether combining multiple fermentable fibers or polyphenols may have additive beneficial effects on gut microbial states. Here, an in vitro fermentation model, seeded with human stool combined from 30 healthy volunteers, was supplemented with blends of polyphenols (PP), dietary fibers (FB) or their combination (PPFB) to determine the influence on beneficial gut bacteria growth dynamics and select metabolite changes. PP and FB blends independently lead to significant increases in the absolute abundance of select saccharolytic taxa, namely Ruminococcus bromii, Bifidobacterium spp., Lactobacillus spp. and Dorea spp. Total short chain fatty acid concentrations (SCFA), relative to non-supplemented control (F), increased significantly with PPFB and FB supplementation, but not PP. Indole and ammonia concentrations decreased with FB and PPFB supplementation, but not PP alone while increased antioxidant capacity was only evident with both PP and PPFB. These findings demonstrated that, while the independent blends displayed selective positive impacts on beneficial gut states, the combination of both blends provided an additive effect. The work outlines the potential of mixed substrate blends to elicit a broader positive influence on gut microbial composition and function to build resiliency toward dysbiosis.

20 Use of avocado oil oleogels as fat substitutes in chicken sausage **Christopher Carter**, deskofchristopher@gmail.com, Md. Jannatul Ferdaus, Roberta Silva. Family and Consumer Sciences, North Carolina Agricultural and Technical State Univ., Greensboro Oleogels have gained attention in recent years for their potential application in food products. This research aims to develop an oleogel that can be used as a healthier fat alternative for saturated fats

within chicken sausages. Different oleogels were prepared using avocado oil with three oleogelators (carnauba wax, rice bran wax, and ethylcellulose) in two different rations (5% and 10%). The oleogels were analyzed by oil binding capacity (OBC), texture, rheology, and polarized light microscopy (PLM). The oleogel with 10% carnauba wax showed more defined, intense, and pronounced fat crystals at room temperature compared with the others. OBC revealed that oleogels prepared with ethylcellulose presented a similar level of OBC for 5% and 10% of addition (91.1 ± 0.8% and 91.1 ± 1.8%). Carnauba wax oleogels presented a lower OBC with 8.5 ± 1.1% for 5% and 9.1 ± 1.2% for 10% of addition, rice bran wax oleogels showed the lowest OBC with at 6.8 ± 0.8% and 7.3 ± 1.0% at 5% and 10% respectively. Systems with higher % of all structural agents showed an increase in textural attributes, such as firmness, spreadability, adhesiveness for all. The rheology parameters (G' and G") were affected by the type of structuring agent. All the oleogels presented an increase of the elasticity and viscosity with the raise of the % of the oleogelator. These assessments will help develop the most effective saturated fat substitute for sausage application in the next steps.

21 Modification of purified Ana o 3 with phenylglyoxal disrupts antibody binding C Nacaya Brown[1], Rebecca A. Adams Dupre[1], Tien Thuy Vuong[1], Alexis Payne[2,1], Brennan Smith[1], **Christopher P. Mattison**[1], chris.mattison@usda.gov. (1) FPSQ, USDA Agricultural Research Service, New Orleans, Louisiana (2) Oak Ridge Institute for Science and Education, U.S. Dept. of Energy, Oak Ridge, Tennessee Ana o 3 is an immunodominant cashew nut allergen, and immunoglobulin (IgE) antibodies to Ana o 3 are strong predictors for clinically relevant cashew allergy and severe allergic reaction. Four mouse monoclonal anti-Ana o 3 antibodies have been characterized, and in silico docking experiments predict two conformational epitopes and two linear epitopes. The 2H5 and 5B7F8 clones recognize linear Ano 3 epitopes that are not disrupted by treatment of purified Ana o 3 with a reducing agent such as dithiothreitol. The predicted 2H5 and 5B7F8 epitopes lie within published linear Ana o 3-IgE epitopes and include arginine residues R21, R28, R30, R42, and R45. Phenylgloxal (PG) has been used to selectively modify arginine residues on protein surfaces and within active sites. Here, purified Ana o 3 is chemically modified with PG, and we demonstrate that this modification reduces 2H5 and 5B7F8 antibody binding to Ana o 3. The findings are consistent with in silico modeling predictions and suggest that surface exposed arginine residues are, at least in part, important for 2H5 and 5B7F8 monoclonal anti-Ana o 3 antibody binding.

22 Exploring the potential of nitrogen plasma as a non-thermal alternative in fruit juice processing **Si-Ting Lai**, penny960511@gmail.com, **Yu-Jou Chou**, lucy840218@gmail.com, Yuwen Ting. Institute of Food Sci. and Tech., National Taiwan Univ., Taipei The processing of fruit juices is crucial in maintaining their nutritional value and sensory attributes. While traditional thermal methods have been effective in inactivating microorganisms and enzymes, they often lead to a compromise in the nutrient content and sensory qualities of the juices due to high temperatures. This has spurred the exploration of non-thermal alternatives in juice processing. An emerging non-thermal method in food science is atmospheric cold plasma, the mechanism of which, despite being promising, is not entirely understood. This study delves into the potential of Nitrogen plasma as a viable alternative to traditional heat treatment in fruit juice processing. Atmospheric cold plasma, generated through the dissociation and excitation of gases, is utilized to evaluate its impact on microbial growth inhibition and preservation of nutritional quality. Moreover, this research investigates the characteristics of plasma treated, focusing on factors like pH and peroxide levels, and their consequent influence on juice quality. Through a comprehensive comparative analysis across various fruit juices such as apple, grape, orange, guava, and pineapple, key parameters including total bacterial count, phenolic content, antioxidant activity (measured by DPPH), color, total solids, pH, anthocyanin levels, and vitamin C content are evaluated. The findings of this study suggest that Nitrogen plasma processing holds promise in maintaining both the nutritional value and taste of fruit juices. Furthermore, it is evident that different juices exhibit varying responses to plasma treatment, underscoring the role of unique characteristics in determining treatment efficacy. This research underscores the potential of Cold Plasma as a superior alternative to heat treatment in fruit juice processing, offering better preservation of nutrients and overall quality. However, further research is warranted to fully comprehend the nuanced effects of Cold Plasma on different types of juices, thus paving the way for its practical implementation in the industry.

23 Evaluation of the nutritive value of protein concentrates from solanum macrocarpon from Nigeria **Oluwayemi O. Onawumi**[2], estherdr@rocketmail.com, **Abiodun Sodamade**[2,3], sodamade1@gmail.com, **Olubunmi A. Adewusi**[1], bunmiadewusi@yahoo.com, **Folake A. Amoo**[2], folakemiabbey55@gmail.com. (1) Dept. of Chemistry, Lagos State Univ., Ojo, Nigeria(2) Dept. of Pure and Applied Chemistry, Ladoke Akintola Univ. of Technology, Ogbomoso, Oyo, Nigeria(3) Dept. of Chemistry, Emmanuel Alayande College of Education, Oyo, Nigeria Protein shortage and some of its associated deficiency diseases are still rampant in some countries nowadays. This resulted in a search for a suitable source of dietary protein from plant sources that would alleviate problems encountered through protein shortages. Solanum microcarpon is one of the green vegetables consumed all over the world and has served medicinal purposes. This study focused on determination of proximate composition, mineral content, amino acids constituents and functional properties of an edible leafy vegetable concentrates, Solanum macrocarpon. A fresh sample of the plant (Solanum microcarpon) was purchased at the vegetable garden situated near Erelu dam of the Emmanuel Alayande Univ. of Education, Oyo. This sample was authenticated at the Forestry Research Institute of Nigeria, Ibadan. The leaves of the plant were washed with distilled water and processed into leaf protein concentrates. The leaf protein concentrates of this plant sample were evaluated for proximate analysis, mineral composition, functional properties and Amino acid profile using standard method of analysis. The proximate analysis of the sample showed moisture content; (33.27±0.00 g/100g) to be the highest followed by carbohydrate, protein, crude fibre, ash and crude fat; (6.81±0.49g/100g) respectively in order of increase. The mineral elements present in the sample in mg/100g, showed appreciable amount of Mg, K, Na, Ca, with the following amount of Fe; 1.90±0.09, Zn; 4.0± 0.27, Cu; 0.1±0.03 and Mn; 0.1±0.06. Selenium and lead were not detected in the sample. The value functional properties of the sample showed water absorption capacity 267.18±0.2, oil absorption capacity; 195.70±0.6; foaming capacity; 26.00±1.30, foaming stability; 2.00±1.3, emulsion capacity 27.00±0.3 and emulsion stability; 50.00±0.6. The results also showed the presence of eighteen amino acids consisting of ten essential amino acids and eight non-essential amino acids. The study conducted on the leaf protein concentrate showed that the sample is a viable source of nutrients, food additives, essential minerals required for proper growth and development and a reliable source of amino acids.

24 Medium-throughput phenotyping approach of quantification of 11s/7s protein ratio in soybean **Yaojie Zheng**, yaojie@vt.edu, Cynthia Denbow, Guillaume Pilot, Bo Zhang. School of Plant and Environmental Sciences, Virginia Polytechnic Institute and State Univ., Blacksburg Glycinin (11s) and β-conglycinin (7s) subunits

are the primary components of soybean storage protein, with their ratio (RGC) significantly affecting soy protein's functional properties and processing in the food industry. Therefore, accurate and highly efficient RGC assessment is crucial for enhancing soybean protein quality. RGC phenotyping employs SDS-PAGE electrophoresis to profile soy protein isolates, followed by calculating the ratio from band signal intensities. The existing methods often compromise between accuracy, sensitivity, and ease of use. However, plant breeding requires methodologies ensuring efficiency, accuracy and stability at the same time. Our study aimed to develop a RGC quantification protocol that balances accuracy and simplicity as a medium-throughput method. We quantified RGC in three soybean lines with various protein content using two established protocols and developed a new method with simplified extraction buffer and employed stable reducing agents to enhance usability. Meanwhile, we also integrated chemicals to prevent protein aggregation and degradation, ensuring result uniformity and stability. As a result, our method produced distinct and consistent bands, which accurately reflect subunit content changes and minimize measurement errors. We will demonstrate its screening efficacy and reliability through inter-line and intra-line variance analyses, as well as its comparison with other protocols at the conference. This optimized approach promises to enhance RGC phenotyping for soybean variety development with specificized RGC and soy food processing industry.

25 Natural products magnetic resonance database (NP-MRD): Comprehensive resource for NMR data enabling natural products discovery and understanding **John R. Cort**[1,2], john.cort@pnnl.gov, Roger Linington[3], David Wishart[4], Lloyd Sumner[5], Jessica Bade[6], Bharat Goel[5], Matthew Pin[3], Ella Poynton[3]. (1) Biological Sciences Division, Pacific Northwest National Laboratory, Richland, Washington (2) Institute of Biological Chemistry, Washington State Univ., Pullman (3) Simon Fraser Univ., Burnaby, British Columbia, Canada(4) Univ. of Alberta, Edmonton, Canada(5) Univ. of Missouri, Columbia, Missouri (6) Pacific Northwest National Laboratory, Richland, Washington The Natural Products Magnetic Resonance Database (NP-MRD, np-mrd.org) was established in 2020 as a database and repository for natural products and specialized metabolites NMR data. NP-MRD contains raw data (FIDs), derived data (chemical shift assignments, coupling constants) curated from the scientific literature or from raw data, predicted data (from DFT calculations and machine learning), and simulated spectra. The database also provides structures, synonyms, search and other tools, links to other databases, and data deposition interfaces. The NP-MRD mission is create an enduring research resource to facilitate discovery and understanding in natural products and secondary metabolites research. NP-MRD is a free and open database complying with FAIR database principles. Deposition of raw data is now required by many natural products journals and some funding agencies. NP-MRD accepts raw data collected in support of novel structure elucidations and characterization of mixtures, through an easy and intuitive deposition interface. NP-MRD also accepts legacy data still residing on computers in individual laboratories. Historically, raw NMR data has not been archived and much of what has been acquired over the decades is already irretrievably lost. Curation of derived data published in the literature presents a conundrum, as much of it has problems due to ambiguous or erroneous chemical shift assignments, incorrect referencing, typesetting mistakes, or poor proofreading. Curating data, particularly from older literature in low-resolution pdf format, is slow and may introduce additional errors. Poor quality may make such data unsuitable for uses such training AI/ML models, and raises the question of whether it is worth curating data from the literature. Some of these limitations can now be overcome, because chemical shift predictions via both AI/ML and quantum chemical calculations is becoming increasingly accurate. These calculations can be used to validate published chemical shifts and locate and correct outliers. NP-MRD has predicted chemical shifts and simulated spectra for most natural products.

Molecular Simulation guided adsorption mechanism of anthocyanin on macro reticular ion exchange resin **Anindita Paul**[1], aninditaofficial1992@gmail.com, **Abhishek Mandal**[2], amandal@temple.edu, **Anirban Dutta**[3], anirban.iari@yahoo.com, Aditi Kundu[3], Supradip Saha[3]. (1) ICAR-CTRI, Rajahmundry, India(2) ICAR-Indian Inst. of Horticultural Research, Bangalore (3) ICAR-Indian Agricultural Research Institute, Delhi, India Adsorption of anthocyanins and phenolic compounds on ion exchange resin was found to be significantly influenced by non-bonding interactions with aromatic groups and -OH groups, as predicted by molecular simulations. Simulation studies were used to determine the mechanism of the adsorption phenomenon. OPTIPOREL493 is the synthetic copolymer of styrene and cross linker, divinyl benzene with sulfonyl moiety as the cation exchanger. The geometry of the representative polymer was optimised by using “Üniversal” forcefield in Forcite module of Materials Studio version 2020. Hydrophobic interactions and hydrogen bonds were more prevalent than electrostatic bonds in the results for the ligands (cyanidin-3-glucoside, cyanidin-3,5-diglucoside,malvidin-3,5-diglucoside,cyanidin3-O-(6-O-p-coumaryl)glucoside, quercetin-3-glucoside) attached at the surface of the macroporous ion exchange resin. The phenolic compound is lesser stable than the studied anthocyanin molecule as per number of interactions is concerned. The favorability of hydrophobic interactions increased in the following order: Q3G< C35-DG<C3acyl-G<C3G. The least adsorption energy was recorded for acylated anthocyanin (-760.432 $kcalmol^{-1}$) which commemorated that the binding of acylated anthocyanin on resin surface is more stable in the system than all the tested compounds. On the other hand, the highest adsorption energy shown by Q-3G, (-467.677 $kcalmol^{-1}$) proved that the phenolic compound-resin complex is the least stable. In case of competitive adsorption study among anthocyanin and phenolics, the adsorption energy indicated that the ease of binding is more when anthocyanin is alone at simulated resin surface than in combination with phenolic compound. In other words, phenolic compound, Q-3G affects the adsorption of anthocyanin, C-3G by hindering them to accumulate at adsorption site of resin surface. Hence the adsorption energy may get compromised in the system than when anthocyanin was alone. This also affirmed that the competitive adsorption certainly took place. This study launched for the first time to give a valuable insight onto adsorption mechanism of anthocyanin on macroporous resins.

Utilizing a green pH-driven approach for developing curcumin-infused soymilk **Anthony Suryamiharja**, anthony.suryamiharja@uga.edu, Xiping Gong, Casimir C. Akoh, Hualu Zhou. Food Sci. and Tech. Univ. of Georgia, Griffin With the global population projected to reach approximately 10 billion by 2050, there is a urgent need for sustainable, healthy, and affordable next-generation foods to meet increasing demand. However, fully harnessing the potential of plants to enhance the sustainability and health benefits of plant-based ingredients or foods remains challenging, particularly in the absence of efficient and cost-effective processing methods. In this study, we developed a novel two-in-one approach, termed the post pH-driven (PPD) method, to simultaneously extract and encapsulate curcumin in plant-based milks. This innovative technique offers a highly efficient and economical means of incorporating bioactive curcumin or turmeric for enhanced health benefits. Using soy milk as a model system, we initially dissolved curcumin or turmeric in an aqueous extraction solution. Subsequently, the dissolved compounds were directly encapsulated into the hydrophobic phase of soymilk. Finally, the

mixture was processed into milk powder, achieving exceptional extraction and encapsulation efficiencies of approximately 100% for curcumin and 80% for turmeric. The slightly lower efficiency observed for turmeric can be attributed to the fact that only approximately 80% of curcumin was extracted, while its encapsulation efficiency approached 100%. Moreover, the resulting curcumin-infused milk powder exhibited high water solubility due to the encapsulation of curcumin within the hydrophobic phase of soymilk. Additionally, the chemical stability of curcumin was significantly enhanced. The successful infusion of curcumin or turmeric can be attributed to the rapid and efficient processing enabled by the PPD approach. Moreover, this method is noteworthy for its avoidance of organic solvents and sophisticated equipment, resulting in a reduced environmental footprint. Overall, the PPD approach holds significant promise for driving innovation in the development of plant-based foods.

Organocatalytic acetylation of maize starch through reactive extrusion **Carolina Lagunes Delgado**[1], carolagunes21@gmail.com, Edith Agama Acevedo[1], Tomy J. Gutierrez[2]. (1) Centro de Desarrollo de Productos Bióticos, Instituto Politecnico Nacional, Morelos, Mexico(2) Inst. de Investigación en Ciencia y Tecnología de Materiales, Univ. Nacional de Mar del Plata, Argentina Nowadays, reactive extrusion is used to modify starch in a single step and can be combined with organocatalytic reagents to produce acetylated starch by a green method. Acetylated starches are widely used in food and non-food applications due to the properties (agglutination, hydrophobicity, emulsification, thermal stability, among others) they impart to products. During the extrusion process chemistry reactions occur simultaneously due to heat transfer and pressure operations. The objective of the present work was to evaluate the effect of the organocatalytic acetylation through reactive extrusion on the degree of substitution (DS), chemical structure, and molecular structure of the modified starch. Normal maize starch (26 % of amylose) was modified with acetic anhydride as an acidulant reagent and tartaric acid as an organic catalyst during the reactive extrusion. Acetylated starch obtained a DS of 0.38, the analysis of ^{13}C NMR demonstrated that tartaric acid also esterified starch due to the appearance of a peak at 180 ppm (carboxylic group). The spectra of FTIR of the modified starch showed two bands at 1747 and 1630 cm^{-1} that correspond to the ester group (from the linkage) and carboxylic acid which belongs to acetate or tartrate. The molecular weight of the amylose and amylopectin decreased after the modification (from 9.05 to 4.52 $x10^5$ and from 2.45 to 1.53 $x10^7$ g/mol, respectively), likewise, the amylose content increased from 26 to 35 %. The reactive extrusion acetylates the starch, and the starch chains were broken in the presence of tartaric acid, which also crosslinks the carbohydrate chains by an ester linkage.

Development of phosphorus and nitrogen rich flame retardant by encapsulation technology **Sechin Chang**, sechin.chang@usda.gov, Jade Smith. USDA-ARS Southern Regional Research Center, New Orleans, Louisiana, US Microencapsulation is a procedure in which active substances are coated by nano-micro size small capsules. The achievement of this technology is due to the correct choice of the wall material, the core release form, and the encapsulation method. Furthermore, research and development are still needed to identify and develop new wall materials and to improve the existing methods of encapsulation for the better use of microencapsulation and its potential applications. The use of flame retardants for textiles has undergone a significant evolution due to environmental issues related to the use of certain types of high performing flame retardant. In the last three decades, many of the high performing formaldehyde- or halogen-based flame-retardants for fabrics have been excluded from commercial use, thus favoring the use of organophosphate compound. In this study, a melamine tritolyl phosphate microcapsules were developed. Cotton fleeces were treated in microcapsules with binder to provide different add-on values. Treated fabrics were tested for flammability by such methods as vertical, 45 degree angle flame and limiting oxygen index tests. Additional thermal properties of desired products were discussed using thermogravimetric analysis and microscale combustion calorimeter.

Exploring puffed rice as a novel ink for 3D food printing: Rheological characterization and printability analysis **Boram Park**[3], bboram27@korea.kr, Legesse S. Chewaka[3], Chan S. Park[3], Junhee No[1], Kwan-Mo You[2,3]. (1) Food Science and Nutrition, Kyungpook National Univ., Daegu, Korea (the Republic of)(2) Food Science and Innovation, Univ. of Chester, Cheshire, United Kingdom(3) Agro-food resource, National Institute of Agricultural Sciences, Wanju-gun, Jeollabuk-do , Korea (the Republic of) This study delves into puffed rice's (PR) physicochemical and rheological properties as a novel ink for 3D food printing. Due to gelatinization and dextrinization, PR saw notable water absorption and solubility gains, with a modest viscosity uptick from 39.2 to 49.9 RVU, sharply contrasting NR's jump from 128.9 to 167.8 RVU, emphasizing PR's minimal retrogradation. Rheological evaluations reveal that PR 25% (w/w) exhibits a desirable balance among viscosity, yield stress (τy), and flow stress (τf), indicative of excellent viscoelastic properties that facilitate printability and shape fidelity. The results exhibit a viscosity of 897.4 Pa.s, τy of 2471.3 Pa, and τf of 1509.2 Pa. Texture Profile Analysis outcomes reveal that PR significantly enhances key textural properties including hardness, adhesiveness, and springiness at this specific concentration. The correlation between the rheological behaviors and the successful 3D printing outcomes underscores the potential of PR as a versatile, sustainable ink for 3D food printing.

Effects of proanthocyanidin degree of polymerization on pulse protein-proanthocyanidin interactions **Chen Chen**, chenchen@tamu.edu, Joseph Awika. Food Science and Technology, Texas A&M Univ., College Station The growing interest in pulse proteins for plant-based meat alternatives and other uses faces limitations due to reduced protein polymer-polymer interactions. Proanthocyanidins (PA) can crosslink proteins and strengthen protein network density, potentially fostering a fibrous structure in pulse proteins. This study aimed to determine the effects of PA degree of polymerization (DP) on pulse protein-PA binding properties. Soybean protein control, alongside pulse proteins isolates (pea, faba, and lentil) were treated with catechin (DP 1), oligomeric PA (OPA, DP 2-10), and polymeric PA (PPA, DP>10). Binding properties were analyzed by nephelometry. MWs were measured by sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) and size exclusion chromatography - multi-angle light Scattering (SEC-MALS). Thermal stability was assessed by differential scanning calorimeter (DSC). Nephelometry revealed that pea and faba proteins exhibited the lowest dissociation constants (Kd) (3.13-8.74) whereas soy and lentil had the highest Kd (249-935), suggesting faba and pea's stronger affinity for PA. SDS-PAGE revealed the disappearance of ~100 kD MW bands in pulse proteins with OPA and PPA but not catechin. On the other hand, SEC profiles demonstrated new ~1500 kD protein peaks with OPA and PPA but not catechin, with 2.16-6.27X higher peak intensity for PPA than OPA treatment. This indicates that the ~100 kD pulse proteins preferential crosslinked with higher DP PA to form large complexes. SEC-MALS confirmed an increase in protein-PA complex MW with increasing PA DP, indicating more extensive cross-linking with larger PA. DSC showed that higher DP PA increased pulse protein denaturation temperatures by 6.8-16.7°C, indicating enhanced thermal stability of the protein-PA complexes. The findings highlight the potential of higher MW proanthocyanidins to enhance pulse protein polymer interactions and resulting complex stability. This could enhance pulse protein functional and textural properties.

L-Theanine production by whole cell conversion for high concentration of substrates using an ATP regeneration system **Kyungjae Yu**[1], totojae1004@naver.com, Byung Wook Lee[1], Gaeul Kim[1], Yoon Jung Jung[1], Jung-Oh Ahn[2], Yung-Hun Yang[3], Hee Taek Kim[4], Hyung-Wook Jang[5], Minjeong Sohn[5], See-Hyoung Park[1], Kyungmoon Park[1]. (1) Biological and Chemical Engineering, Hongik Univ. - Sejong Campus, Sejong, Korea (the Republic of)(2) Biotechnology Process Engineering Center, Korea Research Institute of Bioscience and Biotechnology Chemical Biology Research Center, Ochang, Chungcheongbuk-do, Korea (the Republic of)(3) Biological Engineering, Konkuk Univ., Gwangjin-gu, Seoul, Korea (the Republic of)(4) Food Science and Technology, Chungnam National Univ., Daejeon, Korea (the Republic of)(5) Biotechnology Center, Ace BioPharm, Daejeon, Korea (the Republic of) Since Covid-19, a number of people have been suffered from mental illness, which has brought attention to functional foods for mental disorder such as L-theanine. L-theanine from Tea (Camellia sinensis L.) has the unique chemical structure similar with amino acid. L-theanine is known to relieves tension brought on by mental stress with relatively less side effect. So far, researchers tried to develop chemical and biological synthesis system to produce high concentration of L-theanine. Nevertheless, the previously reported L-theanine biosynthetic pathway is notably dependent on adenosine triphosphate (ATP) requiring the external ATP to produce high concentrations of L-theanine. Hence, this study aims to examine polyphosphate kinase 2 (PPK2) as an ATP regeneration system with high concentration of substrate. We examined L-theanine productivity of three different kinds of L-theanine synthetase at high substrates concentrations. To increase industrial feasibility, we used substrates up to 800 mM monosodium glutamate (MSG) and ethylamine with adenosine triphosphate (ATP) as a co-substrate. Among three kinds of L-theanine synthetase, γ-glutamylmethylamide synthetase (GMAS) from Methylovorus mays showed 41% conversion yield, similar with ecGCS from Escherichia coli, but RhGMAS from Rhodovulum sp. showed 10% conversion yield. For GMAS and ecGCS, 800 mM of substrates with 200, 300, and 420 mM of co-substrate resulted in 41, 45, and 60% conversion yield, respectively. PPK2s derived from Corynebacterium glutamicum, Rhodobacter sphaeroides, Cytophaga hutchinsonii were introduced to our system with hexametaphosphate as a substrate for PPK2. Taken together, ATP regeneration system was examined to observe the potential of ATP reusability for high concentration of L-theanine production.

Application of carbon quantum dots (CQDs) solution as a novel solvent for hydrophobic surface coating on PVA films **Yena Oh**[1], ooohyena_01@yonsei.ac.kr, Kitae Park[1], Jamilur R. Ansari[1], Jihyeon Hwang[2], Dowan Kim[2], Jongchul Seo[1]. (1) Yonsei Univ., Seoul, Korea (the Republic of)(2) Gangneung-Wonju National Univ. College of Life Sciences, Gangneung, Korea (the Republic of) Polyvinyl alcohol (PVA) is a popular material used in the packaging industry due to its transparency, non-toxicity, and oxygen-barrier properties. However, it is vulnerable to moisture attack, which can affect its performance and durability. The permeation process in films is mostly impacted by moisture sorption and diffusion, making it hard for water molecules to dissolve in polymers that have low surface hydrophilicity. Applying hydrophobic materials like tetraethyl orthosilicate (TEOS) and hexadecyltrimethoxysilane (HDTMS) by spraying them onto PVA offers a potential solution to enhance water resistance, but this can lead to opacity problems and uneven coating layers. To overcome these issues, we have developed a new technique that uses carbon quantum dots (CQDs) to enhance the dispersibility of the coating solution. By using CQDs solution as a solvent for the hydrophobic coating layer on the PVA surface, a smooth and clean film morphology was achieved, and the water contact angle (WCA) was enhanced to 105°. The uniformity of the coating layer further enhanced the barrier properties of the PVA film. This study has promising prospects for various coating processes, making it ideal for applications in packaging and other fields.

Effects of food preparation technology and storage on phenolics and antioxidant activity in sweet corn **Fangxiang Dong**, fangxiang412@gmail.com, Huan Wu, Liangli Yu. Nutrition and Food Science, Univ. of Maryland, College Park Phenolics are a group of important food components because of their potential health benefits. This study examined the effects of freezing, canning and storage conditions on the phenolic acids in sweet corn. The bi-color sweet corn (Baseline) freshly harvested from the field was processed by direct canning ("canning0"), canning after one-month storage ("canning1"), and freezing with the kernels on the cob ("FC1") and off the cob ("FO1"). Soluble free, soluble conjugated, and insoluble bound phenolic acids were extracted and analyzed using a HPLC analysis. Ferulic (FA), p-coumaric (PCA) and benzoic (BA) acids were quantified in all the samples. The contents of FA, PCA and BC in the Baseline samples were 180.0, 5.6 and 172.1 mg/100 g dry corn. FA decreased by about 42 and 49% in FC1 and Canning0 samples, respectively, but had no change in FO1 and Canning1 samples. PCA decreased in all samples compared to the Baseline. BA decreased by 74 and 31% in FC1 and FO1, respectively, but increased in Canning0 and Canning1. The FC1, Canning0, FO1 and Canning1 had reduced TPC. The DPPH radical scavenging capacity had no significant change. The ABTS cation radical scavenging capacity increased in the Canning0 and Canning1 samples whereas no significant change was detected in the FO1 and FC1 samples. Results from this study provide a scientific foundation on improving food processing and storage techniques for better maintaining the bioactive components in sweet corn.

Chemical constituents of parsley (Petroselinum crispum) extract and its potential in mitigating the SARS-CoV-2 infections **Ethan Lee**, elee1212@umd.edu, Yuanhang Yao, Huan Wu, Margaret Slavin, Liangli Yu. Nutrition and Food Science, Univ. of Maryland, College Park The coronavirus disease-2019 (COVID-19) pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was a threat to global public health. While vaccinations are the most effective prevention method to combat COVID-19, alternative strategies are still needed. This study examined parsley extract for potential inhibitory effects on the binding of SARS-CoV-2 spike protein to ACE2, ACE2 activity/availability, and radical scavenging properties. Analysis using a ultra-high-performance liquid chromatography (UHPLC) coupled with a mass spectrometer tentatively identified 22 chemical components in the extract. The parsley extract was able to inhibit the SARS-CoV-2-ACE2 interaction by 70% at a concentration of 3.3 mg dry parsley/mL and inhibit ACE2 activity by 86% at 5.0 mg/mL. Parsley extract showed free radical scavenging capacity against hydroxyl ($HO^{\bullet}$), $DPPH^{\bullet}$ and $ABTS^{\bullet+}$ with the values of 184.09, 0.03, and 9.58 μmol Trolox equivalent/gram, respectively. These findings suggest that parsley may have potentials to help mitigate SARS-COV-2 infections.

Assessing the impact of electrolyzed water treatment on the post-harvest quality of strawberries **Yavuz Yagiz**, yavuzy@ufl.edu, Jingyi Cheng, Haotian Chang, Ashley Maharaj, Ahmad Moussa, **Liwei Gu**, lgu@ufl.edu. FSHN, Univ. of Florida, Gainesville Strawberries, known for their short shelf life of approximately seven days, incur significant wastage—approximately 25%—during distribution and retail. This investigation evaluates the efficacy of electrolyzed water (EW) treatments in preserving post-harvest quality and extending shelf life. Initially, freshly harvested strawberries ('Sensation®' Florida127') were exposed to EW (10, 50, 100 ppm) or deionized (DI) water for 5, 10, and 15 minutes. Quality parameters such as color, acidity, soluble content, pH, and sugar content were

monitored over a 14-days at 1°C. The L* and a* values increased gradually during storage, reaching their peak on Day 6, while the total sugar content peaked on Day 10 for all treatments. No significant differences were observed between treated and untreated strawberries. In a subsequent experiment, fresh strawberries (Fragaria × ananassa) cv. Camino Real underwent pre-cooling before packing, followed by EW treatment (10, 50, 100 ppm) or DI water with 10 min dipping and subsequent rinsing to remove residuals. Along with air control (without contact with any liquid), packed fruits were stored at 1°C with 95±2% RH for 22 days. Despite an observed decline in color and firmness over time, no statistically significant variances were detected among all groups. Notably, while the EW-treated groups exhibited less weight-loss between Days 4 and 16 compared to the air control group, this discrepancy dissipated by Day 22. These findings suggest that while EW exhibits disinfectant properties and aids in moisture retention, it does not significantly influence the post-harvest quality of strawberries in terms of color, acidity, soluble content, and sugar profile. Consequently, while EW may offer benefits in terms of hygiene and moisture preservation during storage, its overall impact on fruit quality appears limited within the parameters of this study.

Bovine liver hydrolyzate pretreated with either pepsin or pepsin+ultrasound as a valuable source of free amino acids and bioactive peptides Marta Gallego, Leticia Mora, **Fidel Toldra**, ftoldra@iata.csic.es. Instituto de Agroquímica y Tecnología de Alimentos (CSIC), Valencia, Spain The valorisation of waste generated from meat industries, including by-products and co-products, is of current interest due to its economic and environmental impact. Meat co-products such as liver are sparsely consumed despite their high nutritional value, and are often used for low-value purposes. So, the use of these products to obtain protein hydrolyzates rich in peptides or free amino acids can constitute a valid approach for giving added value. The aim of this study was to evaluate the effect of different pretreatments, such as the use of pepsin or combination of pepsin and ultrasound, on the amino acid and peptide profile and bioactivity of bovine liver hydrolysates. The process consisted of subjecting bovine liver to either pepsin hydrolysis (1 % enzyme, 2 h) or pepsin hydrolysis+ultrasound (1 % enzyme, 20 kHz ultrasound pulses, 1 h and 2 h) as pretreatments prior to hydrolysis with flavourzyme. The profile of free amino acids and the molecular weight distribution of peptides of the different liver hydrolyzates as well as their potential antihypertensive activity (measured as ACE inhibitory activity) and antioxidant capacity (DPPH and ABTS radical scavenging activities) were determined. Results showed the highest amount of free amino acids in the hydrolyzate pretreated with pepsin, whereas a similar pattern was found between the samples with the combined pretreatment for 1 h and 2 h. Leu and Phe were the most abundant residues in all samples, followed by Val, Tyr, and Ile. However, the hydrolyzate pretreated with pepsin+ultrasound for 2h presented the highest percentage of peptides lower than 3 kDa (40 %) which could be potentially bioactive. In this regard, the three hydrolyzates showed values close to 80 % of ACE inhibition, but the sample pretreated with pepsin and ultrasound for 2 h showed slightly higher antioxidant activity than the others. In conclusion, the application of pepsin pretreatment improved the release of free amino acids, which could be used as nutritional food supplements or taste enhancers, whereas the combination of pepsin and ultrasound might improve the generation of peptides with potential health benefits. Thus, such pretreatment with pepsin and ultrasounds could be applied as a sustainable strategy to obtain liver protein hydrolyzates rich in valuable compounds, giving added value to this co-product.

Protein and amino-acid contents in mushroom varieties with different cooking methods **Sojung Kim**, sojung@mire.re.kr. Commercialization Support Team, Marine Industry Research Institute for east sea rim, Marine Science Road in Jukbyeon-myeon, Uljin-gun, Gyeongsangbuk-do, Korea (the Republic of) Amino acid, the basic units of proteins, play an important role in the metabolic processes of living organism. Recent, analysis of trace amino acid in physiological have received more attention. Because the analysis of these compounds could provide fundamental and important information for medical, biological, and clinical fields. The constituent unit material of proteins is amino acids, which are mainly used in human construction and are also rarely used as energy sources. This study compared the content of 19 kinds(aspartic acid, serine, glutamic acid, glycine, histidine, threonine, arginine, alanine, proline, tyrosine, valine, methionine, lysine, isoleucine, leucine, phenylalanine, taurine, tryptophan) of amino acid contents and protein of in mushroom varieties(Shiitake Mushrooms (Lentinula edodes), Enoki Mushroom (Flammulina velutipes), King Oyster Mushroom (Pleurotus eryngii) with different cooking methods(in blanching, roasted, and raw). Precision and reproducibility of assay value were expressed with %RSD(relative standard deviation) and Z-score. LOD(limits of detection) is the lowest concentration of a sample which can still be detected by the analysis method. LOQ(limit of quantification)is the lowest concentration which can still be quantitatively detected with accuracy and an acceptable precision.

Separation of mycotoxins in floral tissue of hemp infected by Fusarium graminearum **Isabelle A. Kagan**[1], isabellekagan1@windstream.net, Henry S. Smith[2], Nicole Gauthier[2]. (1) Forage-Animal Production Research Unit, USDA Agricultural Research Service, Lexington, Kentucky (2) Dept. of Plant Pathology, Univ. of Kentucky, Lexington Fusarium graminearum, a grain pathogen, has been found to cause disease on hemp across the U.S. In grains, production of mycotoxins, particularly deoxynivalenol (DON), by F. graminearum is a major health concern for humans and livestock. Little is known about whether F. graminearum produces DON or related mycotoxins in hemp. A method is being developed to extract and quantify DON and several derivatives in the floral tissue of hemp infected with F. graminearum. Commercial standards of nivalenol (NIV), DON, DON-3-glucoside (D3G, a plant-produced derivative), and 3- and 15-acetyldeoxynivalenol (3-ADON and 15-ADON, respectively) were separated by high-performance liquid chromatography (HPLC) on a C18 column with an acetonitrile-water gradient and ultraviolet (UV) detection. External calibration curves with $R2 > 0.99$ were obtained for DON, NIV, D3G, 3-ADON, and 15-ADON. Air-dried hemp floral tissue was extracted with 84% acetonitrile. Solid-phase extraction removed polar interfering compounds and some of the cannabinoids. When hemp floral tissue infected with F. graminearum was extracted and separated, coinjections of 15-ADON and 3-ADON coeluted with sample peaks. The 3-ADON coeluted with a compound having a different absorbance maximum; hence, further resolution or cleanup is needed for 3-ADON identification. DON, NIV, and D3G were not detected in the tested samples at the detection limits set. The method will be used to quantify mycotoxins in field samples.

Comprehensive dietary glycan Encyclopedia of food: revealing complex carbohydrate molecular structures via LC-MS/MS **Sophia Jiang**[1], jsojiang@ucdavis.edu, Shawn Ehlers Cheang[1], Christopher Suarez[1], Cheng-Yu Weng[1], Aaron Stacy[1], Jules Larke[1,2], Danielle Lemay[1,2], Carlito B. Lebrilla[1]. (1) Univ. of California Davis (2) USDA Agricultural Research Service, Washington, DC. Carbohydrates are one of the primary energy sources of the human diet, and their importance are widely studied. Various forms of carbohydrates exhibit unique biological activities based on their structural properties. However, carbohydrates, especially polysaccharides, are poorly studied and often oversimplified on nutrition labels. To address this issue, we have developed a multi-glycomic LC-MS analysis to build a comprehensive glycan

encyclopedia of foods. Lyophilized food samples were treated with ethanol precipitation to separate the alcohol soluble carbohydrates (ASCs) from polysaccharides. The ASCs were subjected to Combined Alcohol Soluble Carbohydrate Determination (CASCADE) analysis, which analyzed the ASCs in native form after chloroform extraction. The polysaccharide portions were analyzed by Monomeric Analysis of Polysaccharides (MAPS), Comprehensive Linkage Analysis of Polysaccharides (CLAPS) and Fenton's Initiation Towards Defined Oligosaccharide Groups (FITDOG). MAPS analysis utilized acid hydrolysis and PMP derivatization. CLAPS analysis was similar to MAPS, but with the addition of permethylation prior to acid hydrolysis. FITDOG analysis included radical reaction to depolymerize the polysaccharides into oligosaccharides. CASCADE, MAPS, and CLAPS products were analyzed on UPLC-QqQ, while FITDOG products were analyzed on HPLC-QTOF. The glycan encyclopedia covers 250 frequently consumed foods in America and provides detailed ASCs, glycosidic linkage, and polysaccharide composition. Grain products contained mainly glucose, along with arabinose and xylose. Fruits and vegetables yielded greater monosaccharide diversity containing GalA and rhamnose. Nearly 50 unique glycosidic linkages were observed in foods. High fiber foods such as vegetables and beans contained 2-galactose, 4-p-xylose, t-f-arabinose, and 5-f arabinose. Starch and cellulose were the top two most abundant polysaccharides present in most foods. Other polysaccharides such as mannans, galactan, and xylan were also observed in fruits, vegetables, and beans. Dairy, sweets, and beverages contained primarily ASCs, including glucose, sucrose, and lactose. Lastly, to showcase the application of this encyclopedia, a random forest model was generated to predict insulin resistance using glycan features and carbohydrate intake.

Brewing a solution: Practical synthesis of catechin-polymer particles **Sawyer S. Chang**[1], sawyerchang@rocketmail.com, Jorge Pereira[1,2], Swadeshmukul Santra[1,2,3]. (1) NanoScience Technology Center, Univ. of Central Florida, Orlando (2) Dept. of Chemistry, Univ. of Central Florida, Orlando (3) Burnett School of Biomedical Sciences, Univ. of Central Florida, Orlando Tea has been an integral part of human culture for millennia. Leaves from Camellia sinensis harbor many polyphenols that account for the organoleptic properties of black, green, white, oolong, and pu'er teas. These compounds have been determined to be key for the heralded health benefits of these teas. It is hypothesized that polyphenols interact with hydrophilic polymers through hydrogen bonds, creating particle aggregates, which would allow for the loading of other compatible compounds. In this work, polymer-derived particles were generated in situ to deliver and protect loaded active ingredients from the physiological environment of the human digestive tract. The ability to load a wide range of molecules allowed for the formulation of a health-based formula and an energy-based formula. This health-based formula is focused on the nutritional needs of expectant mothers including folate and minerals. The energy-based formula is based on energy drinks that aim to provide caffeine and taurine for increased performance. In the teas, the particle size and surface charge were identified through dynamic light scattering and zeta potential (DLS/Zeta), while the loading was quantified via liquid chromatography mass spectroscopy (LC-MS) and atomic absorption spectroscopy (AAS). These findings exemplify how drug delivery can be engineered based on a simple design, such as steeping tea. Furthermore, this approachable design has the ability to be applied towards both nutrient and drug delivery as a uniquely aromatic vector.

Evaluating structural and digestive properties of polymerization degree-dependent dextran fraction via Gluconobacter oxydans biosynthesis Seung-Min Baek, **Boram Park**, bboram27@korea.kr. National Institute of Agricultural Sciences, Wanju-gun, Jeollabuk-do , Korea (the Republic of) Dextran, a slowly digestible biopolymer, is enzymatically produced from dextrin by Gluconobacter oxydans dextran dextrinase (EC2.4.1.2). The study investigates the structural and digestive attributes of dextran fractions synthesized by G. oxydans, dependent on polymerization degree. Three α-glucan fractions were characterized based on molecular weight (MW) via gel permeation chromatography (GPC). Each fraction exhibited distinct MW sizes (Mp) (424.5, 29.3, 2.0 kDa) and corresponding degrees of polymerization (DP) (2620, 181 and 13) respectively. The ^{1}H-NMR data for each fraction revealed distinct α-1,4:α-1,6 bond linkage ratios of 11.3, 2.4, and 1.7, respectively. The GC-MS analysis revealed the α-1,6 glycosidic bond proportions in each fraction to be 53.9%, 48.4%, and 28.7%, respectively. Evaluation of each fraction hydrolysis by mammalian intestinal α-glucosidases suggests that the medium molecular weight fraction undergoes slower conversion to glucose compared to commercial dextran. These findings suggest that oligosaccharides with bent L-form structures, rather than linear α-1,6 glycosidic bonds, contribute to non-digestibility. This insight may inform the design of novel dietary fiber materials from starch.

Antimicrobial and antifungal screening of new nitrogen derivatives Zuleima González[1], **Concepcion C Gonzalez**[1], ccgm@ipna.csic.es, Cristina Giménez Mariño[2], Ana Sofía Ramírez Corbera[3], Jose Bismarck Poveda Guerrero[3]. (1) SIPN, Instituto de Productos Naturales y Agrobiologia, San Cristobal de la Laguna, Canarias, Spain(2) UDI Fitopatología, Facultad de Ciencias, Univ. de La Laguna, San Cristóbal de La Laguna, Tenerife, Spain(3) Instituto Univ. de Sanidad Animal y Seguridad Alimentaria (IUSA-ULPGC, Univ. de Las Palmas de Gran Canaria, Spain In the past decades, the misuse of antimicrobials in agriculture and farms has led to the emergence of microorganisms resistant to known treatments, including those of last resort. One of the key issues in the search for new antimicrobials is their selectivity, as in many cases those in use also kill beneficial microbiota. Among the most active commercial antibiotics, we can highlight those that contain amino acids and/or sugars in their structure. In our case, we have synthetically prepared new thioureas and thiohydantoins from α-amino acids or amines, as similar compounds have already demonstrated their antimicrobial, nematicidal and antiviral action, among others. Once synthesised, their activity against different reference bacterial strains of human affection was evaluated, using the minimum inhibitory concentration (MIC) in 96-well plates and the minimum bactericidal concentration (MBC) in tubes with the corresponding culture medium. With the data obtained, a structure-activity study (SAR) was performed with the idea of improving the selectivity of these compounds. We can conclude that the bacteriostatic action observed in gram-positive bacteria is due to the products and not to the substrates or reagents from which we started.

Encapsulation and controlled release of cyanocobalamin from ionotropic gel carriers made from pectins with different nanostructural characteristics **Yang Kim**, ya_kim@hotmail.com. Seoul National Univ., Seoul, Korea (the Republic of) Each nutraceutical has unique physicochemical properties and has an adequate site for utilization within the human gastrointestinal tract. Many nutraceuticals have low bioaccessibility due to their instability within the human digestive system thus adequate carriers are required for protection and efficient delivery to the site of utilization. In recent years, natural polymers have been explored as ideal materials for site-specific carriers. Pectin, a natural dietary fiber consisting of plant cell walls, has gotten great attention as a carrier material delivering bioactive materials since they are not digested by enzymes but completely degraded by pectinolytic enzymes produced by colonic microflora. To produce an efficient delivery system for cyanocobalamin, microbead carriers were prepared using well-characterized low methyl ester and amidated pectins via calcium-mediated ionotropic gelation. The effects of the nanostructure of

pectin on the release and the bioaccessibility of cyanocobalamin from the carriers were investigated using an in vitro simulated gastrointestinal tract model and a spectrophotometer. As a result, nanostructural characteristics of pectin greatly affected the physicochemical properties of delivery systems and huge differences were induced in encapsulation efficiency (EE), release, and bioaccessibility of cyanocobalamin ($p<0.05$). The carrier made from low methyl ester pectin with contiguous demethylesterified galacturonic acid residues exhibited much lower EE than the one from randomly demethylesterified pectin due to its strong calcium-mediated gelation property. Amidated pectin with different degrees of amidation/methyl esterification exhibited different EE and release patterns. The carrier made from the amidated pectin with the degree of amidation (DA) 20 and DM 27 showed the highest EE of 67% while the release rate during the intestinal digestion was as low as 54%. However, the one made from the amidated pectin with DA 15 and DM 35 showed EE of 64% and the highest release rate of 68%. The results clearly showed that the nanostructure of pectin greatly affected the properties of pectin microbead carriers. While selecting a pectin carrier for a specific nutraceutical, the nanostructure of pectin must be carefully considered according to the properties of nutraceuticals for successful encapsulation and site-specific delivery within the human body.

Utilizing deep learning algorithms (experiential A.I.) for agricultural analysis to optimize urban farming yield in Southern California Stuart E. Wettstein, **D. Richard Rakijian**, drakijia@lasierra.edu, **Marco M. Allard**, mallard@lasierra.edu. Chemistry and Biochemistry, La Sierra Univ., Riverside, California The ability to optimize agricultural yield with respect to energy, nutrient and water consumption is necessary to ensure more sustainable agricultural practices. Optimizing farm yields by automating agriculture in an urban environment is critical in order to reduce the carbon footprint, minimize cost, and encourage sustainable local food production. In Southern California the weather can vary widely, and heavy energy use for climate control of hydroponic systems can be unsustainable. We aim to investigate and optimize plant yield as a function of agricultural intrants and costs. This work is primarily focused on accurately predicting yields (in terms of mass) from photo analysis. To achieve this we will use a Deep Learning Algorithm trained with carefully collected relevant data. This will include: time stamped photos from multiple angles, weight of plant mass, humidity, temperature, luminosity, and growth media pH/conductivity for the hydroponic systems. The algorithm will be trained on this data through various deep learning protocols in order to obtain a plant yield directly from field pictures. The ultimate goal is to automate and optimize growth conditions while using simple digital images. This work will be focused on fast-growing plants (various Lettuce) grown hydroponically, indoors, in controlled conditions. We will collect and analyze the data through traditional methods first (RGB picture analysis for plant areas as a function of time). Then carefully weigh each plant at various times, perform simple correlations, all in order to generate an algorithm that can accurately assess plant yields from a single picture.

Coriander (Coriandrum sativum) extract's chemical composition and potential antiviral effects **Ethan Lee**[1], elee1212@umd.edu, Huan Wu[1], Boyan Gao[2], Liangli Yu[1]. (1) Nutrition and Food Science, Univ. of Maryland, College Park (2) Food Science and Technology, Shanghai Jiao Tong Univ., China After the Coronavirus Disease 2019 (COVID-19) pandemic caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), treatments against viral infection gained importance due to the threat of new or resurgent infections. A barrier to treatment for many Americans is the high cost of medical care making it imperative to the health and wellbeing of all that an inexpensive and accessible treatment be found. To analyze the chemical composition of coriander ethanol extract, to determine the effect of coriander extract on SARS-CoV-2 infections and determine free radical scavenging activity. Dried coriander flakes were generously donated from the Frontier Co-op. Coriander was ground and sieved. 1 g of sample was extracted for 24 hours in 10 mL of ethanol and centrifuged. The supernatant was then collected. The chemical constituents were tentatively identified using ultra high-pressure liquid chromatography – mass spectroscopy (UHPLC-MS), fragment ions, molecular formulas generated from analysis software, published literature, and databases. Thirteen compounds were tentatively identified in coriander. Coriander extracts could inhibit the SARS-CoV-2-ACE2 interaction by 100% at a concentration of 3.3 mg dry coriander/mL and ACE2 activity by 87% at 5.0 mg/mL. Coriander extract's free radical scavenging capacity against $HO^{\bullet}$, $DPPH^{\bullet}$, and $ABTS^{\bullet+}$ was found to be 140.49, 11.49, and 0.08 µmol Trolox equivalent/gram, respectively. Coriander extract was able to inhibit ACE2 and the SARS-CoV-2 & ACE2 interaction, and quench free radicals. These findings highlight coriander as a bioactive plant that may have applications in nutraceuticals.

Streamlining sample preperation: The decision tree tool for the periodic table of food initiative **Macy Gruszczynski**, Macyg@colostate.edu, Margaret Read, Susan B. Mitchell, Jacqueline M. Chaparro, Melanie Odenkirk, Jessica Prenni. Colorado State Univ., Fort Collins The Periodic Table of Food Initiative (PTFI) is a global effort to advance our understanding of the world's edible biodiversity. The early steps of food collection, sample preparation, and sample processing are imperative to the success of downstream comparison of foods and rely on standardized practices and rich metadata collection. Intake processing begins with collection of food samples from various locations such as grocery stores, fields, or fresh markets. Sample preparation is next, which includes washing, cutting, and (sometimes) cooking the food. Sample preparation methods are written and photographed to create detailed standard operating procedures (SOPs). Prior to processing, the food is stored in –80C. Sample processing begins with lyophilization, or freeze-drying. The sample is lyophilized for roughly 72 hours to remove moisture and concentrate sample. Following lyophilization, the sample undergoes homogenization to ensure uniformity for extraction efficiency. To finalize processing, the sample is weighed out into smaller portions called aliquots for analysis. This method can be seamlessly applied to a vast array of food types. However, certain food types, such as high-fat products, beverages, and high sugar content challenge a single method for all food types. For example, liquid foods stored in -80C will melt during homogenization, so a cyrohomogenization method was implemented by freezing the grinder at -20C and the sample in -80C prior to homogenization. Using our experience with these steps for the processing of over 500 foods, we have created a standardized decision tree tool to support future analysis for any unique food type.

Peptide-polyphenol interactions: Antagonistic effect of pea pentapeptide on antioxidant properties of quercetin and rutin in Caenorhabditis elegans **Leticia Lam Hon Wah**[1], llamh010@uottawa.ca, Samanta Reyes Flores[1,2], Ornella Mosibo[1], Toluwase Fatoki[3], Rotimi Aluko[4], Chibuike Udenigwe[1]. (1) School of Nutrition Sciences, Univ. of Ottawa, Ontario, Canada(2) Univ. de las Americas Puebla, Cholula, Mexico(3) Federal Univ. Oye-Ekiti, Oye, Nigeria(4) Food and Human Nutritional Sciences, Univ. of Manitoba, Winnipeg, Canada Food-derived peptides and polyphenols have demonstrated antioxidant activities against reactive oxygen species and free radicals. However, little is known about their combined antioxidant capacity when interacting within food product matrices. This study investigated the antioxidant capacity of complexes formed between flavonoids (quercetin or rutin) and pea protein-derived pentapeptide (VNRFR) in vitro and in vivo using

Caenorhabditis elegans model. Dynamic light scattering revealed an increased in particle size, while ultraviolet–visible spectroscopy and molecular docking analyses revealed peptide-polyphenol complex formation. These physicochemical analyses gave an indication that peptide binds with polyphenol through non-covalent interaction, especially by π-stacking between the peptide phenylalanine and the polyphenolic aromatic ring. This interaction resulted in antagonistic radical scavenging activity in vitro (via the DPPH and ABTS radical scavenging assay) and antioxidative effects in vivo based on nematode mean lifespan and survival rate. Antagonism followed a dose dependent relationship only at concentration exceeding 0.1mM of peptides. Additionally, the antagonism was more pronounced for rutin due to the additional H-bonding of its rhamnosyl glucoside moiety formed with the peptide. These findings provide valuable insights into food matrix interactions that affect antioxidant capacity of nutraceutical mixtures in formulated products. Consequently, this proved to be effective in understanding the molecular interaction happening between peptides and polyphenols, showcasing a decline in radical scavenging activity within the peptide-polyphenol complex.

Value-added products from apricot fruits **Zayniddin K. Muhidinov**[1], muhidinovzayniddin@gmail.com, Matlub Rahmonov[1], Jamshed Bobokalonov[1], Gary Strahan[2], Arland Hochkiss[2]. (1) Biopolymer Chemistry, Institute of Chemistry named after V.N. Nikitin of the National Academy of Sciences of Tajikistan, Dushanbe (2) Eastern Regional Research Center of the ARS USDA, Wyndmoor, Pennsylvania Fruit pomace is a rich source of prebiotics and antioxidants, which have been shown to have health-beneficial effects. Pectin oligosaccharides (POS) and polyphenols usually remain in an alcohol solution or permeate from the diaultrafiltration process during pectin production in high amounts that vary from 16 to 55%, depending on the raw materials. Previously, we reported on the fat and waxes and (POS) isolation from different fruits [8]. This work emphasizes sugar and polyphenol analysis of POS - byproducts from pectin production, subsequently extracted from apricot fruits. POS represents a new class of prebiotics with multiple health-promoting effects. Those extract also contains a polyphenolic compound, one of the powerful antioxidants. Yet, research has to explore value-added byproducts produced during the pectin hydrolysis and extraction process. The fine structure of both pectin and POS was obtained by 1D and 2D homo- and hetero-nuclear NMR spectroscopy, including results from Carbohydrate linkage analysis. Monosaccharide composition of the apricot alcohol soluble POS fraction determined by HP Anion-Exchange Chromatography with Pulsed Amperometric Detection (HPAEC-PAD) comprises 93.26% Clc, 2.95% Ara, 1.25% Xyl, 0.94% Man, 0.58%Gal, 0.36% GalA, and 0.33 ClcA, and 0.31% Rha sugars. The results of monosaccharide analysis of DUF POS fractions from apricot fruits during pectin extraction processing were mainly represented by glucose (39%), arabinose (28%), maltose (16%), sucrose (15%), and a trace amount of galactose and rhamnose. We were also able to determine the total amount of polyphenolic compounds and their composition by spectroscopy and capillary electrophoresis, which are quantitatively presented by: 2-(4-Hydroxyphenyl)Ethanol, Resveratrol, 3,4-Dimethoxybenzoic acid, Vanillin, Trans-Cinnamic acid, Sinapic acid, Quercitrin, Syringyc acid, Trans-Ferrulic acid, p-Coumaric acid. Among them are Vanillin, Sinapic acid, and 2-(4-hydroxyphenyl) Ethanol.

Analysis of soil fumigant emmisions by solid phase microextraction (SPME) with gas chromatography-mass spectrometry (GC-MS) **Dana Gramckow**, dgramckow@hillsdale.edu, Mark A. Nussbaum. Hillsdale College, Michigan This research was conducted to: a) develop a sensitive and reproducible method for measuring emission rates of soil fumigants under various conditions, and b) study the viability of biochar as a soil covering to reduce the emissions of agricultural fumigants 1,3-dichloropropene (1,3-D) and chloropicrin (CP). Vertical soil columns were constructed from PVC pipe, each with injection ports at four different soil depths and a gas-tight headspace cap. The cap contained a valve for solid phase microextraction (SPME) sampling and a miniature fan to circulate the headspace gases. Methods for GC-MS analysis of 1,3-D and CP were developed for low-level emissions. Analyses by SPME and GC-MS were performed for qualitative and semi-quantitative determinations of 1,3-D in the headspace as a function of time after soil injection. Samples were measured regularly over a 25-hour period to determine the rate of fumigant propagation through the soil. Notably, the cis isomer of 1,3-D reached the headspace more quickly than the trans isomer. Fumigant propagation tests were conducted on one Michigan soil sample and three different California samples. Soil tests were conducted with no soil covering, with a thin LDPE plastic covering, and with a 1” layer of biochar covering. The tests with biochar covering showed no detectable 1,3-D emissions over 25 hours. The relative effectiveness of biochar as an alternative covering to plastic in the practice of fumigation is yet to be determined, but the apparatus, methods, and procedures reported here show promise for future study.

Phony noni: evidence of widespread misbranding of commercial powdered Morinda citrifolia products **Brett West**, Brett.West@partner.co, Shixin Deng. Research and Development, Partner.Co USA, American Fork, Utah Morinda citrifolia fruit juice, commonly known as noni juice, has become a globally popular health supplement. We have discovered that some sources of purported noni fruit ingredients include locations where related plant species are often confused with actual noni. One species in particular, Morinda coreia (syn. Morinda tinctoria), has been found to be frequently misidentified as noni. Phytochemical analyses of samples of raw and processed noni fruit and M. coreia fruit were performed. A comparison of results has revealed that distinct phytochemical profiles may be used to identify commercial products containing authentic noni juice versus M. coreia fruit. Using this information, a survey of commercial powdered “noni” products purchased from major online retailers revealed that a high percentage of these were misbranded and contained M. tinctoria fruit instead of authentic noni. As such, many consumers are not receiving what they believe they have purchased. Further, this presents potential risks as the safety and efficacy of these misbranded products has not been evaluated in human studies.

Synthesis of carnosine-based aqueous-soluble antioxidant dendrimers **Blessed Agbemade**, agbem1b@cmich.edu, Collins Antwi-Boasiako, Choon Y. Lee. Chemistry and Biochemistry, Central Michigan Univ., Mount Pleasant Oxidative stress produced by free radicals during metabolism, stress, infection, inflammations, and exposure to environmental factors may lead to health repercussions such as diabetes, cancer, cardiovascular and neurodegenerative diseases. Polyphenols are well known for scavenging free radicals and providing various health-related benefits. However, most of the phenolic antioxidants are not aqueous-soluble, decreasing their bioavailability. In this presentation, we will report synthesis of two water-soluble dendritic antioxidants, which were synthesized using L-carnosine as the core and vanillin and syringaldehyde as building blocks. We will also present their DPPH radical scavenging activities, DNA protective effects against free radicals, and their pro-oxidant potentials.

MONDAY MORNING August 19
Sustainable Agriceuticals

Improvement of health functional properties of edible insects via fractionation, protein extraction, and fermentation **Eunyoung**

Oh[1,2], oheuy0725@korea.ac.kr, Yookyung Kim[1]. (1) Dept. of Human Ecology (Food Science and Nutrition), Graduate School, Korea Univ., Seongbuk-gu, Seoul, Korea (the Republic of)(2) Interdisciplinary Program in Sustainable Living System, Graduate School, Korea Univ., Seongbuk-gu, Seoul, Korea (the Republic of) Edible insects have been highlighted as an alternative to animal protein, owing to the challenges posed by exponential population growth. Despite their nutritional value and health benefits, direct consumption of edible insects remains less preferable. Therefore, processing technology emerges as a valuable approach to preparing insect-based ingredients and products. In this study, we examined the impact of insect fractionation on health functional properties by producing filtrate (CF), supernatant (CS), and pellet (CP) fractions from cricket (Gryllus Bimaculatus) using a screw presser. Chitin content significantly decreased after fractionation (less than 2%; raw cricket: 15%). CS exhibited the highest antioxidant, nitrite scavenging (74%), and alcohol dehydrogenase activities (111%). It also had the lowest α-glucosidase inhibitory activity among fractions. Additionally, we investigated protein extraction methods (alkali: MA; salt: MS; enzyme: ME; screw presser: MP) of mealworm (Tenebrio molitor larvae) and found that ME yielded the highest levels of total, essential, and branched-chain amino acids, in vitro digestibility, total phenolic contents, antioxidant capacities, and cell proliferation. MS demonstrated the highest anti-inflammatory potential inhibiting TNF-α (0.17-fold reduction) and IL-1β (0.16-fold reduction) secretion compared to other samples in lipopolysaccharide (LPS)-treated Hep3B cells, along with enhancing insulin resistance inhibition. To assess the fermentation effects of mealworm (FT) and white-spotted flower chafer (Protaetia brevitarsis larvae; FP) on health functionalities, they were fermented with salt (20%) for 60 days. The IC_{50} values for DPPH radical scavenging capacities decreased with fermentation (29% and 20% reduction in FT and FP, respectively). Furthermore, treatment with FT significantly decreased (20%) the myostatin, a negative regulator of muscle synthesis, promoter activity in C2C12 cells compared to that of non-fermented mealworms. These findings suggested the beneficial potential of processing, including fractionation, protein extraction, and fermentation, on the health-functional aspects of edible insects. This study could also illuminate insects' health-beneficial food industry uses.

High-protein low carbohydrate dietary pattern alleviates chronic alcohol intake-induced hepatic steatosis and liver injury in mice **Songtao Li**, lisongtao@zcmu.edu.cn. Zhejiang Chinese Medical Univ., Hangzhou, Zhejiang, China Alcohol abuse is a prominent risk factor contributing to the global public health burden. Long-term alcohol consumption is associated with the development of alcohol-related liver disease (ALD), a significant cause of chronic liver diseases that affects a substantial number of individuals annually. Approximately 20%-40% of ALD patients with hepatic steatosis progress to alcohol-related steatohepatitis, which probably develops to hepatic fibrosis, cirrhosis, and even hepatocellular carcinoma. Despite the substantial economic burden and detrimental effects on public health, there have been limited advancements in ALD treatment, except for abstinence from alcohol being the primary approach. Thus, managements for ALD with potential application value are urgently needed. Nutritional therapy has been proved to be a promising strategy to defend ALD. Recently, emerging evidence has revealed that reasonable dietary patterns, especial for appropriate proportion among macronutrients, contribute to the improvement of metabolic diseases. Here, we reported that high-protein low carbohydrate (HPLC) dietary pattern alleviates chronic alcohol intake-induced hepatic steatosis and liver injury in mice. Mechanistic study shows that HPLC-reversed 3-hydroxybutyrate dehydrogenase 2 (BDH2) reduction caused by alcohol intervention contributes to its protective role. Besides, HPLC significantly improves alcohol-induced intestinal barrier permeability and reduces plasma LPS levels. Our study demonstrates that HPLC might be a promising choice for ALD management.

Functional properties and flavor characteristics of milk from cows supplemented with jujube powder Chen Zhang, **Hongyun Liu**, hyliu@zju.edu.cn. College of animal sciences, Zhejiang Univ., Hangzhou, Zhejiang, China Jujube has various functional properties and is a promising source of bioactive compounds and flavors. This study investigated the functional properties and flavor characteristics of milk from cows supplemented with jujube powder (JP). Here, milk volatile profiles and taste properties were analyzed by using an electronic nose, and headspace solid-phase microextraction gas chromatography-mass spectrometry (HS-SPME-GC-MS). Compared to the control group, the total antioxidant capacity, 2,2′-azino-bis-3-ethylbenzothiazoline-6-sulphonic free radical scavenging activity, lactoferrin, and IgG levels increased significantly in the JP group. Volatile flavor analysis indicated that ketone levels increased, while acid abundance decreased, and toluene and dimethyl sulfone significantly increased in the JP group. Taste profile analyses demonstrated that jujube supplementation altered the taste of the milk. In summary, dietary jujube powder supplementation affects the volatile flavor composition and aroma of milk, as well as the bioactive component and antioxidant properties. These findings enhance our understanding of milk production using direct dietary supplementation to produce sustainable dairy products.

Animal bones by-products as a source of cardioprotective bioactive peptides **Fidel Toldra**, ftoldra@iata.csic.es, Gisela Carrera-Alvarado, Leticia Mora. Instituto de Agroquímica y Tecnología de Alimentos (CSIC), Valencia, Spain Animal bones are rich in collagen and therefore constitute an interesting source for the sustainable production of bioactive peptides. The use of peptidases able to hydrolyze collagen contribute to the release of large amounts of peptides with a diversity of lengths, some of them showing different types of bioactivity. The purpose of this work was to hydrolyze bones with specific peptidases and determine the generation of peptides with ACE-I inhibitory activity as well as neprilisin inhibitory activity. Defatted bones were crushed to powder and then either directly hydrolyzed or pretreated by heating at 95°C for 1 hour to improve the further accessibility of peptidases to target sites. Then, cooked and uncooked bone samples were hydrolyzed for 2 h with 1% Protamex at 55°C, 1% Flavorzyme at 55°C, 4% Alcalase 4 at 65°C, and Protana Prime at 65°C. ACE-I inhibitory activity was determined using the fluorescent substrate Abz-Gly-Phe(NO2)-Pro and captopril as positive control. Neprilisin inhibitory activity was determined according to the commercial kit using thiorphan as control. The activities were assayed in kinetic mode at 37°C for 60 min using a CLARIOstar microplate reader. Free amino acids were analyzed through RP-HPLC. The highest degree of hydrolysis was obtained with Flavorzyme in uncooked (36.7%) and cooked (45.2%) bones samples. Cooking pretreatment also contributed to the highest content of essential free amino acids and total free amino acids (205.6 mg/100 mL hydrolysate), and therefore this hydrolyzate would be associated to a highest nutritional value. The cooked bones hydrolyzed with Protamex showed the highest ACE-I inhibitory activity (93.3% inhibition), that was very close to that of the control captopril (100%), and the highest neprilisin inhibitory activity (71.4% inhibition). On the other hand, the cooking pretreatment of bones did not have a significant effect on the bioactivity when hydrolyzed with Alcalase 4. In summary, the results confirm that cooking pretreatment of bones followed by further hydrolysis with a peptidase like Protamex can contribute to the sustainable production of cardioprotective bioactive peptides.

Ultrasound-augmented conjugation of whey protein isolate and propolis: Structural insights and functional enhancements

Shiqin Peng[1], Xinyu Yu[1], Lingchen Tao[1], Shanshan Li[1], Xiaobin Ma[2], **Fuliang Hu**[1], flhu@zju.edu.cn. (1) College of Animal Sciences, Zhejiang Univ., Hangzhou, Zhejiang, China(2) Univ. College Cork, Ireland The utilisation of free radical reactions, both with and without ultrasound treatment, was employed in the conjugation between whey protein isolate (WPI) and propolis. Notably, subjecting the reaction to ultrasound at a power of 270 W for 20 min accelerated the conjugation process, leading to significantly elevated levels of total phenolic and total flavonoid contents compared to the traditional free radical conjugation. To better understand the conjugation mechanisms under the influence of ultrasonic waves, the structural properties of various WPI-propolis conjugates were investigated with the aid of Fourier transform infrared spectroscopy, circular dichroism and fluorescence spectrometry. Comparative analysis revealed distinct differences between conjugates prepared via ultrasound and those produced through the traditional free radical method. Specifically, the ultrasound-treated conjugates exhibited reduced α-helix structures but showcased higher contents of β-turn and random coil. Additionally, these conjugates displayed enhanced fluorescence intensity and surface hydrophobicity. Furthermore, the integration of ultrasound exhibited a multifaceted impact on the bioactivity and functionality of the conjugates; it significantly augmented antioxidant activity, emulsifying stability and solubility. These collective results revealed the potential of ultrasound as a promising method for enhancing protein-propolis conjugation.

Electrospun biomimetic periosteum capable of controlled release of multiple agents for programmed promoting bone regeneration **Xian-Ai Shi**, shixa@fzu.edu.cn, Xingkai Zhao, JM Yang. College of Biological Science and Engineering, Fuzhou Univ., Fujian, China The effective repair of large bone defects remains a major challenge due to its limited self-healing capacity. Inspired by the structure and function of the natural periosteum, an electrospun biomimetic periosteum is constructed to programmatically promote bone regeneration using natural bone healing mechanisms. The biomimetic periosteum is composed of a bilayer with an asymmetric structure in which an aligned electrospun poly(ε-caprolactone)/gelatin/deferoxamine (PCL/GEL/DFO) layer mimics the outer fibrous layer of the periosteum, while a random coaxial electrospun PCL/GEL/aspirin (ASP) shell and PCL/silicon nanoparticles (SiNPs) core layer mimics the inner cambial layer. The bilayer controls the release of ASP, DFO, and SiNPs to precisely regulate the inflammatory, angiogenic, and osteogenic phases of bone repair. The random coaxial inner layer can effectively antioxidize, promoting cell recruitment, proliferation, differentiation, and mineralization, while the aligned outer layer can promote angiogenesis and prevent fibroblast infiltration. In particular, different stages of bone repair are modulated in a rat skull defect model to achieve faster and better bone regeneration. The proposed biomimetic periosteum is expected to be a promising candidate for bone defect healing.

Whole Grains Bioactives & Human Health

Harnessing the chemistry of phenolics to deliver the benefits of whole grain components to human health **Joseph Awika**, awika@tamu.edu. Food Science & Technology, Texas A&M Univ., College Station, Texas Whole grains (WG) intake remains low relative to dietary recommendations despite credible evidence on the health benefits associated with WG consumption. A major impediment to WG intake is their reduced sensory properties relative to alternatives made with refined grain components. Phenolic compounds concentrated in bran tissues are major health beneficial components of WG, but also impact WG product processing and sensory properties due to their reactive nature. Thus, WG phenolics provide considerable opportunity to design health promoting WG ingredients and products with broad consumer appeal. For instance, although flavonoids are typically minor components of cereal grain phenolics, they play a disproportionately large role in impacting WG product color and flavor (directly or through interactions with Maillard reaction intermediates), and textural properties (e.g., via interactions with proteins and non-starch polysaccharides). Furthermore, among flavonoids, the C-ring configuration is a major determinant of their relative reactivity and biological properties. For example, the C-Ring p-bond and C-4 oxo group found in flavones dramatically enhance inhibition of late-stage Maillard reaction products condensation/polymerization, leading to reduced colored melanoidin formation during thermal processing. This reduces desirable Maillard browning, but could also be harnessed to produce desirable volatile Maillard reaction intermediates, or inhibit formation of undesirable compounds. The C-ring configuration of flavonoids can also be exploited to improve bioavailability and bioactivity of other phenolic compounds via synergistic interactions, thus further enhancing benefits of WG components. The presentation will discuss the latest evidence of how the WG phenolics influence processing and product quality attributes relevant to consumers, and opportunities to direct the chemistry of the compounds to innovate in the WG products space.

Ancient grains: Presentation by Nu Life market president, Earl Roemer **Earl Roemer**, EarlR@nulifemarket.com. Nulife Market, Scott City, Kansas Sorghum Bicolor is an ancient cereal grain producing grass which survived and evolved in the harsh climatic conditions of West Africa. Grain sorghum developed unique plant based cellular protective mechanisms that allowed it to both survive under these harsh climatic conditions and produce grain for the people living in these regions of Africa prone to pestilence, drought, and excessive heat. Specific grain sorghums established high volumes of unique polyphenolic compounds to support its survival in each individual environment it evolved in. Research is discovering the ability of these unique grain sorghum bioactive phenolic compounds to protect mammalian cells and support health. My presentation will provide information related to grain sorghum phenolic compounds and their application in functional foods, beverages, nutraceuticals, or pharmaceuticals. Proanthocyanidins (condensed tannins) are present in large volumes and located in the testa layer of specific grain sorghums, but these compounds are not present in other major cereal grains. Research has shown grain sorghum proanthocyanidins provide benefits related to their anti-inflammatory characteristics, anti-cancer characteristics such as colon cancer, and benefits to people with diabetes and their ability to bind digestive enzymes which slows the conversion of starch to glucose. Black sorghum, rich in 3-deoxyanthocyanins and luteolinidin, have shown effective benefits related to gastrointestinal microbiota health and cardiovascular protection associated with the suppression of CD38 and related ADP ribosyl cyclase activity along with protecting the endothelium of the heart during the onset of ischemia and reperfusion as would occur in a heart attack and its revascularization treatment. No other cereal grain contains the volume of unique phenolic compounds and potential health benefits as does grain sorghum.

Health benefits of sorghum products: In vitro and in vivo studies for anti-cancer and anti-obesity activity **Seong-Ho Lee**, slee2000@umd.edu. Univ. of Maryland, College Park Sorghum is the fifth most-produced crop in the world and has been used for foods, domestic animal feedstuffs, brewing of alcoholic beverages, and biofuels. Recently, many research groups demonstrated that sorghum contains diverse bioactive components that are highly associated with the prevention of major human chronic diseases. To explore a potential use of sorghum products for health benefits, we highlight multiple findings to propose a mechanistic link between use

of sorghum products and reduced risks of colorectal cancer and obesity. Colorectal cancer is the third leading cause of cancer-related death in US and its etiology is highly associated with obesity and correlated with eating pattern such as a low consumption of whole grains and a high consumption of dietary fat and red meat. In in vitro studies using several human adenocarcinoma colorectal cancer cell lines, treatment of high phenolic sorghum bran extracts inhibited proliferation and induced apoptosis of colorectal cancer cells. The cellular and molecular mechanisms include downregulation of TNF-α-stimulated NF-κB transactivation and IGF-1-stimulated PI3K/Akt and β-catenin transactivation, and activation of AMPK and autophagy. In an in vivo study using a genetic mouse model of intestinal cancer, feeding with high-phenolic sorghum bran significantly suppressed the tumor load in small and large intestine. In the second study, we investigated the effect of sorghum products including bran and leaves extracts on the differentiation of 3T3-L1 preadipocytes. Sorghum bran and leave extracts repressed triglyceride accumulation and expression of adipogenic and lipogenic proteins in differentiated adipocytes. Sorghum bran and leaf extract repressed MAPK signaling pathways and repressed insulin signaling and glucose uptake in differentiated adipocytes. In an in vivo study using high-fat diet-induced obesity, supplementation of sorghum bran did not affect body weight and fat pads weight but tended to reduce blood glucose and insulin surge. Our data demonstrate the potential application of sorghum products as a functional food for the prevention of chronic diseases such as colorectal cancer and obesity.

Developing new foods and beverages from health-promoting tannin-containing sumac sorghum bran **Ryan Ardoin**[1], ryan.ardoin@usdsa.gov, Brennan Smith[1], Dmitriy Smolensky[2], Stephen Boue[1], Scott Bean[2], Fadi Aramouni[2], Adina Santana[3], Jaymi Peterson[2]. (1) Food Processing and Sensory Quality, USDA-ARS Southern Regional Research Center, New Orleans, Louisiana (2) Grain Quality and Structure Research Unit, Manhattan, Kansas (3) Kansas State Univ., Manhattan, Kansas Globally, sorghum is the fifth most grown cereal crop. The sumac genotype is high in polyphenolic compounds and is referred to as a tannin-containing variety. Phenolic compounds, residing in the bran, have shown health-promoting activity. However, they are often associated with bitter taste and are largely removed from the kernel during decortication. Upon milling, the phenol-rich bran becomes a lower-valued byproduct. In two separate studies, new food and beverage applications of sumac sorghum bran were evaluated chemically and by consumer sensory analysis. Proof-of-concept for a novel cold-brewed acidified sorghum bran beverage was demonstrated. The beverages showed in vitro antioxidant capacity via ORAC analysis (3.32–3.96 mmol TE/ml). Perceived bitterness from condensed tannins (0.33 mg CE/ml) was reduced by adding sugar to the formulation, and so-called “supertasters” did not show diminished acceptability of the phenolic-containing product. The research demonstrated novelty of the beverage concept, and an antioxidant message significantly increased purchase intent of the product among a sample of 114 consumers (McNemar’s test of marginal homogeneity, α=0.05). In another study, an optimized sorghum-based gluten-free bread formulation was obtained using response surface methodology. Levels of water, sumac sorghum bran, and a hydrocolloid gum were selected based on key physical quality attributes. The resultant bread, containing 14.2% sorghum bran, showed 61.6 µmol TE/g oxygen radical absorbance capacity and had 13.4% fiber (a “high fiber” food). Based on 100 consumer hedonic evaluations, the sensory quality of the optimized bread did not differ from the control product and did not show concerning bitterness (mean of 2.9 on a 9-point bitterness intensity scale). Similar applications of high-phenolic bran from other grains are currently being investigated. These product development efforts can help add value to grain milling byproducts, enhance healthful options for consumers, and keep health-promoting grain portions in the food supply which would otherwise be diverted.

Evaluation and anti-glycation potential of sorghum and quebracho tannins extracted using pressurized liquid extraction **Adina Santana**, adina.santana@gmail.com. Grain Science and Industry, Kansas State Univ., Manhattan Proanthocyanidins, or condensed tannins, are phenolic polymers abundant in plant barks, pulps, and seeds, with application as colorants, antioxidants, and anti-corrosives. Many sorghum genotypes contain oligomeric and polymeric proanthocyanidins. Quebracho (QB) species have been used as proanthocyanidin standard and in industrial applications. Methods to extract and purify proanthocyanidins have been published with the use of solvents ethyl acetate, acetone, methanol, ethanol, and their water mixtures, commonly acidified with acetic acid at 0.5%. However, there is no investigation on which solvents are most suitable to select proanthocyanidins from sorghum based on their oligomeric or polymeric nature. Pressurized liquid extraction (PLE) is a fast and clean method that has emerged to prepare samples for analytical detection of target compounds. This work characterized proanthocyanidins in three sorghum genotypes (Sumac, SC84 and PI570481), the QB (Schinopsis balansae) wood and a commercial extract of QB via solvent extraction with water, 70% ethanol and 70% acetone ± acetic acid (0.5%, v/v), to select appropriate solvent for PLE. The effect of PLE on the quality of proanthocyanidins was studied at 50ºC and 100ºC. The total phenolic content (TPC) of extracts was measured via Folin-Ciocalteu reagent. Total proanthocyanidins were separated via normal phase high performance liquid chromatography (NP-HPLC). The inhibition of advanced glycation end products (AGEs) was investigated with the bovine serum albumin-fructose assay. The TPC in sorghum was lowest in water extracts (2.91-12.61 mgGAE/g), in comparison to 70% ethanol (5.91-19.92 mgGAE/g) and 70% acetone (12.43-35.99 mgGAE/g) non-acidified extracts. Acidified extracts did not induce difference on TPC. For this reason, the solvent selected for PLE was 70% acetone. 70% acetone increased polymeric proanthocyanidins in sorghum by c.a. 50-60%. Both QB wood and extract contained mostly monomers, dimers and trimers. For conventional process, 70% acetone showed the highest AGE inhibition (about 30%), except for commercial QB extract (9.51%). PLE for 20 min at 50ºC, improved TPC concentration in sumac. However, 100ºC degraded phenolics, except for commercial QB extract, which TPC increased to 1302.81 mgGAE/g, AGE inhibition increased to 31.90%. PLE of sorghum diminished AGE inhibition compared to conventional extraction.

High-polyphenol Sorghum modulates carcinogen-metabolizing enzymes in colon cancer cells **Petra Tsuji**[1], ptsuji@towson.edu, Cynthia Lascarez[1], Dmitriy Smolensky[2]. (1) Biological Sciences, Towson Univ., Maryland(2) ARS Kansas, US Dept. of Agriculture, Manhattan, Kansas The aromatic hydrocarbon Benzo[a]pyrene (BaP) is a ubiquitous carcinogen associated with increased cancer risk. It is metabolized by Phase I enzymes, mainly cytochrome P450 (CYP) isoforms. This facilitates BaP-metabolite export but also their potential to bind to DNA. However, Phase II enzymes potentially inactivate BaP-metabolites. Inhibition of Phase I and induction of Phase II enzymes may shift the balance toward BaP detoxification, and may suppress the ability of the BaP-metabolites to bind to DNA, consequently reducing the risk of mutagenesis and subsequent tumor formation. Many plant polyphenols are known for such cancer preventive properties. Here, extracts from leaves and bran from three Sorghum bicolor varietals were used to compare the effect of high and low-polyphenol sorghum varietals on the expression of Phase I & II enzymes in human colon cancer cells. We hypothesize that extracts from high-polyphenol varietals will decrease expression of Phase I and increase expression of Phase II enzymes in BaP-treated cells.

Caco2 human colorectal cancer cells were incubated with 2.5 µM BaP, 1 µl/mL sorghum extract, or both for 6 hours. RNA and protein were isolated. mRNA expression of Phase I/II enzymes was quantified using qPCR. Cytosolic protein expression was assessed with Western blotting relative to β-ACTIN. Catalytic activity of CYP1 was assessed with the EROD assay using ethoxyresorufin as substrate. Compared to untreated cells, BaP increased CYP1A1 and CYP1B1 mRNA expression 5-fold and 3-fold, respectively. The addition of high-polyphenol Sorghum extracts significantly decreased the BaP-induced mRNA expression of CYP1A1 and CYP1B1. The extract from Sorghum leaves, in particular, also appeared to decrease CYP1A1/1B1 protein expression, and also the BaP-induced catalytic activity of these enzymes. Interestingly, the mRNA expression of the few Phase II enzymes investigated thus far seems unaffected. We continue to investigate various isoforms, time points, cell lines, and metabolite generation to assess the chemopreventive potential of extracts from high-polyphenol varietals of Sorghum bicolor.

Golden grains: Exploring the genetic underlying of bioaccessible sorghum carotenoids **Rae C. McDowell**[1,2,3], mcdower@colostate.edu. (1) Horticulture, Colorado State Univ., Fort Collins (2) Soil and Crop Science, Colorado State Univ., Fort Collins (3) USDA-ARS Arkansas Children's Nutrition Center, Little Rock, Arkansas Vitamin A deficiency (VAD) contributes to immune deficiency, preventable blindness, and death of millions around the world. Regions experiencing the highest incidence of VAD primarily rely on cereal based diets, such as sorghum (Sorghum bicolor [L. Moench]), which are generally low in provitamin A carotenoids. Biofortification breeding can increase provitamin A carotenoids to biologically relevant levels in staple crops, however concentrations may vary per target environment. Molecular breeding can be used to increase carotenoid concentrations to biologically relevant levels, however, the carotenoid bioavailability must also be considered during the breeding process. We hypothesized that sorghum grain carotenoid bioaccessibility is an oligogenic trait that is correlated with other grain composition traits. To test this hypothesis, a mapping population of F6 recombinant inbred lines (n=127) was developed to map carotenoid content and carotenoid bioaccessibility. Carotenoids were quantified via high-performance liquid chromatography (HPLC) and relative bioaccessibility was quantified via in-vitro digestion. We identified a handful of quantitative trait loci and marker trait associations for carotenoid content and carotenoid bioaccessibility. These results can be used to create molecular markers for breeders to assist in biofortification with marker assisted selection. These results identified for the first time in sorghum, markers underlying variation in carotenoid bioaccessibility, and with further research these markers can contribute to efforts aimed at carotenoid biofortification.

Changes in sorghum starch digestibility phenolic profile, and cell bioactivity after cooking **Jaymi Peterson**, jaymi.peterson@usda.gov, Dmitriy Smolensky. USDA Agricultural Research Service, Washington, D.C. Sorghum is an agronomically advantageous crop due to its drought tolerance, pest resistance, and ability to grow in a variety of soil conditions. Although sorghum is considered a food staple in many African and Asian countries, most of the grain produced in the US is exported or used for livestock feed and ethanol production. Despite this, sorghum has gained recent attention for containing health promoting compounds, polyphenols. The reported health benefits from sorghum phenolics are extensive and include: antioxidant activity, anticancer, antidiabetic, anti-inflammatory, and antiobesity. However, the presence of phenolics is known to decrease digestible starch. Understanding how processing methods affect sorghum phenolics will be important to validate sorghum use in human foods. The objective of this study was to examine the effect of cooking on sorghum starch digestibility, phenolic profile, and cell bioactivity. Brown, whole grain sorghum flour was combined buffers at pH 3, 4, 5, 7, & 8, were cooked 0, 10, 30, 60, and 120 minutes, and freeze dried prior to analysis. Sorghum starch digestibility was evaluated using a Megazyme kit, the K-DSTRS. Phenolic profile was evaluated using the total phenolic content (TPC) and condensed tannin content (CTC) assays coupled with reverse phase high performance liquid chromatography (RP-HPLC). Cell bioactivity was examined using the cell inhibition assay in human colon cancer cells. Digestible starch increased after cooking. Cooking samples for 10 minutes did not significantly reduce TPC of samples. CTC of samples decreased with cooking time while pH had no effect. All 3-deoxyanthocyanidins decreased after 10 minutes of cooking. However, other flavonoids of interest either did not change or increased after cooking. Bioactivity was not significantly impacted after cooking for 10 minutes. The bioactivity of sorghum polyphenols was more effective by cooking at lower pH levels, independent of cooking. In conclusion cooking samples for 10 minutes improved starch digestibility without decreasing potential health benefits. This shows potential for polyphenol-containing sorghum to be used for health food applications.

Phenolic ethanolic extracts of sorghum grains and leaves ameliorate intestinal colitis and inflammation induced by dextran sulfate sodium on mice model **Ibtesam Sleem**[1], isleem@utk.edu, Adrienne Rodriguez[1], Bingqi Chen[1], Dmitriy Smolensky[2], Vermont P Dia[1]. (1) Food Science, UT AgResearch, Knoxville, Tennessee(2) USDA, ARS, Manhattan, Kansas Inflammatory bowel disease has been strongly linked to the incidence of colon cancer and other intestinal consequences. Sorghum, as a promising source of polyphenols, exhibited numerous protective effects against multiple chronic diseases. Therefore, this study aimed to evaluate the ability of sorghum phenolic extracts (SPEs) to mitigate intestinal colitis and inflammation status induced by dextran sodium sulfate (DSS) on mice model. Forty C57BL/6 male mice were randomly grouped into five experimental groups: negative control, positive control (DSS treatment only), the other three groups assigned to one of ethanolic extracts from brown sorghum grains (SCG), brown sorghum leaves (SCL) and white sorghum grains (SWG) for 42 days. DSS was used to induce colitis and inflammation in mice. SPEs supplemented groups showed a significant reduction in the inflammatory cytokines such as IL-6 and IL-1 beta in the plasma and colon, colonic disease activity index values and hemoglobin content in feces compared to positive control group ($P < 0.001$). Moreover, SPEs administration mitigated neutrophil infiltration via inhibiting myeloperoxidase activity in the colon. SPEs ameliorated colonic colitis and inflammation through downregulation of proinflammatory cytokines production and neutrophils infiltration. Thus, sorghum phenolics represent an effective chemopreventive agent to ameliorate chronic intestinal inflammation.

Sorghum's nutrients and phytonutrients for human health **Jim Painter**, jimpainterphd@gmail.com. United Sorghum Checkoff Program, Lubbock, Texas Humans have used sorghum for millennia in Northeast Africa. The first mention of it in the US was by Benjamin Franklin in 1757 regarding broom making. The US is the top sorghum producer worldwide, and 6 central states in the US produce 90% of all production. The main use of sorghum worldwide is for food due to its ability to thrive in very dry conditions making it a very sustainable crop. In the US, more sorghum is used for biofuel and animal feed than for human consumption, but this percentage is quickly rising with the interest in sorghum as a gluten-free, whole-grain replacement for wheat and its potential for functional ingredients. The Journal of Food Sci. is currently developing a special supplement on the Health Benefits of Sorghum that will be reviewed in this presentation. Livia de Lacerda d Oliveira and Lucio Flavio de Alencar Figueiredo authored an article in this supplement, Sorghum phytonutrients, and their health benefits: A systematic

review from cell to clinical trials. Dr de Lacerda discusses the Colored sorghum, richer in phenolic compounds, especially 3-deoxyanthocyanins, and tannins, inhibited cancer cell activities, including proliferation, tumor growth, and ROS activity, and promoted cell cycle arrest and apoptosis. Anita Stefoska-Needham authored Sorghum and Health: An Overview of Potential Protective Health Effects in this same supplement and discussed how these phytonutrients are beneficial to human health. She states that Whole-grain sorghum foods may elicit health-promoting effects when consumed regularly in the diet. This review discusses key functional sorghum grain constituents, including dietary fiber, slowly digestible and resistant starches, lipids, and phytochemicals, and their effects on metabolic processes that are associated with the development of chronic diseases, such as heart disease and diabetes. Additionally, as consumers are seeking more traditional sweeteners, sorghum syrup is returning in both home kitchens and restaurants, such as Husk which features condiments such as sorghum-sweetened butter in their southern cooking menus.

ACS Microbiome Research Consortium - Carbohydrates & the Microbiome

Dietary carbohydrates regulate intestinal colonization and dissemination of Klebsiella pneumoniae **Aaron Hecht**[1], aaron.l.hecht@gmail.com, Lisa Harling[1], Junhee Lee[1], Ceylan Tanes[2], Kyle Bittinger[2], Mark Goulian[3], Gary D. Wu[1]. (1) Gastroenterology and Hepatology, Univ. of Pennsylvania Perelman School of Medicine, Philadelphia (2) The Children's Hospital of Philadelphia, Pennsylvania (3) Univ. of Pennsylvania, Philadelphia **Background:** Dysbiosis, an alteration of the gut microbiome associated with chronic diseases, has been previously described in patients with liver cirrhosis. Common features of dysbiosis include the outgrowth of the family of human pathogenic bacteria Enterobacteriaceae, including Klebsiella pneumoniae. Infectious complications, namely spontaneous bacterial peritonitis (SBP) and bacteremia, are deadly for patients with cirrhosis with up to 50% mortality. K. pneumoniae is one of the most common causes of these infections, thought to originate from bacterial translocation across the intestinal epithelium. While this suggests a connection between dysbiosis and disseminated infection, the underlying risk factors are not well understood. Data from our previous human dietary intervention study suggested that fiber plays a critical role in intestinal colonization of K. pneumoniae, suggesting a direct connection between diet and dysbiosis. **Methods and Results:** We find in human subjects that antibiotic treatment in the context of a fiber-free (FF) diet induces a dysbiotic microbiota, featuring low bacterial diversity and high abundance of K. pneumoniae. Based on these findings, we hypothesized that treating mice with an FF diet and antibiotics would induce a similar dysbiosis, allowing for enhanced engraftment of K. pneumoniae. Indeed, we found that in this model, the mice experienced sustained low bacterial diversity and that K. pneumoniae engrafted at levels 1000-times that of mice on a high-fiber (HF) diet. Treatment with an FF diet induced alterations in the metabolome including elevated levels of stool amino acids and ammonia, with depletion of urea, dependent on K. pneumoniae urease, mirroring findings from our human subject trial. Through bacterial mutants, in vitro, ex-vivo, and in vivo modeling, we identify the paucity of available carbon sources as a critical limiting factor during K. pneumoniae intestinal colonization. This model of dysbiosis lead to increased susceptibility to K. pneumoniae disseminated infection after disruption of the intestinal epithelium. **Conclusions:** Through mouse and human studies, we verify that dietary fiber is critical for recovery of the microbiota after antibiotic depletion. This dysbiotic state increased the risk of disseminated infection from the gut microbiota. These findings shed light on the role of diet in disseminated infection, with possible therapeutic implications for susceptible patients.

Long-chain dextran produced by Weissella cibaria boosts the diversity of health-related gut microbes Ex Vivo **Pieter Van den Abbeele**[1], pieter.vandenabbeele@cryptobiotix.eu, Maria Tintoré[2], Jordi Cuñé[2], Lam Dai Vu[1], Jonas Poppe[1], Aurélien Baudot[1], Carlos de Lecea[2]. (1) Cryptobiotix SA, Ghent, Belgium(2) AB Biotek Human Nutrition and Health, Peterborough, United Kingdom Long-chain dextrans are α-glucans that can be produced by lactic acid bacteria. NextDext™, a specific long-chain dextran with a high degree of polymerisation, produced using Weissella cibaria, was recently shown to exert prebiotic potential in vitro. In this study, the ex vivo SIFR® technology, recently validated to provide predictive insights into gut microbiome modulation down to the species level, was used to investigate the effects of this long-chain dextran on the gut microbiota of six human adults that altogether covered different enterotypes. A novel community modulation score (CMS) was introduced based on the strength of quantitative 16S rRNA gene sequencing and the highly controlled ex vivo conditions. This CMS overcomes the limitations of traditional α-diversity indices and its application in the current study revealed that dextran is a potent booster of microbial diversity compared to the reference prebiotic inulin (IN). Long-chain dextran not only exerted bifidogenic effects but also consistently promoted Bacteroides spp., Parabacteroides distasonis and butyrate-producing species like Faecalibacterium prausnitzii and Anaerobutyricum hallii. Further, long-chain dextran treatment resulted in lower gas production compared to IN, suggesting that long-chain dextran could be better tolerated. The additional increase in Bacteroides for dextran compared to IN is likely related to the higher propionate:acetate ratio, attributing potential to long-chain dextran for improving metabolic health and weight management. Moreover, the stimulation of butyrate by dextran suggests its potential for improving gut barrier function and inflammation. Overall, this study provides a novel tool for assessing gut microbial diversity ex vivo and positions long-chain dextran as a substrate that has unique microbial diversity enhancing properties.

Prebiotic citrus limonin glucosides promote Lactobacillus proliferation **Vikas Dadwal**, vikkasdadwal@gmail.com, Bhimu S. Patil. Dept. of Horticulture Sciences, Texas A&M Univ., College Station Citrus triterpenoids, such as limonin glucosides (LGs), have diverse health benefits; however, there is limited research linking them to gut health. We hypothesized that supplementing LGs as a prebiotic would modify the beneficial gut microbe population, focusing on five strains in the Lactobacillus genus. Assessing bacterial growth patterns, examining the effect under salinity stress, and measuring the production of microbial byproducts can provide initial outcomes that can be related to gut health. In our study, we observed that LGs act as a prebiotic, promoting the growth of five Lactobacillus strains (L. plantarum, L. rhamnosus, L. casei, L. delbrueckii, and L. acidophilus) compared to the known prebiotic; inulin and pectin at various concentrations (1–5 mg/mL). The bacteria showed different growth patterns at different LG doses, but all showed enhanced growth. The maximum growth was observed at 1.0 and 2.0 mg/mL LG. Bacterial growth typically declines in a high-salt environment. However, LG supplementation countered the effects of salt stress and maintained the growth of the Lactobacillus strains we tested. Furthermore, an increase in acidity at different growth phases was observed indicating the biosynthesis of short-chain fatty acids (SCFAs) in the growth culture. Comparing supplemented to non-supplemented cultures, gas chromatography–mass spectrometry (GC-MS) analysis showed considerable amounts of acetate, butyrate, and propionate. These SCFAs are known for influencing the intestinal barrier, assisting cell communication, providing energy, and having antimicrobial activity against

foodborne pathogens. In summary, our findings show that LGs promote the growth of probiotic bacteria in the Lactobacillus genus, which produce beneficial metabolites such as SCFAs, suggesting mechanisms by which LGs may function to improve gut health.

Zein-Glucomannan active films for fruit preservation **Jamshed T. Bobokalonov**[1], jamshedbt@gmail.com, Ikromjon Ismoilov[1,2], Durdona Uldasheva[1,2], Zainiddin K. Muhidinov[1], Lin Liu[3]. (1) High molecular compounds, V.I. Nikitin Institute of Chemistry, Dushanbe, Tajikistan(2) Tajik Technical Univ. named after M S Osimi, Dushanbe, Dushanbe, Tajikistan(3) USDA-ARS Eastern Regional Research Center, Wyndmoor, Pennsylvania Active packaging of food products from biopolymer compositions, including biologically active compounds (BAC): essential oil of meadow sage (Salvia pratensis) and polyphenolic extract from pomegranate peels (Punica granatum L.) were developed, and their antibacterial activity was studied. Zein from corn and glucomannan from the Eremurus plant (E.Hissaricus) were utilized to potentially serve as a biopolymer source for preparing composite films. Different combinations of zein (Z), glucomannan (GM), and then polyphenol extract from pomegranate and Saliva essential oil (SEO) were evaluated to develop a packaging film appropriate for fruit preservation. Extensive characterization of these films, such as chemical interactions of the components, thickness, moisture penetration, tensile strength, elongation, swelling, and solubility, were studied. Based on the above properties, the film prepared with Z:GM (1.5:1 v/v) was an optimal composition. The antimicrobial study tests show that the obtained composite films, both without and with BAC, exhibit antibacterial activity against gram-negative and gram-positive bacteria with a minimum active substance concentration in the range of 10-50 μg/mL. The effectiveness of prepared films in extending the shelf life of fig and strawberry fruits were evaluated. Physiological changes in storage were significantly lesser ($p< 0.05$) in active packaged fruits than in unpackaged fruits. Based on several spoilage indices studied, unpacked fruits had a shelf life of less than seven days, while those packed in the active film were acceptable for up to 14 days in the case of strawberries and 36 in the case of figs when stored at room temperature (20 °C). Antimicrobial films and coatings based on biopolymers containing BAC would be beneficial for extending the marketable period of the fruits, which can be used for storing perishable fruits and their long-term transportation.

Design and synthesis of heparan sulfate mimetics in targeting tau-heparan sulfate interaction and attenuating hyperphosphorylated tau-induced cell dysfunction associated with Alzheimer's disease **Hien M. Nguyen**, hmnguyen@wayne.edu. Chemistry, Wayne State Univ., Detroit, Michigan Alzheimer's disease (AD) is the most prevalent form of adult dementia. It is a progressive brain disorder of memory loss and cognitive dysfunction. A key pathological hallmark of AD is the aggregation of hyperphosphorylated tau (p-tau) in the brain as neurofibrillary tangles (NFTs). Pathological p-tau may spread transcellularly in the brain, likely via interactions between tau and cell surface heparan sulfate (HS) proteoglycans. The abnormal tau and its aggregates are toxic to neurons and cause neuronal cell death. AD is a protein misfolding disease, and the first line of defense against misfolded proteins is endoplasmic reticulum (ER) that initiates the Unfolded Protein Response (UPR) to protect cells from stress challenges. If the burden exceeds the repair capacity, it triggers ER stress-associated apoptosis and proinflammation. Herein, we present a novel HS mimetic, composed of a lipophilic oleanolic acid and a sulfated trisaccharide, to maintain the viability of a p-tau treated neuroblastoma cells. This molecule also protects cells from p-tau-inflicted cellular stresses, including ER stress-associated inflammation and apoptosis. This study serves as a foundation for the development of novel targets to counter tauopathies.

Elucidating the structures and functions of gut microbiota-derived peptidoglycan fragments in hosts Jeric M. Kwan, Chenyu Li, Christopher Adamson, Yaquan Liang, Allan Ng, Evan W. Ng, Sunny H. Wong, **Yuan Qiao**, yuan.qiao@ntu.edu.sg. Nanyang Technological Univ., Singapore Trillions of microorganisms, known as the gut microbiota, inhabit the human gut niche and are indispensable in maintaining host health. Defining the underlying mechanistic basis of the gut microbiota-host interactions has important implications for treating microbiota-associated diseases. Our lab focuses on gut microbiota-derived peptidoglycan fragments (PGNs), which represent an emerging family of signaling molecules that are ubiquitously present in hosts and significantly impact host biology. I will describe our recent efforts to establish a robust analytical chemistry pipeline that facilitates the discovery of novel PGNs of the gut microbiota, our chemical and chemoenzymatic synthesis to access these PGN molecules and analogues, as well as our biological insights into the immunological activities of these natural PGNs in vitro and in vivo. Collectively, our research may inform novel strategies to manipulate gut microbiota-derived PGNs as potential postbiotics to benefit hosts.

Stem cell-based organoid-microbe coculture model to study environmental toxicants and microbial products Ibrahim M. Ibrahim[1], Anirban Chakraborty[2], Stefania Tocci[1], Leanne Dugan[3], Kaili Inouye[3], Tapas Hazra[2], Laura Alexander[3], **Soumita Das**[1], soumita_das@uml.edu. (1) Biomedical and Nutritional Science, Univ. of Massachusetts Lowell (2) Internal Medicine, The Univ. of Texas Medical Branch at Galveston (3) Medicine, Univ. of California San Diego, La Jolla Gut microbes are associated with enteric infections, gastrointestinal diseases, and other chronic diseases. It is essential to develop a disease model that mimics physiological settings closer to humans than the existing animal models. Utilizing the recent developments in stem-cell biology, we have developed an organoid-based "gut-in-a-dish" cell model either from humans or mice that can be cocultured with immune/nonimmune cells and microbes/environmental toxicants associated with the disease. Using this model, we demonstrated that cancer-associated microbes and environmental toxicants such as electronic cigarettes (E.cig) and cigarettes produce DNA damage that disrupts the gut barrier integrity of the host. Specifically, colorectal cancer (CRC)-associated microbe Fusobacterium nucleatum (Fn) in coculture with organoid-derived monolayers (EDMs) downregulated NEIL2, an oxidized base-specific DNA glycosylase among all DNA repair proteins. Fn infection in NEIL2-null mouse-derived EDMs showed significantly greater DNA damage and inflammatory cytokines. Interestingly, Several CRC-associated microbes and microbial products induced the accumulation of DNA damage and pro-inflammatory marker IL-8 in organoid-derived disease models. Similarly, E.cig can induce DNA damage and increase IL-8 in colon-derived EDMs. Interestingly, pre/probiotics mixtures in the EDMs protect the gut barrier integrity, prevents DNA damage and inflammation. We conclude that the microbes or environmental toxicants associated with cancer can downregulate NEIL2, and the subsequent accumulation of DNA damage and increased IL-8 play critical roles in cancer progression.

VIRTUAL SESSION
Honoring Professor Chi-Tang Ho on the Occasion of His 80th Birth Year

Forty-five years career in flavor chemistry research **Chi-Tang Ho**, ctho@sebs.rutgers.edu. Food Science, Rutgers The State Univ. of New Jersey, New Brunswick I love flavor chemistry! In the late 1970s when I began my flavor research program, I identified the volatile compounds in different fried foods such as French fries, potato chips, and fried chicken. I identified many long-chain alkyl-

substituted heterocyclic compounds such as pyrazines, thiazoles, oxazoles, and thiophenes in these fried food volatiles, and then realized that there is a potential interaction between lipid oxidation and Maillard reaction products in the formation of these compounds. I changed my research direction toward the mechanistic understanding of various factors in Maillard reaction flavor chemistry. In the 2000s, I found that flavonoids such as catechins were able to trap reactive carbonyl species (RCS) such as methylglyoxal and glyoxal through a new mechanism. As RCS are intermediate reactants of the Maillard reaction, we began to focus our research on the effects of phenolic compounds on Maillard flavor generation. I will also discuss our recent effort on the generation of pyrazinones by peptide Maillard reaction interactions.

Chronic benzo[a]pyrene exposure induces aging toxicity and the preventive potential of tangeretin supplementation in Caenorhabditis elegans **Chia-Cheng Wei**[1,2], ccwei@ntu.edu.tw, Chun Ming How[1], Ko-Chun Cheng[1], Yong-Shan Li[1], Min-Hsiung Pan[3]. (1) Institute of Food Safety and Health, National Taiwan Univ., Taipei (2) Dept. of Public Health, National Taiwan Univ., Taipei (3) Institute of Food Sci. and Tech., National Taiwan Univ., Taipei Aging is an irreversible biological process in organisms, mainly resulting from the oxidative stress generated during their lifetime. Benzo[a]pyrene (BaP) is one of the most commonly detected polyaromatic hydrocarbons (PAHs) in dietary products, acting as a food contaminant capable of inducing oxidative stress. However, whether chronic exposure to BaP can induce or impair organismal aging is not fully understood. On the other hand, citrus flavonoids such as tangeretin (TAN) have been shown to exhibit excellent antioxidant activity. Thus, TAN could serve as a potential dietary supplement to mitigate BaP-induced toxicity. In this study, we used the nematode Caenorhabditis elegans as an in vivo model to investigate the toxic effects of chronic BaP exposure on aging and further explored if dietary TAN supplementation alleviated BaP-induced toxicity. The results showed that exposure to 0.1–10 μM BaP impaired C. elegans locomotive behaviors, and exposure to 10 μM BaP significantly inhibited the growth of C. elegans. In addition, chronic exposure to 10 μM BaP aggravated aberrant protein aggregation in an age-dependent manner and shortened the median lifespan of C. elegans. Additionally, BaP exacerbated the age-dependent decline of aging indicators such as motility and pharyngeal pumping, and the accumulation of reactive oxygen species. Furthermore, exposure to BaP led to significantly elevated transcript levels of heat shock protein-related genes, including hsp-16.1, hsp-16.2, hsp-16.49, and hsp-70. Chronic exposure to BaP also resulted in a significant decrease in survival under heat stress, showing a negative impact on the stress resistance of aged C. elegans. Moreover, we found that dietary TAN supplementation alleviated the BaP-induced decline in locomotive behaviors, pumping, poly-Q accumulation, and restored heat shock proteins transcript levels. These findings suggest that TAN supplementation holds promise as a preventive and protective measure against the chronic exposure of BaP-induced aging toxicity.

Occurrence of dietary advanced glycation end products in meat products and the potential factors affecting their formation **Wei-Lun Hung**[1], wlhung@tmu.edu.tw, You-Yu Lin[2], You-Mei Liu[1], Chi-Tang Ho[3]. (1) School of Food Safety, Taipei Medical Univ., Taipei, Taiwan(2) Master Program in Food Safety, Taipei Medical Univ., Taipei, Taiwan(3) Dept. of Food Sci., Rutgers The State Univ. of New Jersey, New Brunswick The Maillard reaction (MR) is a nonenzymatic browning reaction that provides a desirable flavor and color to thermally processed food products. However, this reaction may also generate potentially harmful compounds, such as acrylamide, α-dicarbonyls, and advanced glycation end products (AGEs). During MR, reducing sugar reacts with amino groups to form Amadori compounds, which generate a-dicarbonyls after the decomposition reaction. α-Dicarbonyls can react with amino acids, particularly lysine and arginine, to form AGEs. Recent studies have shown that consumption of AGEs may cause adverse effects on health, such as the elevation of oxidative stress and inflammatory responses and the promotion of dysbiosis. Therefore, the occurrence of AGEs in food is important when estimating their consumption. Thermally processed food usually contains a high level of AGEs, such as bakery and processed meat products. Our recent study showed that several lysine- and arginine-derived AGEs were identified in commercial meat products, in which the most abundant AGEs included Nε-(carboxymethyl)lysine (CML), Nε-(carboxyethyl)lysine (CEL) and methylglyoxal-hydroimidazolone 1 (MG-H_1). Also, correlation analyses revealed that the contents of AGEs in meat products were positively correlated with their nutrients, particularly carbohydrates. Finally, we also found that the addition of condiments also significantly impacted AGE formation in meat products.

Key roasty odorants in highly roasted tea and their formation mechanism related to the thermal reaction of theanine and sugar Xiaoting Zhai, Mengru Li, **Xiaochun Wan**, xcwan@ahau.edu.cn. Anhui Agricultural Univ., Hefei, China Aroma is one of the most critical criteria of tea flavor quality. According to long term experiences of tea production, roasting can induce characteristic roasty aroma of roasted teas. In the present study, furaneol and several pyrazines including 2-methyl-5,6-diethylpyrazine, 2,5-dimethyl-6-ethylpyrazine, 3-methyl-6-ethylpyrzine, 2-acetylpyrazine were characterized as the key odorants for the roasty aroma of large-leaf yellow tea by the application of the sensomics approach. In addition, the mechanism of theanine's participation in aroma formation during tea roasting was revealed via thermal reaction models. The analysis of volatile products from different thermal reaction models of theanine showed that tea extract could inhibit the thermal reaction between theanine and glucose, among which amides and imides were the mostly inhibited, while pyrazines products were less inhibited. The distributions of products were 70% from the decomposition of theanine. They were amides, imides, pyrroles; 5% from the decomposition of glucose. They were furans and O-heterocyclic compounds. Only 25% were from the Maillard reaction between theanine and glucose. They were 16 pyrazines and 16 pyrroles. The optimized condition for the production of roasty pyrazines was roasting for 4h at 110~160 ○C. The comparison of roasted teas with three different roasting degrees showed that the amounts of furaneol and pyrazines accumulated with the roasting degree, which led to more intense roasty aroma of tea infusion. The present study would like to provide an important theoretical basis for the aroma improvement and the development of roasted tea processing technique.

MONDAY AFTERNOON
Honoring Professor Chi-Tang Ho on the Occasion of His 80th Birth Year

Contributions to the understanding of thermal generation of flavors and aromas **Robert J. Mcgorrin**, robert.mcgorrin@oregonstate.edu. Food Science and Technology, Oregon State Univ., Corvallis The characteristics of flavors generated by heat are the result of thermal decomposition of carbohydrate, protein, and lipid precursors in foods. The desirable sensory qualities of roasted beef, nuts, coffee, broiled chicken, toasted oat cereals, baked potatoes and bread are representative examples of the tremendous complexity of thermally-derived flavors and aromas. Numerous chemical thermal reactions occur upon cooking, baking, grilling and roasting, often producing hundreds of volatile aroma chemicals. The bland or weak flavors of unroasted

nuts, coffee, chocolate and raw beef are dramatically changed upon heat processing. The Maillard reaction is the underpinning for the generation of complex browned and savory flavors during cooking. The extreme importance of flavor and aroma development in cooked foods has led to extensive research studies on the flavor chemistry of precursors in the Maillard reaction, specifically amino acids and reducing sugars. Often, these are the foundation of process flavors developed by the flavor industry using complex mixtures of selected precursors that are converted to flavors by thermal processing steps. Beginning early in his flavor research career, Professor Chi-Tang Ho systematically studied model-system thermal reactions of amino acids, sugars, lipids and their intermediate products. His considerable efforts have significantly contributed the identification and mechanisms of formation of new thermally-generated volatile aroma compounds. Novel flavor-significant heterocyclic compounds identified from these reactions include: substituted pyrazines, pyrroles, thiazoles, and oxazoles. Highlights of Dr. Ho's extensive contributions to our understanding of the thermal generation of flavors and aromas will be presented.

Designing minimally processed plant proteins for human health
Veronika Somoza[1,2,3], veronika.somoza@univie.ac.at, Katrin Gradl[4,1], Phil Richter[4,1]. (1) Leibniz Institute for Food Systems Biology at the Technical Univ. Munich, Freising, Germany(2) Nutritional Systems Biology, Technical Univ. of Munich, Freising, Germany(3) Physiological Chemistry, Univ. Wien, Wien, Wien, Austria(4) Doctoral School of Life Sciences, Technical Univ. Munich, Freising, Germany Transitioning towards plant-based diets offers a host of benefits for environmental sustainability and human health. Plant proteins provide numerous advantages over animal proteins, as they are characterized by lower environmental impact and improved nutritional profiles, delivering reduced loads of saturated fats and cholesterol while being rich in minerals and dietary fiber. Recent data show that dietary plant proteins reduce various health risks, e.g., obesity and inflammation and their co-morbidities. However, major drawbacks of plant-derived proteins are a lower protein quality based on the lack one or more essential amino acids, and reduced digestibility. Some plant proteins may contain allergenic peptides and antinutritional factors such as phytates, lectins, or enzyme inhibitors, which can interfere with the absorption of minerals like iron, zinc, and calcium. From a consumer's perspective, plant-based protein sources often have distinct textures and bitter off-flavors, which require more intense processing compared to animal proteins. Protein hydrolysates, often used in industrial food processing for technological advantages, are considered ultra-processed foods (UPFs). UPFs are generally defined as foods that are heavily processed and contain additives, preservatives, and other ingredients that are not typically found in home cooking and have been hypothesized to bear certain health risks of, e.g., increased blood pressure due to high sodium contents or obesity due to higher energy intake of more palatable food formulations. This presentation will provide strategies to design minimally processed plant proteins with optimized nutritional profiles to help maintain human health. One of the most promising strategies is precision fermentation. Using protein-adapted fermentation cultures to generate highly palatable, non-bitter tasting protein hydrolysates with health benefits, e.g. satiating and anti-inflammatory effects, and high techno-functionality will ensure industrial use and consumer acceptance. However, metabolic transformations of the protein hydrolysate administered need to be considered. Recent data from our group show that non-bitter tasting proteins or protein hydrolysates, e.g. from pea protein, are degraded into peptides with bitter-taste qualities that stimulate mechanisms of gastric digestion, satiation, and defense against pro-inflammatory cytokine release by helicobacter pylori infections.

Insights into citrus flavor and health benefits: Recent progress
Yu Wang[1,2], yu.wang@ufl.edu. (1) Citrus Research and Education Center, Univ. of Florida Institute of Food and Agricultural Sciences, Lake Alfred (2) Food Science and Human Nutrition, Univ. of Florida Institute of Food and Agricultural Sciences, Gainesville We are delighted to present our research progress in citrus flavor chemistry and the exploration of health benefits derived from citrus byproducts. As we celebrate the remarkable career of my esteemed Ph.D. advisor Dr. Chi-Tang Ho, whose contributions to flavor chemistry and natural products chemistry have been foundational, I, on behalf of my entire team, humbly share insights gained from our laboratory endeavors. Leveraging metabolomics techniques, we have investigated the complex pathways controlling citrus flavor formation, elucidating key compounds that define the sensory experience of citrus fruits. Additionally, our investigations into citrus byproducts have uncovered novel bioactive compounds with potential health-promoting properties, emphasizing the value of sustainable utilization in citrus processing. Through this presentation, we aim to contribute to the ongoing dialogue in the citrus chemistry while honoring the legacy of my mentor Dr. Chi-Tang Ho and his invaluable contributions to the field.

Development of dairy flavors from the Maillard reaction
Michael H. Tunick[1,2], mht39@drexel.edu. (1) College of Nursing & Health Professions, Drexel Univ., Philadelphia, Pennsylvania, US(2) Dairy & Functional Foods Research Unit, USDA, ARS, Wyndmoor, Pennsylvania In 2007 Romero and Ho described the generation of food flavors through the Maillard reaction. The initial reaction occurs in dairy products through the condensation of a reducing sugar, lactose, and an α-amino acid from casein or a whey protein. From there, subsequent reactions such as rearrangements, cyclization, enolization, fission, aldolization, and the Strecker degradation yield a long list of compounds, some of which are involved in the flavor profile of the product. Aldehydes, cyclic nitrogen compounds, furans, and sulfur compounds arise from the many reactions that occur. This review will describe the progress that has been made in determining the production of Maillard products in dairy foods.

Volatile compounds generated from the Maillard reaction of Asn-Pro, Pro-Asn, and a mixture of asparagine and proline with glucose
Qing Xiao, qingxiao619@gmail.com, Chi-Tang Ho. Food Science, Rutgers The State Univ. of New Jersey, New Brunswick This study first-time reported the generation of aroma compounds from a model system consisting of dipeptides Asn-Pro, Pro-Asn, and Asn plus Pro with glucose as the reducing sugar at pH 7.5. Plenty of heterocyclic compounds were produced, and in which, the Asn-Pro dipeptides formed larger amounts of pyrazines, quinoxalines, pyridines as well as prolines-specific compounds of pyrrolizines and azepines than the Pro-Asn dipeptide at three temperatures (130 °C, 150 °C and 170 °C). In comparison, the Pro-Asn dipeptide only showed the large production of furans. The results suggested that the primary amino group of Asn-Pro was more reactive than the secondary amino group of Pro-Asn in catalyzing the transformation and fragmentation of glucose. Besides, the formation of Schiff base in Asn-Pro with glucose and its degradation products was supposed to be faster than in Pro-Asn. As compared to the volatiles produced from the mixture of asparagine, proline with glucose, Asn-Pro displayed its great generation on furans, pyrazines, pyrroles, and pyridines at each temperature, whereas produced more quinoxalines, pyrrolizins and azepines only at 130 °C and 150 °C. At elevated temperature of 180 °C, only pyrrolizines were produced in relatively equal abundance.

Identification of key odorants in roasted pecan oil
Keith R. Cadwallader, cadwlldr@illinois.edu, Kristen L. Malloy. Food Science and Human Nutrition, Univ. of Illinois Urbana-Champaign

Pecans are often eaten in their natural raw form as a stand-alone snack, or found in healthy snacks such as trail mix, granola, and protein bars. Their use in baking and confectionary applications, such as in pralines and pies, benefits from the flavor enhancement that occurs when the nut is heated or roasted. With the desirable flavor of roasted pecans being widely accepted, along with recent trends toward healthier oil alternatives, roasted pecan oil has entered the consumer market in recent years making it an interesting target for aroma characterization. Sensory profiling of roasted pecan oil indicated presence of roasty, nutty, doughy, malty, caramel-like, buttery, and green/grassy aroma notes. Predominant odorants were identified by solvent extraction/SAFE combined GCO, AEDA and GC-MS. These could be classified by the chemical pathways in which they are produced, as well as by their potential sensory contributions. Volatile compounds of roasted pecan oil are mainly generated via lipid oxidation/ degradation and by the Maillard reaction. Doughy and green/grassy sensory attributes are likely attributed to lipid derived compounds including hexanal (green, grassy), (E)-2-nonenal (fatty, stale), and (E,E)-2,4-decadienal (fatty, fried). The remainder of the sensory attributes can be attributed to volatile products of the Maillard reaction, such as 2-acetyl-1-pyrroline (roasty), 2- and 3-methylbutanal (malty), 4-hydroxy-2,5-idmethyl-3(2H)-furanone (caramel-like), 2,3-butanedione (buttery), and 2-ethyl-3,5-dimethylpyrazine (nutty).

Chemical drivers of cold brew flavor liking Nancy Cordoba, Paola Forero, Megan Booth, **Edisson Tello Camacho**, tellocamacho.1@osu.edu, Devin G. Peterson. Food Science and Technology, The Ohio State Univ., Columbus Coffee has been popular for centuries, and consumer preferences are constantly evolving. Despite the popularity of conventionally hot-brewed black coffee, recent market trends indicate a rising preference for innovative beverages offering unique flavors and sensory experiences. Cold brew coffee has emerged as a renowned alternative to traditional brewing methods. This project utilized a targeted and non-targeted flavoromics approach to characterize the chemical drivers of flavor liking in cold brew coffee. Fourteen coffee samples were evaluated in a consumer liking study (n = 96) along with the nontargeted chemical profiling of non-volatile compounds by LC/MS-QToF and targeted chemical profiling of aroma compounds by GC/MS-O and GC/MS/MS. Significant differences in the consumer liking scores were reported among the 14 samples and penalty analysis showed that sourness and bitterness were the main attributes driving disliking of cold brew. Chemical drivers of cold brew flavor liking were investigated by modeling the chemical profiles and the corresponding liking scores by orthogonal partial least squares (OPLS) analysis with good fit and predictive ability ($R^2Y > 0.82$ and $Q^2 > 0.65$). The top predictive volatile and non-volatile compounds of cold brew flavor liking were selected based on their VIP predictive scores. Six aroma compounds were identified as highly predictive of liking while six non-volatile compounds including 4 chlorogenic acids and 2 quinides were identified as drivers of disliking of cold brew coffee. Further sensory recombination testing confirmed the sensory activity of the predictive compounds on liking. This work provides a novel basis to optimize the quality of coffee and enhance the value of the supply chain.

Whole Grains Bioactives & Human Health

Characterizing the impact of a novel corn bran derived arabinoxylan in humans: Findings from an exploratory trial in adults with excess weight **Edward C. Deehan**, edeehan2@unl.edu. Nebraska Food for Health Center, Univ. of Nebraska-Lincoln Grains provide a natural mixture of bioactive compounds, such as dietary fibers, that have been shown to favorably impact human health and the gut microbiota when consumed as a whole grain. However, there are concerns as to whether bioactive compounds found in whole grains continue to exert reliable physiological benefits in humans when reductionist approaches are used with purified ingredients. There are also concerns about safety and whether humans can tolerate purified ingredients at the levels needed to induce reliable physiological benefits. Using an exploratory, randomized controlled trial in adults with excess weight (n=15), we characterized the physiological effects of corn bran-derived arabinoxylan (AX), a novel, generally recognized as safe food ingredient rich in soluble fiber. Corn bran AX was supplemented for six weeks at a high dose of 25 g/day (females) or 35 g/day (males). Microcrystalline cellulose served as the microbiota-non-accessible control (n=16). Briefly, AX consumption was shown to enhance satiety, attenuate levels of insulin resistance, selectively promote Bifidobacterium longum, and increase outputs of the short-chain fatty acid propionate. While AX consumption also increased digestive symptoms during weeks 1 to 3, symptoms reverted to baseline levels by week 6. These findings demonstrate that whole grain-derived bioactive compounds such as AX can induce health-relevant effects in humans when consumed at tolerable levels as a purified ingredient.

Dietary oat β-glucan alleviates high-fat induced insulin resistance through regulating circadian clock and gut microbiome **Jie Liu**, liujiefantasy@163.com, Xingyu Wang, Zongwei Wang, Lingxiao Gong, Huijuan Zhang, Jing Wang, Ziyuan Wang. Beijing Technology and Business Univ. School of Food and Health, Beijing, China High-fat diet induced circadian rhythm disorders (CRD) are associated with metabolic diseases. As the main functional bioactive component in oat, β-glucan (GLU) could improve metabolic disorders, however its regulatory effect on CRD remains unclear. In this research, the effects of GLU on high-fat diet induced insulin resistance and its mechanisms were investigated, especially focusing on circadian rhythm-related process. Male C57BL/6 mice were fed a low fat diet, a high-fat diet (HFD) and HFD supplemented 3% GLU for 13 weeks. The results showed that GLU treatment alleviated HFD induced insulin resistance and intestinal barrier dysfunction in obese mice. The rhythmic expressions of circadian clock genes (Bmal1,Clock and Cry1) in the colon impaired by HFD diet were also restored by GLU. Further analysis showed that GLU treatment restored the oscillatory nature of gut microbiome, which could enhance GLP-1 secretion via SCFAs mediated activation of GPCRs. Meanwhile, GLU consumption significantly relieved colonic inflammation and insulin resistance through modulating HDAC3/NF-κB signaling pathway.

Impact of probiotics and prebiotics on the function and abundance of Faecalibacterium prausnitzii **Wei Dong**, dwei@ncat.edu, Shuwei Zhang, Pei-Sheng Lee, Shengmin Sang. North Carolina Agricultural and Technical State Univ., Kannapolis Faecalibacterium prausnitzii (F. prausnitzii), one of the most abundant bacterial species found in the human gut, plays a crucial role in maintaining intestinal and systemic host health. Numerous studies have demonstrated that the abundance of F. prausnitzii is reduced in various chronic diseases, particularly gut disorders. Monitoring F. prausnitzii levels may therefore serve as a biomarker to aid in the diagnosis of gut diseases. Our recent studies have identified the production of double bond reduced metabolites of oat avanthramides (AVAs), DH-AVAs, as an objective biomarker of F. prausnitzii abundance. Additionally, F. prausnitzii is a major producer of butyrate, an important short-chain fatty acid. By using the formation of DH-AVAs and butyrate as indicators of F. prausnitzii abundance, this presentation will discuss our recent findings on the impact of different probiotics and prebiotics on the function and abundance of F. prausnitzii.

Can betainized metabolites be the biomarkers of whole grain intake? **Yanhe Li**, yli5@ncat.edu, Shengmin Sang. North Carolina Agricultural and Technical State Univ., Kannapolis Cereal-based food products have been the basis of the human diet for centuries. Increased whole grain (WG) consumption is, in general, inversely associated with the risk for developing diet-related disorders, including diabetes, cancer, and cardiovascular diseases. WGs are a rich dietary source of betainezed compounds, which have been associated with diets rich in WGs and been suggested to play a role in health effects in relation to a whole-grain- rich diet. However, there are no pharmacokinetic studies of these compounds after WG intake. This presentation highlights our recent research on the pharmacokinetics of these compounds following the consumption of two servings of WG wheat and oat intake, respectively. Our pharmacokinetic studies offer robust data to determine whether betainized metabolites can serve as the biomarkers of WG wheat and oat intake, and identify which betaines are influenced by the consumption of WG wheat and oat, respectively.

5-Heptadecylresorcinol alleviated high-fat diet induced obesity and insulin resistance by activating brown adipose tissue **Zihui Yang**, yangzihui0914@163.com, Siqi Yang, Ziyuan Wang, Yiming Hao, Zongwei Wang, Yulong Wei, Gaoqi Ye, Jing Wang, Jie Liu. Beijing Technology and Business Univ., China The whitening and loss of brown adipose tissue (BAT) during obesity and aging are associated with a higher risk of metabolic syndrome and chronic diseases. 5-Heptadecylresorcinol (AR-C17), the specific biomarker of whole-grain wheat and rye intake, has been proved to have notable health promoting effects, whereas whether AR-C17 could modulate BAT function and the potential mechanism of action remains unclear. In this study, we found that AR-C17 could significantly inhibit body weight gain and insulin resistance in high-fat diet (HFD) induced obese mice. Moreover, AR-C17 treatment improved whole body energy metabolism and alleviated the whitening and loss of BAT compared with the HFD group. RNA sequencing and western-blot analysis indicated that expression of genes and proteins related to BAT energy metabolism was upregulated by AR-C17 administration, including AMPK, UCP-1, ACSL1, CPT1A, and SIRT3. These results suggested that brown adipose tissue might be the target of AR-C17 to prevent obesity and its associated insulin resistance.

Protective effects of wheat bran feruloyl oligosaccharides against intestinal barrier injury in Caco-2 cells **Lingxiao Gong**, samfy007@hotmail.com, Jing Wang, Linlin Hu. Beijing Technology and Business Univ., China Feruloyl oligosaccharides (FOs) are a class of important functional oligosaccharides formed by ester bonds between the carboxyl and hydroxyl groups of ferulic acid (FA). Studies have confirmed that FOs have numerous protective effects , such as antioxidation, immunoregulation and glucosidase-inhibitory. However, it is not yet clear what the protective effects of FOs are on the intestinal barrier, nor the mechanism behind them. This study explores the protective effects of FOs on intestinal barrier function and reveals its potential molecular mechanism. The findings indicated that FOs improved the permeability of the mono-layer Caco-2 cells that damaged by TNF-α. In brief, FOs decrease the expression of IL-1β and TNF-α proteins, and enhance the expression of the anti-inflammatory factor IL-10. Furthermore, FOs augmented the expression of tight junction (TJ) proteins. Additionally, the RNA-seq screening results revealed that FOs-regulated differentially expressed genes (DEGs) were predominantly enriched in MAPK, PI3K-AKT, and NF-κB signaling pathways. Western blot analysis revealed that FOs are capable of inhibiting the phosphorylation of the PI3K/AKT/NF-κB pathway via activation of the AhR receptor. This leads to decreased intestinal permeability and protection of the intestinal barrier function.

Investigating the gut microbiota mediated health outcomes of whole wheat - a clinical nutritional study with individuals with prediabetes **Chris Zhu**, zhu.2484@osu.edu. Human Sciences, The Ohio State Univ., Columbus The idea of using dietary products or their bioactive components to reduce or prevent chronic disorders has become popular in recent years. One of the dietary products that can be tapped for its health benefits is whole grain. Numerous observational studies also suggest that inverse relationships exist between intake of whole grain and obesity, prediabetes, some cancers, and all-cause mortality. Additionally, a growing body of clinical evidence (mostly small randomized clinical trials) demonstrates positive effects of specific whole grain on certain risk factors for chronic diseases and metabolic abnormalities; however, clinical intervention studies have revealed a large degree of interpersonal variation in the effects associated with their consumption, with a subset of individuals not exhibiting any benefits. Furthermore, previous studies have suggested that the consumption of many functional foods may be modulated by the types of bacteria present in the gut of the consumer. Therefore, we hypothesize that gut microbial breakdown and metabolism of whole wheat and its major bioactive components represents an important determination factor that modulates the human health benefits. The objectives of this study are to investigate the effect of whole wheat consumption, the most widely consumed whole grain, on the gut microbiota mediated fecal and plasma metabolomes, metabolic and gut health in a group of prediabetes subjects. To test this, we will conduct a randomized, placebo-controlled, crossover trial in 41 individuals with prediabetes for two weeks to evaluate the effect of whole wheat bread on host plasma metabolomes, outcomes of metabolic and gut health (e.g., blood glucose and lipids, endotoxemia in relation to gut dysbiosis and intestinal permeability), and inflammatory response. Biochemical analysis of host health, multiplex metabolomics assays of host metabolome, and analysis of gut microbial composition were performed to understand if microbial composition will have predictive values to the whole wheat-induced improvement of health outcomes and metabolic profiles of different Prediabetes individuals in the study.

Evaluating effects of whole wheat bread on gut microbiome composition using nontargeted LC/MS **Srikanth Ponneganti**, ponneganti.1@osu.edu, Edisson Tello Camacho, Matt Teegarden, Chris Zhu, Devin G. Peterson. Food Science and Technology, The Ohio State Univ., Columbus Prediabetes, a condition characterized by elevated blood glucose levels, affects an estimated 37% of adults in the US. Maintaining blood glucose levels within a normal range is pivotal to preventing prediabetes from advancing to type II diabetes and associated metabolic conditions, such as obesity and cardiovascular disease. Foods rich in whole grains, like whole wheat bread (WWB), are associated with a decreased risk of these conditions, though the mechanisms behind this protective effect remain to be fully elucidated. Prior research suggests these foods may mediate glycemic response and insulin sensitivity, while other studies have explored potential impacts on the gut microbiome. The current study focuses on screening of bioactive components from WWB that modulate gut microbiota composition, using an in vitro model. Extracts of WWB were fractionated using preparative LC, chemical profiled using LC-QTOF-MS, and cultured with stool samples from prediabetic individuals in an automated human colon model. Partial least square models were generated to correlate WWB chemical composition to changes in microbial function and prioritize bioactives for further isolation and characterization. These results will help to provide evidence-based personalized dietary recommendations to reduce the risk of diabetes.

ACS Microbiome Research Consortium - Exploring the Microbiome Through Technology: Molecular Modeling to Omics

Multiscale computational microscopy of viruses **Lorenzo Casalino**, lcasalino@ucsd.edu, Rommie E. Amaro. Molecular Biology, Univ. of California San Diego, La Jolla By leveraging a set of computational modeling approaches, simulation techniques, analysis algorithms, and advanced visualization tools, the 'computational microscope' serves as a cornerstone for gaining atomic-level insights into the microscopic world of the microbiome, including viruses. This enables the exploration of structural and dynamical features or properties that may remain cryptic to experimental approaches alone. In my talk, I will present a few examples where we investigated the conformational plasticity of different viral glycoproteins, including those found in SARS-CoV-2 and influenza viruses, using multiscale all-atom molecular dynamics simulations. These studies elucidated the pivotal contribution of glycans in shaping the dynamics and antigenicity of the viral glycoproteins, thereby expanding the functional annotation of the glycan shield. Moreover, whole-virion simulations allowed us to illuminate the dynamical interplay of the influenza virus glycoproteins in situ, revealing sites of vulnerability that could be exploited for the development of future vaccines.

Minimal cell under a computational microscope **Jan A. Stevens**[1], stevens.jan.adriaan@gmail.com, Mert Bozoflu[1], Linus Grünewald[1], **Melanie König**[1], m.konig@rug.nl, Fabian Grünewald[2,1], Siewert Marrink[1]. (1) Groningen Biomolecular Sciences and Biotechnology Inst., Rijksuniversiteit Groningen, Netherlands(2) Molecular Biomechanics, Heidelberger Institut fur Theoretische Studien, Heidelberg, Baden-Württemberg, Germany Molecular dynamics (MD) is a well-established simulation method that has successfully been applied to study a wide range of biomolecular processes. As a result of continuous improvements in both modeling methods and computational infrastructures, the study of mesoscopic, multi-component systems has become more attainable. However, the intricacies involved in setting up MD simulations for these systems remain daunting, requiring the integration of diverse data from both experimental and in silico sources. Here we present how the coarse-grained Martini force field and its associated tools, form an ideal ecosystem for facilitating a integrative modeling pipeline. Employing a CG resolution, typically representing four heavy atoms by one CG bead, significantly reduces the computational cost inherent in simulating large-scale MD models. Furthermore, a key feature of the force field is its universality, which allows us to create CG models of all major biological components and construct complete cellular environments. The Martini force field's capabilities are showcased in an ongoing effort to simulate a genetically minimal cell: JCVI-syn3A. We constructed the first near-atomistic MD model of a cell based on data from kinetic models, Cryo-Electron Tomograms, and omics experiments. Studying entire cells under the computational microscope will allow us to look into a wide range of problems, ranging from drug design to understanding the internal organization of cellular environments.

How to solve a problem like mitochondria: Building a computational representation using integrative modelling **Chelsea M. Brown**, c.m.brown@rug.nl, Siewert Marrink. Dept.of Biophysical Chemistry, Rijksuniversiteit Groningen Faculty of Science and Engineering, Groningen, Netherlands Mitochondria are found in the vast majority of eukaryotic cells. They are crucial for the production of energy, signaling processes, metabolism and apoptosis, and defects can lead to a range of inherited metabolic diseases. Mitochondria are a diderm organelle, with distinct inner and outer membranes separated by an intermembrane space, completed with the matrix found within the inner membrane. The inner membrane itself forms cristae, vastly extending the surface area of the membrane. Housed within these membranes are an assortment of complicated protein complexes, which are vital in the function mitochondria perform.
To get a higher spatio-temporal resolution of the dynamics of this organelle, computational microbiology can be employed. Building a model to use in molecular dynamics simulations is not trivial, and a vast amount of experimental data is needed to combine into an accurate model. To compliment this, predicted protein structures can be included to provide a more complete picture. Here we will present the efforts made so far in modelling this complicated organelle and the work that is yet to be done.

Onsite multiple analysis system using photo-immobilized microarray chips **Yoshihiro Ito**[1,2], y-ito@riken.jp. (1) R-NanoBio, Wako, Saitama, Japan(2) RIKEN Institute, Wako, Saitama, Japan Microarray technology is a powerful tool for parallel analysis of multiple components. Here an onsite automatic analysis system using the microarray chips is reported. For immobilization, photo-reactive polymers was developed and employed. Since the method does not require any specific functional groups for immobilization, any organic materials or components can be immobilized on a plastic substrate through covalent bonds. A polymer carries polyethylene glycol (PEG) and photo-reactive groups in the side chains was employed for the immobilization. After coating of the polymer on the chip substrate, various types of biological components were microarrayed and immobilized by photo-irradiation. A new automated system using the photo-immobilized microarray was developed for analyses of allergen-specific antibodies, autoimmune diseases antibodies, pathogen-specific antibodies including variants of SARS-CoV-2, and various biological marker proteins.

Structure and function of the gut microbiota of the in vivo piglet gastrointestinal tract Chloë Rotsaert[2], Yorick Minnebo[3], Cindy Duysburgh[2], **Karley Mahalak**[1], karley.mahalak@usda.gov, Jenni A. Firrman[1], Lin Liu[1], Ahmed Moustafa[4,5], Lisa Mattei[4], Kyle Bittinger[4], Massimo Marzorati[2], Joris Michiels[3], Tom Van de Wiele[2]. (1) Dairy and Function Foods RU, USDA-ARS Eastern Regional Research Center, Wyndmoor, Pennsylvania (2) ProDigest BV, Gent, Flanders, Belgium(3) Center for Microbial Ecology and Technology, Univ. Gent, Belgium(4) Division of Gastroenterology, Hepatology, and Nutrition, The Children's Hospital of Philadelphia, Pennsylvania (5) Dept. of Pediatrics, Univ. of Pennsylvania Perelman School of Medicine, Philadelphia The health of the gut microbiota is known to have a global impact on the body, and as such is studied not only for its direct effects on gastrointestinal health but also for mental health and immune function. However, the mechanisms of the relationships between the gut microbiota and health are still unclear. This problem may be attributed to inherent limits present in animal and in vitro models. To address this, the piglet was explored as a potential in vivo model that could be beneficial for certain aspects of gut microbiota research. Ten animals were subjected to a standardized diet for 21 days prior to analysis of the gut microbiome, and transit time was measured for half of these animals. The structure of the microbial community was analyzed using shallow shotgun sequencing, and the function of the gut was determined through analysis of short-chain fatty acids (SCFA), amino acid, and bile acid content of 6 sections of the gastrointestinal tract (GIT), the duodenum, jejunum, ileum, caecum, proximal colon, and distal colon. Through this analysis, it was determined that SCFA production by the gut microbiota becomes significant from the caecum and onwards through the GIT, increasing along with bacterial load and microbial diversity longitudinally through the GIT. Similarly to humans, primary bile acids are commonly found in the small intestine, while secondary bile acids are found largely in the colon. Overall, we found that using piglets as a

model to determine nutritional impact on the health of the gut microbiota has potential.

A comparative study between the porcine gut microbial community and metabolism developed in vitro and found in vivo **Lin Liu**[1], linshu.liu@usda.gov, Jenni A. Firrman[1], Adrienne B. Narrowe[1], Karley Mahalak[1], Johanna M. Lemons[1], Chloë Rotsaert[2], Yorick Minnebo[3], Cindy Duysburgh[2], Massimo Marzorati[2,3], Joris Michiels[3], Tom Van De Wiele[3]. (1) Dairy and Functional Foods RU, USDA-ARS Eastern Regional Research Center, Wyndmoor, Pennsylvania (2) ProDigest BV, Gent, Flanders, Belgium(3) Univ. Gent, Belgium Foods, drugs, and chemicals affect the composition of the gut microbial community and resultant gut metabolites, with implications for health and disease. Multi-staged Simulators of Intestinal Microbial Systems (MSIMS) have been used to study the effects of foods, drugs, and chemicals on the gut microbial community in vitro. Their applicability assumes that the experimental results produced in vitro in the device would be highly similar to those obtained from an in vivo study. To confirm the applicability of this system as a model of the pig gut, the MSIMS was inoculated using fecal samples harvested from pigs and cultured until steady state was reached. Using shotgun metagenomic sequencing and untargeted metabolomics, the composition and structure of these in vitro microbial communities were compared with those harvested from the corresponding segment of the intestine of the animal from which the feces were collected. While the gut microbial community in the MSIMS diverged in taxonomic composition from the in vivo collected samples; functional profiles including CAZyme gene abundances and substrate potentials, were more consistent with the in vivo condition. The metabolite profiles did differ between methods to some degree; however, most metabolites were detected in both in vivo and in vitro conditions suggesting that the in vitro model can be used to explore the impact of these functional outputs on the mammalian host.

Metabolomic profiling of tyrosine fermentation in production animals and humans reveals specie-specific preference on metabolic pathways **Rui Su**, su000197@umn.edu, Chi Chen. Food Science and Nutrition, Univ. of Minnesota Twin Cities, Minneapolis Unabsorbed aromatic amino acids (AAAs), including tyrosine, phenylalanine, and tryptophan, are the substrates of microbial fermentation in the digestive tract. Due to the resistance of their aromatic rings to structural degradation, microbial metabolism of AAAs mainly occurs to their alanine moiety through individual or combinatorial reactions, generating a cluster of functional metabolites in humans and production animals with positive or negative effects on health and the environment. In the case of tyrosine, the most abundant AAA in vivo, its microbial fermentation mainly bifurcates into the formation of 4-hydroxyphenylpropionic acid (HPPA), a health-promoting compound found benefiting Non-Alcoholic Fatty Liver Disease and colon cancer, and 4-hydroxyphenylacetic acid (HPAA), which is associated with genotoxicity. Moreover, HPAA is the direct precursor of p-cresol, a foul-smell environmental hazard compound. Therefore, understanding the similarities and differences between interspecies in microbial AAA metabolism could facilitate the development of respective modulation approaches for the well-being of health and the environment. In this study, microbial tyrosine metabolites in human and pig feces, broiler excreta, and cow ruminal digesta were profiled by the liquid chromatography-mass spectrometry-based quantitative analysis and multivariate modeling. The results showed that both pigs and broilers favored the HPAA pathway, with pigs producing more p-cresol than broilers, while cows and humans displayed active metabolic activities in both HPPA and HPAA pathways. Across examined species, humans had the highest level of unmetabolized tyrosine, potentially indicating lower tyrosine fermentation activity. Besides these species-specific preferences in tyrosine fermentation pathways, individual variations were also evident. Therefore, further investigations into the enzyme activities responsible for these differences and the strategies to modulate the production of specific metabolites are warranted to enhance the health benefits and alleviate the environmental hazards of gastrointestinal tyrosine fermentation.

Comparative metabolomics studies examine the influence of unhealthy diets and potential natural remedies on gut metabolism **Katarina Jones**, jones.katarinaa@gmail.com, Shawn R. Campagna. The Univ. of Tennessee Knoxville Obesity, and its many comorbidities, are a common health concern linked to gut dysbiosis. Unhealthy high fat and high sugar diets are widespread and significantly contribute to the obesity epidemic, however, major dietary changes are often unattainable. Due to this, many people look to exercise and/or supplements to improve their health and reduce the negative effects of a poor diet. Unfortunately, these presumed solutions often give inconsistent results, as not all individuals find these options successful. A proposed explanation for inconsistent results is that this may be, in part, due to variations in the composition and function of the individual's microbiome. However, while not as frequently discussed, the metabolome can provide insights to the individual's phenotype and is influenced by a variety of factors including diet, the microbiome, genetics, and more. This makes metabolome analysis useful for investigating the common influences of unhealthy diets and potential natural remedies in gut microbiome function. In previous work, the effect of exercise and an herbal supplement, fenugreek seeds (Trigonella foenum-graecum), on the intestinal contents and plasma metabolome in the presence of an unhealthy Western-style diet in a murine model have been investigated independently. Here these two cohorts are used to evaluate the metabolome, and shared trends and commonalities between cohorts. Unsurprisingly, greater microbial diversity and the most apparent metabolome differences from each cohort was found in the cecum contents. Each cohort also displayed significant changes in the plasma metabolome, specifically vitamin B6 metabolism. Additionally, there are commonly influenced metabolite in the large intestinal contents including metabolites involved in tryptophan metabolism and the pentose phosphate pathway. As there are multiple impacted pathways, this highlights the importance of not only nutrients absorbed in the small intestines, but the small molecules that are made available through metabolism by the large intestinal microbiome.

MONDAY EVENING 8PM
AGFD Sci-Mix
Note – also presented are the first 25 posters listed under Sunday Evening General Posters

Re-thinking use of salicylic acid-based poly(anhydride-ester)s: From biomedical to agricultural applications **Victoria Batiz**[1], vbati001@ucr.edu, Mariana Reis Nogueira de Lima[1], Gloria Regalado[2], Lema Safi[1], Thomas Eulgem[2], Kathryn Uhrich[1]. (1) Chemistry, Univ. of California Riverside (2) Botany and Plant Sciences, Univ. of California Riverside Current global climate trends and population growth models suggest the need for improvement in food insecurity and clean water availability around the world. The agriculture industry, a major user of fresh water supply, faces the challenge of meeting these production needs due to climate change. Salicylic acid (SA), well known for its biomedical applications, is a phytohormone in plants which has potential for use in agriculture. SA can reduce negative effects of drought stress on crops by regulating processes such as photosynthesis, membrane permeability, and transpiration. In this project, salicylic acid-based poly(anhydride ester)s (SAPAE)s was applied exogenously to micro-

tom tomato plants and its effects were analyzed. Results were evaluated with special attention to duration of plant survival with no water, and plant growth behaviors during and post dosage. SA was harmful when applied directly to plants in powder form, whereas plants that received SA via the SAPAE controlled-release exhibited little to no stress and behaved similarly to control groups during the dosage period. At the early stages of the drought period, SAPAE groups were observed to outgrow all other groups. SAPAE groups were also observed to survive the longest amount of time without being watered. It is hypothesized that SAPAE plant groups will outperform all other groups in terms of plant mass and production of fruit, however further investigation is being performed with more replicates to confirm. SAPAEs have potential to revolutionize the impact of the agriculture industry on climate change, and additionally help to combat global food insecurity.

Nanoemulsion with Lactobacillus-derived exopolysaccharide potentiates the antimicrobial activity of eugenol to protect fresh produce against foodborne pathogens and biofilms **Sangeeta Balyan**[1,2], sangeetabalyan05@tamu.edu, Vikas Dadwal[2,3], Bhimu S. Patil[2,1,3]. (1) Dept. of Food Sci. & Tech., Texas A&M Univ. System, College Station (2) Vegetable and Fruit Improvement Center, Texas A&M Univ. System, College Station (3) Dept. of Horticulture Science, Texas A&M Univ. System, College Station To address challenges associated with foodborne microbes and biofilms in food processing, in this study, we encapsulated the natural antimicrobial compound eugenol into a nano-emulsion using Lactobacillus-derived exopolysaccharide (EPS) as a natural emulsifier. Eugenol has bactericidal and antioxidant properties, but its uses are limited by its low solubility and stability. To overcome these limitations, a eugenol-nanoemulsion was developed using an ultrasonic emulsification technique, incorporating EPS isolated from Lactobacillus plantarum as an emulsifier. The nanoemulsion displayed a droplet diameter of 192 ± 1.9 nm, a polydispersity index of 0.36 ± 0.01, and a ζ-potential of -32 ±1.9 mV, indicating a stable formulation. The nanoemulsion demonstrated potent bactericidal effects against different strains of Escherichia coli, Listeria monocytogenes, and Salmonella. The tested pathogens showed substantial variation in biofilm-forming abilities when treated with the EPS-eugenol emulsion. Certain strains exhibited resistance to the emulsion, while others showed significant reductions in cell count within biofilms. L. monocytogenes V7 and Scott A strains displayed a minimal reduction of 2.8 log CFU/cm^2 on stainless-steel surfaces, whereas other E. coli and Salmonella strains showed a 3 to 4.5 log CFU/cm^2 reduction. Plastic surface biofilm inhibition averaged 85% for most strains, except for L. monocytogenes strains, which showed lower inhibition, likely due to differing cell membrane integrity. Moreover, the emulsion's efficacy against biofilms was notably enhanced compared to non-encapsulated eugenol. The emulsion was applied to fresh produce (tomatoes, blueberries, lettuce, and queso fresco cheese), where it significantly inhibited the growth of the tested pathogens. Overall, this novel eugenol nanoemulsion appears to be a promising solution for addressing biofilm-related challenges in food processing environments. Its comprehensive benefits include improved stability, enhanced bactericidal activity against diverse pathogens, and effective disruption of biofilm matrices. This research holds the potential to advance food safety and hygiene standards, with practical applications in preserving fresh produce and disinfecting surfaces.

Improving astronaut diets in space: Enhanced preservation and nutrition through plasma-treated peas **Lin-Yong Aaron Chen**, aaronlinyong@gmail.com, Yu-Jou Chou, Yuwen Ting. Institute of Food Sci. and Tech., National Taiwan Univ., Taipei In the context of space exploration, ensuring the preservation and enhancement of nutritional content in astronaut food presents significant challenges. Prolonged missions and the confined environment of space necessitate high-nutrient diets that can withstand the rigors of space travel while maintaining palatability and nutritional value. Peas, with their rich protein and essential nutrient content, emerge as promising candidates to meet these dietary requirements. However, traditional food preservation methods encounter limitations in terms of shelf life, nutrient retention, and palatability. To address these challenges, plasma technology has emerged as a cutting-edge processing technique with vast potential applications in food preservation. Plasma is the fourth state of matter, consisting of ionized gas with unique properties and versatile applications in various fields, including technology, medicine, and food preservation. Plasma jet technology, in particular, offers a promising avenue for enhancing the quality, safety, and nutritional integrity of space foods. By subjecting peas to controlled plasma treatment, both physical and chemical modifications can be induced, aimed at improving antimicrobial activity and spoilage resistance while preserving nutritional content. By employing protein assays and SDS-PAGE analysis, we evaluate the efficacy of plasma treatment in preserving the structural integrity and nutritional content of proteins in peas over time. Our results reveal a significant improvement in protein structure preservation and nutrient retention following plasma treatment, surpassing outcomes achieved through conventional preservation methods. The enhanced shelf life and minimal loss of nutritional value observed in plasma-treated peas underscore the viability of plasma jet technology as a promising alternative for improving the quality of food in space exploration. These findings not only offer a solution to the challenges of astronaut food systems but also pave the way for more nutritious dietary options for astronauts, thus advancing the prospects of sustained human presence in space.

TUESDAY MORNING August 20
Advancement of Application of Agricultural & Food Chemistry: Symposium in honor of Tara McHugh

Contributions by the USDA's Agricultural Research Service **Michael H. Tunick**[1,2], mht39@drexel.edu. (1) Dairy & Functional Foods Research Unit, USDA, ARS, Eastern Regional Research Center, Wyndmoor, Pennsylvania (2) College of Nursing & Health Professions, Drexel Univ., Philadelphia, Pennsylvania Since it was formed in 1953, the Agricultural Research Service (ARS) has been the primary in-house research agency of the US Dept. of Agriculture. ARS scientists conduct nearly 700 projects in over 90 locations nationwide, focusing on ensuring high quality, safe food and other agricultural products; assessing the nutritional needs of Americans; sustaining a competitive agricultural economy; enhancing the natural resource base and the environment; and providing economic opportunities to rural citizens, communities, and society as a whole. The major research centers in ARS and some of the important accomplishments will be described.

Greener chemical approaches to reduce mycotoxins and spoilage in commodities **Michael Appell**, michael.appell@usda.gov. National Center for Agricultural Utilization Research, USDA, ARS, Peoria, Illinois Fungi, sometimes found in foods, can produce many chemically diverse mycotoxins that reduce food quality and impact food security. Examples include aflatoxins in contaminated peanuts, citrinin in corn, and ochratoxin A in wine and grape juice. Several approaches are used to detect and reduce exposure to mycotoxins in food and drinks. One strategy for eliminating mycotoxins uses synthetic chemistry to produce better antifungal compounds; this tactic is aided by using quantitative structure-activity relationship (QSAR) modeling. In another approach, mycotoxin selective receptors, such as polymers equipped with biomimetic functions, are used to analyze minute amounts of mycotoxins in complex food and beverage matrices. A third approach utilizes several safer food-grade

and feed-grade charcoal-based materials that could remove several mycotoxins that contaminate corn-based food and feed. These approaches provide greener and safer tools to minimize exposure to toxins found in food and feed.

New sustainable processing technologies to produce healthy, value-added foods **Tara McHugh**, tara.mchugh@usda.gov. Pacific West Area, USDA, Agricultural Research Service, Albany, California Novel food processing technologies and products, including 100% fruit and vegetable bars, edible fruit and vegetable films, vitamin D enhanced mushrooms, and more, are increasing specialty crop consumption in the U.S. and benefiting human health. These new sustainable technologies are also saving energy and water, while increasing utilization of food waste. The stories behind these innovations will be shared during this presentation. Dr. McHugh and her team's cutting-edge science have positively impacted the food industry and rural economies, adding value to specialty crops and co-products, while creating jobs and improving human health.

AGFD Young Scientists Award

Metabolomics in food and agricultural science: Current and future **Joon Hyuk Suh**, J.Suh@uga.edu. Dept. of Food Sci. & Tech., Univ. of Georgia, Athens In the post-genomic era, metabolomics, a newly emerging toolbox in omics science, has been introduced with the marriage of chemical analysis and informatics. An exhaustive analysis of small molecules called "metabolites" leads to an in-depth understanding of biochemical mechanisms in organisms, because metabolites are generated as the end product of cellular signaling activities and interactions in the biological system. The profiling of metabolites provides us direct information on the phenotype and changed biological functions of the given subject. With these merits, metabolomics has been widely applied in biology, medicine, and clinical science, and has gradually expanded to other areas such as food and agricultural science. In this presentation, the basic concept of metabolomics will be introduced, and its applications in the food and agricultural science, including food flavor, quality control, safety assurance, authenticity, as well as food biomarkers in human health and disease, will be presented, with cased studies (e.g., fruit flavor, nut color) that can help understand the applicability of metabolomics in the area. Future perspectives on metabolomics in food and agriculture will also be discussed.

Understanding the "kokumi" phenomenon and unlocking kokumi technologies **Elizabeth Kreger**, Elizabethkreger@outlook.com. Sensient Technologies Corp, Milwaukee, Wisconsin, US Kokumi, the "sixth" sense, is used to describe a sensation caused by compounds that modify the whole taste experience of a food or beverage without eliciting a taste of their own. They create a complete, harmonious and delicious profile. However, as a newer sensation, kokumi is still misunderstood and debatable. To understand and begin to accept this as real, one first has to understand how taste compounds are perceived though our receptors, and then we can begin to deduce how a tasteless compounds are thusly perceived and how they alter the sensory profiles. This talk will aim to discuss the major challenges, as well as, discoveries to better research and understand kokumi including; methods for identification, taste reception interaction, and neurological signaling cascades. Lastly, it will be discussed how to utilize this to create technologies for the food industry to improve the profiles of our food products.

ACS Microbiome Research Consortium - When Chemistry Meets the Microbiome: Student Workshop in Career Next Steps

Building better application materials for jobs in microbiome research **Rebecca Moore**, R_Moore@acs.org. Publications, American Chemical Society, Washington, District of Columbia As you navigate through graduate school, one of the most common questions you receive is asking what your plans are following graduation. Traditionally, the two paths are to choose either academia or industry. It turns out, there are a plethora of career opportunities for chemists once they receive their Ph.D. One of these routes is to work in scientific publishing where you can utilize the skills that were acquired during graduate school. It is also an excellent way to keep up with the current trends in research. During both my graduate and postdoctoral studies, I was interested in how my work in bacterial research affected the microbiome. Now, managing the day-to-day operations of three journals that publish studies on the microbiome, I am able to continue watching this topical area of research explode.

Nailing the interview **Jason Crawford**, jason.crawford@yale.edu. Yale Univ., New Haven, Connecticut Jason Crawford is a Professor of Chemistry and of Microbial Pathogenesis at Yale Univ.. He carried out his doctoral studies at the Johns Hopkins Univ. with Craig Townsend, working on iterative enzyme catalysis associated with the formation of aromatic polyketides. He then conducted his Damon Runyon Cancer Research Foundation postdoctoral work at Harvard Medical School with Jon Clardy, characterizing diverse small molecules that regulate interactions between bacteria and animals. He began his independent career at Yale in 2012, he has served as Director of the Institute of Biomolecular Design & Discovery, a cross-departmental Chemical Biology research institute, since 2020, and he has served as Executive Committee member, co-Director, and then Director of Yale's NIH-supported cross-departmental graduate Chemistry-Biology Interface Training Program. Crawford's research at Yale focuses on decoding novel small molecule metabolic pathways that function at the human-microbe interface with half of the group now working on bacterial and fungal pathways from the microbiome and half of the group working on human pathways that modulate host immune function and affect microbiota activities. Prof. Crawford is committed to diverse and inclusive research, leadership, and teaching environments. In his roles, he has worked to support: 1) safe, supportive, and inclusive work environments; 2) rigorous and ethical research standards; 3) lab safety; 4) career development; and 5) promoting appropriate time-to-degree metrics. In this workshop, Jason will provide insight into transitioning from trainee to faculty in the academic setting.

When chemistry meets the microbiome **Kerrick C. Rees**, Kreeschem@gmail.com. Cambrex Corporation, East Rutherford, New Jersey Throughout my career in chemistry, one question has always been at the center of my fascination; how to leverage small molecules to solve problems within biological systems. In my graduate work for Prof. Daniel Whitehead at Clemson Univ., I synthesized a class of α-glucosidase inhibitors and assessed their efficacy towards disrupting the growth of several common symbiotic gut microorganisms. The goal of this work was to utilize a small molecule therapeutic to prevent a dysbiosis initiated by these microorganisms, as this precedes the onset of symptoms in a number of autoimmune diseases. At the conclusion of my doctoral work, I had the opportunity to join the laboratory of Prof. Steven Townsend at Vanderbilt Univ., where I further expanded my synthetic skill set by working towards the total synthesis of a class of glycosylated sphingolipid natural products. My experiences with synthetic chemistry and microbiology guided my choice to pursue a career in pharmaceutical chemical development where I was able to join the process, research, and development (PR&D) group at Cambrex Corporation, a world-class contract development and manufacturing organization (CDMO). Here at Cambrex, I have the opportunity to directly aid patients in the clinic by developing synthetic processes

for the large-scale manufacturing of novel chemotherapies championed by our clients. With our expertise, we aid our clients in achieving their goals of providing solutions to the most pressing problems found in the clinic today.

Honoring Professor Chi-Tang Ho on the Occasion of His 80th Birth Year

Phenolics and polyphenolics in Food and their metabolites **Fereidoon Shahidi**, fshahidi@mun.ca. Biochemistry, Memorial Univ. of Newfoundland, St. John's, Newfoundland, Canada Phenolic and polyphenolic compounds in food sources are responsible for a myriad of biocatives with potential health benefits. Their occurrence in the source materials is primarily for the protection of the plant material, including, fruits, seeds, flowers, leaves, bark and roots, against pathogens and herbivory, or for attracting pollinators. They occur in the free, esterified/etherified, and insoluble bound forms. Once ingested, phenolic and polyphenolics may be metabolised to produce an array of compounds which may indeed be the main species rendering in-vivo bioactivity. Depending on their structural characteristics, these features affect their absorption and bioavailability. The presentation provides examples to illustrate details using of variety of compounds or their modified counterparts.

Study of synergy of phenolic compounds to induce antioxidant activitis in vitro **Lingyun Chen**, lingyun.chen@ualberta.ca, Amna Abdurrahim, Vera Mazuraka. Agricultural, Food and Nutritional Science, Univ. of Alberta, Edmonton, Canada Oxidative stress caused by free radicals is blamed for the pathogenesis of multiple chronic health conditions such as atherosclerosis, cancer, neurodegenerative, and coronary heart disease. Increasing scientific evidence supporting the health benefits of phytochemicals against oxidative stress, however, low bioavailability limits their health benefits. This study aimed to assess the antioxidant effect of combined anthocyanins and gingerols on Caco-2 cells. Synergism was observed for the anthocyanin-gingerol (Ac-G) combined dosages of (1+0.125), (1+0.5) and (1+1) μg/mL in the cellular antioxidant activity with a synergistic effect indicator SE up to 1.41. Synergism was also observed in the cytoprotective effects against the toxicity induced by oxidative stress with SE values of 1.25-1.61. The Ac-G combinations with higher doses of gingerol exhibited higher levels of synergism. Furthermore, the antioxidant effects of such combinations on the regulation of antioxidant defense mechanisms were studied and the results show that the Ac-G combinations induced GPx activity and protected the SOD enzyme. In addition, Ac-G combinations positively affected cellular ROS generation, glutathione content, and lipid peroxidation. It is most likely that diverse phenolic compounds in the mixture target multiple sites and act through various antioxidant mechanisms. The low bioavailability of anthocyanins and gingerols limits their health benefits. Thus, achieving the same biological effects at a lower dosage by combining these two types of phenolic compounds may provide a new strategy to overcome the low bioavailability issue. This research also suggested that the synergy of phenolic compounds could be considered for new natural health product and functional food development with enhanced antioxidant effects to prevent oxidative stress and associated chronic health conditions.

Separation and characterization of free, esterified, and bound phenolics in Georgia pecans **Samuel O. Ogundipe**, soo54666@uga.edu, Joon Hyuk Suh, Ronald B. Pegg. Food Science & Technology, College of Agricultural and Environmental Sciences, Univ. of Georgia, Athens Pecans contain a plethora of phenolic compounds in diverse forms including those, which are free, esterified, and insoluble-bound. Upon base/acid hydrolysis, a wide array of phenolic compounds, specifically phenolic acids (i.e., hydroxybenzoic acids, ethyl protocatechuate, and trans-hydroxycinnamic acids), stilbenes, flavan-3-ols, proanthocyanidins, other flavonoids (e.g., isoflavones, flavonols, and flavones), and biflavonoids, were liberated from the esters and glycosides and identified in the acetonic extracts of pecan nut meal. Phenolic fractions were analyzed and characterized by ultra-high-performance liquid chromatography coupled with diode array detection and electrospray ionization mass spectrometry (UHPLC-DAD-ESI-MS^n) operating in full scan mode. Tentative identification of the separated phenolics was based on molecular ions and fragmentation patterns acquired by ESI-MS in both the positive- and negative-ion modes. Approximately 6% of the defatted nutmeat comprised phenolic compounds. Within each fraction, a total of 52, 25, and 42 phenolic compounds were detected in the free, esterified, and bound forms, respectively, representing 15, 33, and 42% of the total phenolics mass. Dominant phenolic compounds — such as ellagic acid, gallic acid, procyanidin dimer (PD2B), (–)-epicatechin, (+)-catechin, and ferulic acid — were identified in all three fractions. Notably, gallic acid was found chiefly in the bound form (80%) with the remaining 8 and 12% being present in the free and esterified forms, respectively. Interesting, 79% of the total ellagic acid content resided in the free form. Understanding the makeup and distribution of these phenolic compounds is pivotal for potential industrial applications of pecans and the design of functional foods. These findings underscore the importance of identifying key antioxidants in pecans for further research and development efforts aimed at harnessing their nutritional and health benefits.

Identification of salt-enhancing compounds in cumin spice extracts **Irene Wang**, wang.13940@buckeyemail.osu.edu, Edisson Tello Camacho, Devin G. Peterson. Food Science and Technology, The Ohio State Univ., Columbus In alignment with guidance from the FDA, the food industry is working towards reducing sodium in commercially prepared foods. Spices have been suggested as potential salt enhancers, and therefore a possible strategy to reduce salt. Nevertheless, a gap exists in understanding the direct impact of spices on salt taste perception, representing an intriguing area for further investigation. The present study focused on discovering nonvolatile salt-enhancing compounds from cumin (Cuminum cyminum L.) spice utilizing a sensory-guided fractionation approach. A comprehensive screening of fractions by a trained panel obtained from multidimensional liquid chromatography revealed two cumin compounds that enhanced the saltiness perception of sodium chloride. The compounds were structurally elucidated using MS/MS fragmentation analysis and mono- and bidimensional nuclear magnetic resonance (NMR) and identified as novel products, one of which consisted of a benzyl piperidine derivate. Further sensory recombination testing demonstrated a significant increase in perceived saltiness in low-salt chicken broth. The identification of naturally occurring salt-enhancing compounds from cumin facilitates the development of consumer-preferred clean-labeled products aligned with the sodium reduction initiative.

Carbonyl stress as a new mechanistic target of dietary flavonoids for prevention of metabolic disorders **Shengmin Sang**, ssang@ncat.edu. North Carolina Agricultural and Technical State Univ., Kannapolis Flavonoids are the most abundant type of polyphenols in the diet, constituting approximately two-thirds of polyphenol intake. Extensive studies have demonstrated that flavonoids are antioxidants and can lower oxidative stress to prevent metabolic disorders. Recently, we have demonstrated that flavonoids can also scavenge toxic reactive carbonyl species (RCS) and carbonyl stress can be a new mechanistic target of flavonoids for prevention of metabolic disorders. This presentation presents the Sang lab’s

research progress on the effects of dietary flavonoids on carbonyl stress in vitro and in vivo.

Gut microbiota influence the metabolism and anti-inflammatory properties of ginger polyphenols **Shuwei Zhang**, szhang@ncat.edu, Yantao Zhao, Pei-Sheng Lee, Shengmin Sang. North Carolina Agricultural and Technical State Univ., Kannapolis Ginger is a widely consumed spice and possesses numerous beneficial effects to humans. However, studies addressing the efficacy of ginger in humans have been inconsistent. Recent literature has emphasized that the gut microbiome's response to dietary intake can vary dramatically between individuals. However, there is limited information available on how the microbiota and ginger are integrated at the metabolic levels. This presentation presents our recent research on how gut microbiota influence the metabolism and anti-inflammatory properties of 6-shogaol (6S), the most abundant shogaol in ginger. We confirmed the microbial metabolites of 6S by comparing its metabolic profile in germ-free (GF) mice with that of specific-pathogen-free (SPF) mice. Intriguingly, we found that fecal samples collected from 6S treated SPF mice has a superior inhibitory effect on LPS-induced nitrite production and iNOS expression in LPS treated RAW 264.7 macrophages comparing to those from 6S-treated GF mice. Additionally, we isolated new microbial metabolites from mouse fecal samples and characterized their structures through NMR analysis.

TUESDAY AFTERNOON
JAFC Best Paper Award

From bioreactor to cup: Exploring the aroma and flavor of cell culture-based coffee **Heiko Rischer**, heiko.rischer@vtt.fi. Teknologian tutkimuskeskus VTT Oy, Espoo, Uusimaa, Finland Coffee is a popular beverage that is traditionally produced by farming, drying and roasting coffee beans. However, not only due to a steadily growing demand this method faces environmental and social challenges, such as land use, climate change and sustainability. Cellular agriculture is a potential alternative that uses biotechnology to grow plant cells in the controlled environment of bioreactors. An initial simplified proof of concept study confirmed the basic feasibility of cell-based coffee. It revealed that cell culture derived coffee exhibits an aroma profile with similar odor-active compounds as conventional coffee even under nonoptimized process conditions. However, the absence of several key odor-active compounds of coffee indicates that further optimization is required to obtain the aroma profile characteristic to coffee. Therefore, subsequent studies focused on applying different processing steps such as roasting regimes and dedicated chemical and sensory methods to evaluate the material and brew. Although bitterness and sourness of cell culture-based coffee were like those of regular coffee the aroma was smokier and burned sugar like in accordance with the levels and ratios of key aroma compounds. The presentation will summarize the status quo of cellular agriculture as an alternative coffee production platform and suggests directions for further optimization.

ACS Microbiome Research Consortium - Modulation of the Gut Microbiome

Metagenomic immunoglobulin sequencing (MiG-seq) exposes patterns of IgA antibody binding in the healthy human gut microbiome
Matthew Olm, mattolm@stanford.edu. Univ. of Colorado Boulder IgA, the most highly produced human antibody, is continually secreted into the gut to shape the intestinal microbiota. Methodological limitations have critically hindered defining which microbial strains are targeted by IgA and why. Here, we develop a new technique, Metagenomic Immunoglobulin Sequencing (MIG-Seq), and use it to determine IgA coating levels for thousands of gut microbiome strains in healthy humans. We find that microbes associated with both health and disease have higher levels of coating, and that microbial genes are highly predictive of IgA binding levels, with mucus degradation genes especially correlated with high binding. We find a significant reduction in replication rates among microbes bound by IgA, and demonstrate that IgA binding is more correlated with host immune status than traditional microbial abundance measures. This study introduces a powerful technique for assessing strain-level IgA binding in human stool, paving the way for deeper understanding of IgA-based host microbe interactions.

Discovery of a novel link between microbial derived metabolite, 2,3-dihydroxypropane-1-sulfonate (DHPS), and cryptic sulfur metabolism in the human gut associated with metabolic dysregulation **Courtney Christopher**[1], cleathe3@vols.utk.edu, Aline Zaparte[2], Lexis Rice[1], Katarina Jones[1], Zane Vickery[1], Lauren Richey[2], Connie Arnold[2], Chris Taylor[2], Adairre Castille[2], Hui-Yi Lin[2], John P Kirwan[2], John W. Apolzan[2], Christopher Ellis[3], Katherine Morgan[4], David Welsh[2], Shawn R. Campagna[1]. (1) chemistry, The Univ. of Tennessee Knoxville College of Arts and Sciences (2) Medicine, LSU Health New Orleans, Louisiana (3) The Univ. of Tennessee Health Science Center College of Medicine, Knoxville (4) Nursing, The Univ. of Tennessee Knoxville Microbial-derived metabolite, 2,3-dihydroxypropane-1-sulfonate (DHPS), is a highly abundant organosulfonate and plays a crucial role in biogeochemical sulfur cycling in aquatic microbiomes, yet has no previously known role in human physiology. However, we recently discovered DHPS in human stool samples across a spectrum of physiological conditions, thereby demonstrating the first association between DHPS and the human gut metabolome. Given the intrinsic link of the gut microbiome to human health with ~90% of diseases being associated with gut dyshomeostasis, it is crucial to investigate the impact of microbial-derived metabolites, such as DHPS, on human physiology. Using a global ultra-high performance liquid chromatography high resolution mass spectrometric metabolomics method to perform untargeted profiling of fecal samples, DHPS appeared in two independent cohorts. Cohort 1 included patients with neurodegenerative diseases (NDD) and age-matched healthy control (HC) patients, while cohort 2 included patients using e-cigarettes or smoking tobacco/cannabis, and controls. Statistical analysis within each cohort revealed DHPS was a significant and consistent indicator of healthy vs control patients being ~8x lower in NDD cohorts compared to the HC cohort and 20x lower in e-cigarette/smoking cohorts compared to controls. Gut microbial degradation of DHPS can result in excess H_2S, thereby potentially linking DHPS to sulfur dyshomeostasis. Additionally, DHPS may also be related to one-carbon metabolism and cellular signaling as acetylated amino acids were positively correlated with DHPS. Combined, this data driven approach based on global metabolomics data has provided the first link of DHPS to cryptic sulfur metabolism in the gut metabolome that is altered by e-cigarette/tobacco use and NDD. We hypothesize that DHPS is implicated in dyshomeostasis of sulfur metabolism and propose it as a missing link in the pathophysiology of gut inflammation that is a comorbidity with many diseases, and further studies are warranted to elucidate the full role of DHPS in human physiology.

Butylated hydroxyanisole does not significantly affect the human gut microbiome ex vivo **Johanna M. Lemons**[1], johanna.lemons@usda.gov, Adrienne B. Narrowe[1], Lin Liu[1], Jenni A. Firrman[1], Karley Mahalak[1], Aurélien Baudot[2], Stef Deyaert[2], Pieter Van den Abbeele[2]. (1) Dairy and Functional Foods Research Group, USDA Agricultural Research Service, Wyndmoor, Pennsylvania (2) Cryptobiotix SA, Ghent, Belgium The world's population is steadily

rising and is expected to reach 9 billion by 2050. Ensuring global food security for this growing population is an ongoing challenge that will likely require increased sustainable food production and reduced food loss via processing techniques that increase safety and shelf-life. For food processing techniques to be accepted by consumers, and benefit the growing population, fears over their safety must be assuaged. The synthetic antioxidant butylated hydroxyanisole (BHA) has raised consumer concern lately due to its status as a "possible carcinogen" even though the U.S. Food and Drug Administration, and other regulatory bodies, consider BHA safe when under a regulated amount. BHA is added to foods to scavenge peroxides from edible oils to prevent rancidity and protect the activity of oil-soluble vitamins. It is found in butter, lard, meats, cereals, potato chips, nuts, dehydrated potatoes, glazed fruits, chewing gum, shortening, cosmetics, and more. While other research groups have sought to explore the direct effect of BHA on mammalian health, we decided to investigate its effect on the human gut microbiome which itself can mediate host health. We investigated the effect of ten times the Acceptable Daily Intake on the human gut microbiota cultured ex vivo. We monitored fermentation parameters (pH, gas, short-chain fatty acids) and the microbial composition of the gut microbiota for 24 test subjects belonging to 4 age groups: breastfed infants, toddlers, adults (25-40), and older adults (60+). There were no statistically significant changes in the microbial composition for any age group in response to BHA treatment. BHA also did not cause large alterations in the functional capacity of the microbiota of the different groups, for instance, BHA only significantly increased gas production in older adults (60+) and significantly decreased short-chain fatty acid production in adults (25-40) but not in other groups. This data suggests that interindividual differences drive more of the variability in the data than the addition of BHA. Although the dose used in this study is modest compared to those used previously in rodent models, it likely exceeds the highest doses humans would normally be exposed to. At these levels, BHA exposure does not appear to pose a significant risk to the natural microbial balance within the human intestine.

Establishment and evaluation of an in vitro model of the small intestinal gut microbiota **Jenni Firrman**[1], jenni.firrman@ars.usda.gov, Lin Liu[1], Karley Mahalak[1], Johanna M. Lemons[1], Adrienne B. Narrowe[1], Gary D. Wu[2], Elliot Friedman[2]. (1) USDA-ARS Eastern Regional Research Center, Wyndmoor, Pennsylvania (2) Univ. of Pennsylvania, Philadelphia The small intestinal microbiota (SIM) has emerged as an important contributor to nutrient utilization within the upper gastrointestinal tract, fueling the need for in vitro platforms to fully elucidate the functional role of this community. Here, an in vitro model of the small intestinal microbiota was developed using glass bioreactors set up to mimic the environmental conditions of the terminal ileum with ileostomy effluent used as the inocula. Shotgun sequencing was combined with metabolomics to profile the communities that developed from four individual donors. Structurally, the communities were highly variable between donors, and this variability and alpha diversity was maintained in vitro. The addition of 5% O2 allowed for growth of typical facultative taxa associated with the small intestine, such as Klebsiella, Escherichia, Streptococcus, and Enterococcus. Although composition was highly variable between donors, the communities reached stability after 5 days of growth using a 4-hour residence time and were maintained until the end of the experiment. Measurement of short chain fatty acids (SCFAs) found that acetic acid was the most prominent SCFA, but unlike what has been reported for the colon gut microbiota, butanoic acid was the second most prominent SCFA and not propanoic acid. For all donors, SCFA production stabilized after 5 days of growth, aligning with stabilization of the community structure. In conclusion, the SIM model described here recapitulates the structure and function of the small intestinal gut microbiota yet maintains the interindividual variability between donors. This model system can be applied to any study looking to address the role of the small intestinal gut microbiota in nutrition and has widespread application potential.

Effects of whey protein isolate on the growth and metabolism of the probiotic Lacticaseibacillus rhamnosus GG **Adrienne Narrowe**, adrienne.narrowe@usda.gov, Venkateswari Chetty, Lin Liu, Johanna M. Lemons, Karley Mahalak, Jenni A. Firrman. Dairy and Functional Foods Research Unit, Eastern Regional Research Center, USDA Agricultural Research Service, Wyndmoor, Pennsylvania Lacticaseibacillus rhamnosus GG (LGG) is a well-known bacterial probiotic strain. Identifying food components which can enhance LGG growth and survival and promote its beneficial effects can offer additional methods for the delivery of this probiotic. In this experiment, LGG was grown with and without the addition of whey protein isolate (WPI) to determine the effects of the WPI on LGG growth and metabolism. Over the course of 31 hours, covering all growth phases, LGG growth was measured by flow cytometry, with functional response to the WPI assessed via RNA-Seq and untargeted metabolomics. Overall WPI strongly promoted LGG growth relative to controls. The addition of WPI also induced increased transcription of the spaABD / srtC1 genes which encode an adhesion pilus that is critical for LGG adhesion to the host GI mucus layer. Other beneficial effects include the increased transcription of the gene encoding the p40 protein which has been demonstrated to benefit the host by reducing intestinal inflammation and promoting healing via transactivation of the host epidermal growth factor receptor. Overall, these results suggest that growth or delivery of LGG with WPI can both promote the growth of this probiotic and induce specific host-beneficial effects.

Undigested glycated lentil proteins modulate the gut microbiota profile but not the metabolites in vitro **Ruth Boachie**[1,2], rtboachie@outlook.com, Edoardo Capuano[1], Teresa Oliviero[1], Chibuike Udenigwe[2,3], Vincenzo Fogliano[1]. (1) Agrotechnology & Food Sciences, Wageningen Univ. & Research, Wageningen, Gelderland, Netherlands(2) Nutrition Sciences, Univ. of Ottawa, Ontario, Canada(3) Chemistry and Biomolecular Sciences, Univ. of Ottawa Faculty of Science, Ontario, Canada Pulses are a sustainable source of plant proteins and are widely consumed due to their health benefits and accessibility. However, the globular structure of their predominant proteins limits their techno-functionality. Although glycation is an effective method for enhancing techno-functionality of pulse proteins, it can alter their digestibility and consequently, the equilibrium between peptides that are absorbed in the small intestine epithelium and those reaching the colon. This study evaluated how undigested glycated lentil protein residues that potentially reach the colon affect the gut microbiota metabolites and population, using batch fermentation and the Simulator of Human Intestinal Microbiome Ecosystem (SHIME®), respectively. A 5% stock solution of both lentil proteins and fructose were mixed, lyophilized, and incubated at 60°C for 0, 24, or 48 h (conjugates are referred to as LP+Fr0, LP+Fr1, and LP+Fr2). Compared to the native protein (LP), particle size of the glycated samples doubled by the end of the 48-hour incubation period. Similarly, Maillard reaction markers, furosine and Nε-(carboxyethyl)-L-lysine, increased by 70-fold and 10-fold in 48 h, respectively. Additionally, the degree of hydrolysis of LP+Fr2 decreased by 23.5% relative to the native protein. Levels of short- and branched-chain fatty acids produced from 48 hour-fermentation of the insoluble hydrolysates of all conjugates were comparable. The bacteria population profile in both colon sections was modulated differently depending on the donor. Our findings show that extent of glycation does not affect levels of short- and branched-chain fatty acids produced in the colon, while the effect on the microbiota population is dependent on the host and colon section.

Revealing the mechanism of food-grade-carrageenan-induced harmful effects: Gut bacteria are the keys **Ruya Ji**, rji@umass.edu, Hang Xiao. Food Science, Univ. of Massachusetts Amherst Carrageenans (CGN), the sulfated polysaccharides derived from red algae, have been extensively used in the food industry due to their gelling, thickening, and stabilizing properties. However, there have been concerns about the safety of CGN, particularly over the possibility of its degradation by gut bacteria into small and harmful fragments. In this study, we fermented ι-CGN anaerobically by human feces and isolated a novel CGN-degrading bacterial strain. Furthermore, degraded ι-CGN were extracted and assessed for inflammatory responses in cell culture studies. Moreover, the specific genes expressing carrageenase were identified by transcriptome analysis. Overall, this study provides evidence for gut bacteria's degradation of food-grade ι-CGN and evaluates the potential to induce inflammation, thus prompting us to reconsider the safety of CGN as a food additive.

Honoring Professor Chi-Tang Ho on the Occasion of His 80th Birth Year

Assessing the anti-inflammatory activity of Georgia pecans **Ronald B. Pegg**[1], rpegg@uga.edu, Phillip Greenspan[2]. (1) Food Science & Technology, College of Agricultural and Environmental Sciences, Univ. of Georgia, Athens (2) Pharmaceutical and Biomedical Sciences, College of Pharmacy, Univ. of Georgia, Athens The role of phenolic compounds in suppressing inflammation has been extensively studied either by employing crude extracts from a large variety of natural products or by examining the bioactivity of individual/isolated phenolic compounds. Our laboratories have previously characterized the phenolic compounds present in pecan nuts and investigated their antioxidant activity in a cell-based system. In this study, the effect of phenolic extracts on the production of nitric oxide and reactive oxygen species was investigated by subjecting a pecan crude extract (acetone/water/acetic acid, 70:29.5:0.5, v/v/v) to Sephadex LH-20 column chromatography to obtain low- and high-molecular-weight (LMW/HMW) fractions. Anti-inflammatory properties of these fractions were assessed in LPS-stimulated RAW 264.7 murine macrophage cells. Nitric oxide production was monitored after three different experimental protocols: (1) pre-treatment with Escherichia coli O111:B4 lipopolysaccharide (LPS), then washing the cells and then adding the phenolic extracts; (2) pre-treatment with pecan extracts, washing the cells and then treating the cells with LPS; and (3) co-incubation of LPS with the pecan extracts. The LMW fraction displayed a dose-dependent (12.5-50 μg catechin equivalents/mL) significant decrease in nitric oxide production when cells were pretreated with LPS or co-incubated with LPS. When cells were treated first with the phenolic extracts, washed and then treated with LPS, no inhibition was observed; this dose-dependent inhibition was not observed when cells were incubated with the crude or HMW fractions. When cells were pre-treated with LPS, only the LMW fraction (25 μg catechin equivalents/mL) inhibited the production of reactive oxygen species. The LMW/HMW fractions were characterized by HPLC-ESI-MS/MS and the HMW fractions contained proanthocyanidins (degrees of polymerization {DPs} of 2-6), while the LMW fraction was composed of (+)-catechin, ellagic acid, derivatives of catechins and ellagic acids, as well as monomeric and dimeric proanthocyanidins. These results demonstrate that LMW phenolics are responsible for the anti-inflammatory activity of pecans.

Revisiting the chemical diversity of organic crops **Joon Hyuk Suh**[1], J.Suh@uga.edu, Jashanpreet Kaur[1], Timothy Coolong[2], Kate Cassity-Duffey[2]. (1) Food Science & Technology, Univ. of Georgia, Athens (2) Horticulture, Univ. of Georgia, Athens Organic food crops have become popular, with increasing attention to healthier and safer foods. Yet, the bulk of our knowledge on chemical diversity (discriminant compounds) of organic crops is limited to less than a hundred compounds within specific chemical classes, such as phenolics. The majority of organic crop studies have focused on the discovery of biomarkers that can distinguish organic crops from the conventional counterparts for crop authentication, control, and management purposes. However, individual markers, e.g., single or a few metabolites, obtained from each study do not represent the true quality of organic crops, because altered metabolism in organic crops involves a multitude of different types and levels of chemical compounds with varying nutritional values and health effects. Screening a whole set of compounds in a subject is ideal, but it's a challenge to current analytical techniques and instruments. In this work, we compiled articles published in the past ten years on the chemical profiling of organic crops, and made a list of potential biomarkers that had been selected as discriminant metabolites between organic and conventional crops at least in two articles. Using the marker list, functional enrichment analysis was executed to uncover a key metabolic network (bundle of metabolic pathways) rewiring in organic crops. The achieved network and related metabolite information allowed to narrow down the number of target metabolites in organic crop research. Finally, as a case study, metabolomic profiles of organic and conventional tomato fruits were investigated, and the chemical diversity of organic tomatoes was identified with their biological meanings. This presentation will cover the workflow of revisiting chemical diversity in organic crops, brief results of the case study, and future perspectives in the area.

Ovomucin hydrolysates reduce bacterial adhesion and inflammation in enterotoxigenic Escherichia coli (ETEC) K88-challenged intestinal epithelial cells **Jianping Wu**, jwu3@ualberta.ca, Xiaoyu Bao, Michael Gänzle. Univ. of Alberta, Edmonton, Canada Enterotoxigenic Escherichia coli (ETEC) K88 is the most common cause of diarrhea in neonatal and post-weaning pigs. After adhering to small intestinal epithelial cells via glycoprotein receptor recognition the pathogen can produce enterotoxins, impair intestinal integrity, trigger watery diarrhea, and induce inflammation via nuclear factor κB (NF-κB) and mitogen-activated protein kinase phosphatase (MAPK) pathways. Inhibiting ETEC K88 adhesion to cell surfaces by interfering in the receptor-fimbriae recognition provides a promising strategy to prevent the initiation and progression of infection. Ovomucin is a highly glycosylated protein in chicken egg white with diverse bioactivities. Ovomucin hydrolysates prepared by the enzymes protex 26L (OP) and pepsin/pancreatin (OPP) were previously revealed to prevent adhesion of ETEC K88 to IPEC-J2 cells. Herein, we investigated the protective effects of ovomucin hydrolysates on ETEC K88-induced barrier integrity damage and inflammation in IPEC-J2 and Caco-2 cells. Both hydrolysates inhibited ETEC K88 adhesion to cells and protected epithelial cell integrity by restoring transepithelial electronic resistance (TEER) values. Removing sialic acids in the hydrolysates reduced their anti-adhesive capacities. Ovomucin hydrolysates suppressed ETEC-induced activation of NF-κB and MAPK signaling pathways in both cell lines. The ability of ETEC K88 in activating calcium/calmodulin dependent protein kinase 2 (CaMK II), elevating intracellular Ca^{2+} concentration, and inducing oxidative stress was attenuated by both hydrolysates. In conclusion, this study demonstrated the potential of ovomucin hydrolysates to prevent ETEC K88 adhesion and alleviate inflammation and oxidative stress in intestinal epithelial cells.

New method for measuring cyanide and cyanogenic glycoside analysis in almonds (Prunus dulcis) and almond hulls **Alyson E. Mitchell**[1,2], aemitchell@ucdavis.edu, Larry A. Lerno[2], Elyse Doria[1]. (1) Food Science & Technology, Univ. of California Davis (2)

Viticulture and Enology, Univ. of California Davis Almonds (Prunus dulcis) comprise the largest tree nut crop in the world, and ~80% of the world's crop is produced in California. Almond production generates significant amounts of coproducts (e.g. hulls and shells) and finding new uses for these materials is critical for the sustainability of the industry. Almond hulls are used as a supplement feed for dairy cows; however, they are being considered for use in human food. At this time, there is no research on levels of cyanogenic glycosides in almond hulls, although they are found in bitter and sweet almond kernels. To address this, a UHPLC-(ESI+)-MS/MS method was developed and validated to simultaneous measure cyanide and cyanogenic glycosides, amygdalin and prunasin, in kernels and hulls. A design of experiments (DoE) was utilized to optimize conditions, finding that the significant components were the ethanol:water ratio and the mass:solvent ratio. Optimal conditions were found to be 1 g kernels and 2 g hulls extracted with 10 mL 90:10 (v/v) ethanol:water and sonicated for 150 minutes. The limits of quantitation were in the sub-ppb ranges for all compounds. The recoveries were 98.2 ± 10.6% and 66.0 ± 2.8% for amygdalin, 125.5 ± 16.85% and 123.4 ± 2.83% for prunasin, and 85.6 ± 3.12 and 108.59 ± 8.79% for ethyl cysteine-derivatized cyanide in the kernels and hulls, respectively. The method was validated in 13 commercial almond varieties grown in California. This method will provide a more comprehensive and consistent extraction analytical method to screen varieties and more accurately quantify the amount of potential cyanide in almond coproduct material considered for human consumption.

3-MCPD fatty acid formation in edible oils Liangli Yu, liangliy@yahoo.com. Dept. of Nutrition and Food Science, Univ. of Maryland, College Park 3-MCPD fatty acid esters are a group of processing-induced food toxins. These food toxins have been detected in many food categories including bread, edible oils and human breast milk, and caused human health concerns. This presentation will discuss the chemical mechanisms behind the formation of 3-MCPD fatty acid esters from triglycerides, diglycerides and monoglycerides. The catalytical role of Fe in 3-MCPD fatty acid formation will also be discussed.

Bioactivities, bioavailability, and biosynthesis of citrus polymethoxyflavones Qingrong Huang, qhuang@sebs.rutgers.edu. Food Science, Rutgers The State Univ. of New Jersey, New Brunswick Polymethoxyflavones (PMFs) are a unique group of flavonoids that abundantly exist in the citrus peels. Multiple health benefits including anti-inflammation, anti-cancer, anti-diabetes and anti-obesity properties have been reported for PMFs. Our previous cell and mouse studies demonstrated that PMFs could attenuate obesity through AMP-activated protein kinase (AMPK) signaling. In this talk, we will discuss the mechanism underlying the anti-obesity activities using high-fat diet (HFD) induced obese mice fed with PMFs. We found that PMFs could significantly increase fecal short chain fatty acids, decrease Proteobacteria prevalence and the ratio of Firmicutes to Bacteroidetes, and significantly and dynamically promote beneficial bacteria, such as Akkermansia spp. and Allobaculum spp. The pharmacokinetic study demonstrated that the oral bioavailability of PMFs can be improved by ~20% by encapsulation using nanoemulsions. For the key PMFs component nobiletin, the major metabolites included 3′-demethylnobiletin (3′DMN), 4′-demethylnobiletin (4′DMN), and 3′,4′-didemethylnobiletin (3′4′DDMN). Other mono-demethylated-nobiletins (DMNs) were also detected in pharmacokinetic and bio-efficacy studies. However, because of the lack of standards, the demethylation positions were not previously identified. We have successfully developed an efficient synthetic method for 6DMN and 7DMN using microbes isolated from aged citrus peels. 6DMN was found to be more potent in suppressing lipogenesis than 7DMN.

Kenneth A. Spencer Award

Green process development for agro-based materials
H.N. Cheng[1], hncheng100@gmail.com, Atanu Biswas[2]. (1) (Retired) Southern Regional Research Center, USDA Agricultural Research Service, Houston, Texas (2) National Center for Agricultural Utilization Research, USDA Agricultural Research Service, Peoria, Illinois Green process development of agro-based materials focuses on utilizing sustainable practices to extract, process, and utilize agricultural resources efficiently. This approach involves minimizing environmental impact by reducing energy consumption, waste generation, and the use of hazardous chemicals. One aspect of green process development is the utilization of eco-friendly extraction methods involving water or ecofriendly solvents to obtain valuable compounds from agricultural byproducts or waste materials. A related approach obviates the use of organic solvents or hazardous reagents in organic or polymer reactions. Another green process entails the use of microwave heating for appropriate reactions to reduce reaction time or energy. Other examples include enzymatic processes, reduced use of strong acids, and more eco-friendly reagents for industrial processes. Overall, green process development of agro-based materials aims to create sustainable and environmentally friendly solutions that contribute to a more resilient and resource-efficient agricultural industry.

CIS (liquid) to trans (solid) isomerization of jojoba oil in supercritical CO2 catalized by Lewis acid Zengshe Liu[1,2], kevin.liu@usda.gov, Shailesh Shah[2], Karl Vermillion[1], H.N. Cheng[3], Atanu Biswas[1]. (1) USDA-ARS National Center for Agricultural Utilization Research, Peoria, Illinois (2) Chemistry and Bio-Chemistry Department,, The Univ. of Texas at Dallas, Richardson (3) US Dept.of Agriculture, Agricultural Research Service, Southern Regional Research Center,, New Orleans, Louisiana Isomerization of the olefin from cis to trans configuration is often a desirable reaction pathway that leads to products with different properties and chemical reactivities. In this work, we report a novel process involving the use of boron trifluoride diethyl etherate in supercritical carbon dioxide that converts a compound with an isolated cis to a trans olefin in quantitative yield. No polymerization was observed. The utility of this reaction has been demonstrated by the conversion of jojoba oil (a natural wax ester, comprising a mono-ester of long-chain fatty acids with cis olefins) to its trans isomers). Jojoba oil is non editable oil and is liquid at room temperature with a melting point of about 10°C; the reacted product is a solid with a melting point of 37.6°C (around the normal human body temperature). The simplicity of the reaction and the use of supercritical CO2 are the attractive features of this reaction.

Quantum computing for natural product structure elucidation
Y. Jane Tseng, yjtseng@csie.ntu.edu.tw. National Taiwan Univ., Taipei Digital Annealer (DA) leverages the computational power of up to 100,000 fully entangled qubits to address natural products' complex structural elucidation problem. This challenge is impractical for classical computers due to the inherent complexity of the mixtures. DA's quantum-inspired computing capabilities are applied to solve large-scale combinatorial optimization problems that are typically beyond the reach of classical methods. The structural elucidation problem in natural products is a quintessential example of an NP-complete problem. In this study, we transform this intricate challenge into a quadratic unconstrained binary optimization (QUBO) problem. Using mass information and various possible scaffolds as input data, DA efficiently identifies optimal combinations of sidechains that match the target molecular weight

while maximizing the probability of selecting suitable sidechains and substituted positions. We analyze datasets from three herb species containing diverse structures within their mixtures to validate DA's capabilities. DA accurately identifies these diverse structures, highlighting its computational prowess. With the appropriate scaffold, DA consistently produces correct solutions within a mere 6-minute timeframe. This study demonstrates how DA can revolutionize natural product structure elucidation, providing accuracy and speed. By bridging the gap between impracticality and feasibility, DA emerges as a vital tool for addressing the inherent complexities in this field.

Applications of sustainable agro-based bioproducts to remove toxins and improve food safety **Michael Appell**, michael.appell@gmail.com, Atanu Biswas. National Center for Agricultural Utilization Research, US Dept. of Agriculture, Peoria, Illinois Agro-based value-added bioproducts are increasingly used to replace materials obtained from less sustainable feedstocks. Our recent studies show that economical biopolymers are suitable alternatives to selectively remove a wide range of natural and human-caused contaminants from drinking water and beverages. Our recent studies of Generally Recognized As Safe (GRAS) natural biopolymer, clay, and charcoal materials have shown that these materials exhibit a wide range of effectiveness at sequestering natural toxins. Toxin sequestration was based on the feedstock used to prepare the bio-based sorbent. Charcoals developed from coconut shells and pine wood agricultural waste products could significantly reduce mycotoxin levels during in vitro gastric fluid studies that simulate animal digestion. These value-added biomaterials offer new uses for agricultural waste products that improve food safety and support sustainable agricultural practices.

Green processes and bio based polymers **Atanu Biswas**, abiswas1955@yahoo.com, H.N. Cheng. USDA Agricultural Research Service, Washington, D.C. As we are in the Corn and Soybean Belt of the USA, our goal has always been to enhance the utilization of corn and soybean. The presentation is on research dealing with expanded uses of the components of corn, such as starch, protein, fiber, and oil. Past and ongoing research work include chemical and enzymatic modifications of renewable resources to produce new biobased materials and value-added products. A particular emphasis is to develop new, green synthetic methodologies through microwave, ionic liquid, and solvent-less processes.

VIRTUAL SESSION
General Papers

Quantitation of odorants in dried and rehydrated lobster mushrooms **Thien Nguyen**, tnguy103@vols.utk.edu, John P. Munafo. Food Science Department, The Univ. of Tennessee Knoxville Institute of Agriculture The increasing demand for healthy, nutritious, and flavorful foods has led to a surge in the popularity of edible mushrooms. Particularly, lobster mushrooms have garnered increasing attention in the culinary world owing to their unique flavor and texture. This is a type of mycorrhizal mushroom with a distinct seafood-like flavor that commonly grows in the temperate forests of North America. Interestingly, the lobster mushroom is not a single species of fungus but rather the result of the colonization of Russula or Lactarius mushroom hosts by the ascomycete fungus Hypomyces lactifluorum. Because lobster mushrooms are harvested for a relatively short period during the warmer months, they are generally dried and sold year round and rehydrated before cooking. The seafood-like aroma of lobster mushrooms is enhanced when cooked, suggesting that thermal treatment improves the aroma. A prior study from our lab identified the key odorants in dried and rehydrated lobster mushrooms and determined their flavor dilution (FD) factors. Herein, the odorants with high FD factors were quantitated via stable isotope dilution assays and the odor activity values were calculated. Notably, the rehydration process induced quantitative changes in several key odorants, including a series of alcohols, aldehydes, lactones, and organic acids. This investigation determined the changes in the odorants of lobster mushrooms after the rehydration process and established a foundation for future studies on further changes in lobster mushroom aroma induced via thermal treatment.

Predicting the permissible arsenic (As) concentration limit for irrigation water used in rice cultivation **Dr. Jajati Mandal**[1], J.Mandal2@salford.ac.uk, Sudip Sengupta[2], Debasis Golui[3], Debapriya Mondal[4], Michael D. Wood[1]. (1) Univ. of Salford, United Kingdom(2) School of Agriculture, Swami Vivekananda Univ., Kanthalia, West Bengal, India(3) Division of Soil Science and Agricultural Chemistry, Indian Agricultural Research Institute, New Delhi, Delhi (4) UK Health Security Agency, London, United Kingdom Arsenic (As) contamination of irrigation water is a serious health threat for millions of people living in As endemic regions of South Asia. Reducing the amount of As consumed through food is important for public health; rice is a staple food in many of these regions. Previously we have collected samples from the As-contaminated rice fields (irrigated and rainfed) in India and used machine learning algorithms to predict the paddy soil bioavailable As (BAs) concentration limit for rice cultivation. The models were defined using the maximum tolerable concentration (MTC) of As in rice grain as per the codex recommendation and 5.70 mg kg^{-1} was the predicted limit for BAs. However, a significant additional source of As in rice cultivation is from As contaminated irrigation water. In the present study, we use data derived from an incubation study with monolithic soil columns collected from ten As-contaminated sites to provide the first derivation of a permissible limit of As in irrigation water used for rice cultivation. Six levels of As contaminated water (0, 100, 200, 300, 400, 500 and 600 mg L^{-1}) were applied to the soil columns, considering two types of irrigation (rainfed and irrigated), and the columns were incubated for four months. The bioavailable As of post-incubated soil columns were classified as “A” (5.70 mg kg^{-1}) and “B” (5.70 mg kg^{-1}). Logistic regression (LR) was used to predict the limit of As in irrigation water. The LR model predicted 190 mg L^{-1} as the limit of irrigation water. When validated using field samples, the predicted permissible limit of As in irrigation water satisfactorily classified the rice grain As <MTC. This study therefore provides an essential point of reference for evaluating the appropriateness of different irrigation water sources for rice cultivation.

Permeability prediction in well log using Gaussian random function simulation and machine learning **Sukma Tangkin**, tangkinsukma@gmail.com. Petroleum, Institut Teknologi Bandung, Jawa Barat, Indonesia The rock’s ability to conduct fluids is termed as permeability. The permeability of a rock depends on its effective porosity, consequently, it is affected by the rock grain size, grain shape, grain size distribution (sorting), grain packing, and the degree of consolidation and cementation. Permeability measurements are rarely conducted in most reservoirs; therefore, permeability must be estimated from available data. Permeability data are only available from laboratory tests on core samples and well tests which are usually taken from several wells. Often, this information is extrapolated to calculate permeabilities all over the field, but the lack of enough data usually causes unreliable predictions, making permeability one of the most difficult properties to characterize . Unlike well logs, generally, almost all wells utilize various logging tools to obtain valuable information about subsurface conditions by measuring various physical properties of rocks except for permeability, which cannot be directly measured using logging tools. In previous studies, various empirical methods have been employed

to predict permeability in uncored Wells, such as the HFU (Hydraulic Flow Unit) method, Winland R35, and Rock Fabric Method. Of these three methods, the first step is to examine the relationship between porosity and permeability and then divide it into several groups, which are then referred to as rock types. The rock type is the challenging aspect to predict in wells without core data because the rock type itself is derived from the permeability-porosity relationship. In this study, the author will predict permeability by utilizing both core and log data without the need to determine rock types in each interval, whether they have core data or not. Two methods will be used by the author: the method using Gaussian random function simulation and the machine learning method as a comparison.

Discerning the content and quality of alcoholic beverages using femtosecond thermal lens spectroscopy Sonaly Goswami[1], **Debabrata Goswami**[1], dgoswami@iitk.ac.in, Rohit Goswami[2]. (1) Chemistry, Indian Inst. of Technology Kanpur, Uttar Pradesh (2) Haskoli Islands, Reykjavik, Iceland Femtosecond laser induced Thermal Lens spectroscopy (FTLS) relies on the temperature increase within a sample upon laser excitation, followed by nonradiative relaxation. When employing the TEM(00) Gaussian beam profile, this temperature rise generates a refractive index gradient, acting akin to an optical lens. This phenomenon is examined by directing another laser beam through the sample. By observing the changes in the center beam intensity of the probe laser at the far field, both qualitative and quantitative insights into the physical properties of the sample are acquired. This method differs from single-beam Z-scan experiments commonly employed to assess nonlinear optical properties, including multiphoton absorption and the nonlinear refractive index. The instantaneous high power of femtosecond pulses has made them a popular choice for nonlinear studies using the Z-scan technique. It is noteworthy that femtosecond laser pulses can induce transient heating in the sample. However, thermal lensing (TL) due to a single femtosecond pulse is negligible, as the TL effect occurs over micro to millisecond timescales, depending on the interaction of the laser beam with the sample. In the case of high repetition rate (HRR) lasers, transient heating accumulates in the sample, resulting in a prolonged TL signal. The high peak power of femtosecond pulses allows for the measurement of TL signals at relatively low powers without damaging the sample. Under such HRR conditions, the FTLS can be easily measured, and we differentiate monohydric alcohols based on their molecular characteristics and thermophysical properties. Employing both dual-beam Z-scan and time-resolved thermal lens (TL) measurements, we discern thermal signatures of representative homologous series, including aliphatic, cyclic, and aromatic alcohols. In aliphatic alcohols, the amplitude of the TL signal is strongly influenced by molecular size and chain length, while cyclic and aromatic alcohols exhibit dominance of their photophysical characteristics over the molecular influence on TL signal. The convective properties of short-chain molecules result in a distinct trend in dual-beam experiments.

Structure-activity relationship study of dendritic antioxidants **Choon Y. Lee**, lee1cy@cmich.edu, Blessed Agbemade, Ajit Sharma. Chemistry and Biochemistry, Central Michigan Univ., Mount Pleasant Numerous studies have reported that free radical damages to cellular materials may cause oxidative stress which is linked to many human diseases, including cancer and neurodegenerative and cardiovascular diseases. Antioxidants neutralize free radicals and are known to help prevent pathogenesis of human diseases. Unfortunately, many antioxidants in the presence of transition metal ions have pro-oxidant effects by which more free radical species are produced. The useful antioxidants for biological applications not only should have potent free radical scavenging effects but also should be free from the pro-oxidant effects. Antioxidants in an appropriate dendrimer architecture are known to achieve both goals. In this presentation, we will present the structure-activity relationship of dendritic antioxidants as well as their pH-dependent antioxidant and pro-oxidant activities.

Sustainable development: Biodegradable packaging with curcuma longa L. as an active and patent monitoring **Ester Ribeiro**[1], ester.retse333@gmail.com, Fabiany Gonzaga[1], Robson Almeida[2]. (1) Dept. of Exact and Natural Sciences, Univ. Estadual do Sudoeste da Bahia, Itapetinga, BA, Brazil(2) Postgraduate Program in Biotechnology - PPGBiotec/UFBA, Univ. Federal da Bahia, Salvador, Bahia, Brazil Active packaging has gained traction in the market due to its biological activities that aid in extending the shelf life of products. Curcuma longa possessing antimicrobial and antioxidant properties, holds potential for active packaging development. In this study, a qualitative and quantitative patent search was conducted using keywords: 'Curcuma longa', 'active packaging', 'casing', 'food packaging', yielding 214 patents, with only one related to the application of curcuma as wrapping paper and packaging material for plant-derived foods. Additionally, biodegradable packaging was developed using curcuma l. as an active ingredient, observing its good solubility as the concentration of Curcuma longa L. decreases, eventually reaching 100% solubility. The UV/visible absorbance spectrum was used to evaluate the transmittance capacity of the packaging in the UV-visible light range, at wavelengths of 350-750 nm. Packaging containing turmeric exhibited excellent light barrier properties, particularly when produced at high concentrations of Curcuma, based on the methodology employed and the results obtained through specular transmittance analysis, which covers the ultraviolet and UV-visible light spectrum. Hence, these developed biodegradable packaging solutions show potential for application in the food industry as active packaging, necessitating further chemical and mechanical characterizations.

Nitrates in our daily lives: A review **Adrian A. Chetty**[1,2], adrian.chetty@fnu.ac.fj, Joslin J. Lal[1]. (1) Chemistry, The Univ. of the South Pacific., Suva, Fiji(2) Pure Sciences, Fiji National Univ., Nasinu, Suva, Fiji The magnitude of nitrates presence in nature's domain is exhibited through the "Nitrogen Cycle". Thus Nitrates are omnipresent in the natural world through accumulation in edible plants, fruits and drinking water. Studies have publicized that nitrate content of edible plants can reach concentrations greater than 6000mg kg^{-1}.Nitrate itself is not tagged as being toxic or carcinogenic. Its reduction to nitrites through bacterial or enzymic exploits is nevertheless a cause for concern. Nitrites are the foremost causative factor in the inception of methemoglobinemia. Its carcinogenic status is due to its reaction with secondary or N-alkyl-amides to form N-nitroso carcinogens. Man's addition of the above mentioned ionic forms of nitrogen to the "Nitrogen cycle" is mainly through the context of Food Technology (as preservatives for meat) and Agricultural Science (fertilization of soil for enhanced food production). A century long focus on nitrates and nitrites has mainly focused on the factors affecting the accumulation of nitrates, quantitative determination in foods and beverages, development of simpler and faster analytical techniques, epidemiological studies and daily consumption of these anions through population and country specific dietary assessments. The purpose of the current review is to draw attention to the presence of nitrates and nitrites in our daily lives and highlight various research labors in this respect.

Volatiles derived from Philippine plant species exhibited antimicrobial activity, antioxidative and cytotoxicity using a newly developed microplate-based assay **Genesis C. Albarico**[1,2], genesis.albarico@vsu.edu.ph, Marketa Houdkova[2], Ivo Doskocil[3], Jan Tauchen[6], Klara Urbanova[4], Edgardo Tulin[5], Ladislav Kokoska[2]. (1) Dept. of Pure and Applied Chemistry, Visayas State Univ.,

Baybay, Leyte, Philippines(2) Dept. of Crop Sciences and Agroforestry, Ceska Zemedelska Univ. v Praze, Praha, Czechia(3) Dept. of Microbiology, Nutrition and Dietetics, Czech Univ. of Life Sciences Prague, Czechia(4) Dept. of Sustainable Technologies, Ceska Zemedelska Univ. v Praze, Praha, Czechia(5) Philrootcrops, Visayas State Univ., Baybay, Leyte, Philippines(6) Dept. of Food Sci., Ceska Zemedelska Univ. v Praze, Praha, Czechia Essential oils derived from Philippine plant species were evaluated for bioactivity using a newly developed microplate-based bioassay. It has been known that several volatile plant-derived products exhibit considerable bioactivities, however, results of conventional microplate-based assays used to evaluate such highly shifting volatile products can sometimes yield erratic and unusual results. With the aim to demonstrate such phenomenon, antimicrobial, antioxidant, and cytotoxic activities of three Philippine essential oils (Alpinia elegans, Cinnamomum iners, and Xanthostemon verdugonianus) were evaluated in a series of experiments including both ethylene vinyl acetate (EVA) Capmat sealed and nonsealed microplates. The results clearly illustrated that vapor transition to adjoining wells causes false-positive results of bioassays performed in nonsealed microtiter plates. The microplate layout and a duration of the assay were demonstrated as the key aspects defining level of the results affected by the vapors of volatile agents. Additionally, we reported biological activities and chemical composition of essential oils from A. elegans seeds and X. verdugonianus leaves, which were, according to our best knowledge, were analyzed for the first time. Considering our findings, certain modifications of conventional microplate-based assays are necessary (e.g., using EVA Capmat as vapor barrier) to obtain reliable results when biological properties of volatile agents are evaluated.

Characterization of the taste profile of Chardonnay marc through taste-guided fractionation **Ngan Nguyen**, nnguye49@vols.utk.edu, John P. Munafo. Food Science, The Univ. of Tennessee Knoxville Institute of Agriculture, Knoxville Chardonnay marc, a byproduct of winemaking, mainly comprises the seeds, stems, and skins that remain after extracting the juice from Chardonnay grapes. More than half a million tons of Chardonnay marc are produced annually and are typically used as animal feed or discarded. However, owing to its health benefits and pleasant flavor, Chardonnay marc is now gaining considerable attention. Although previous studies have characterized the key odorants in Chardonnay marc, its key tastants remain unknown. Therefore, the long-term objective of this project is to characterize the taste chemistry of Chardonnay marc using a taste-guided fractionation methodology and coupling natural product chemistry separations with sensory evaluation. Solid-phase extraction (SPE) was used as the first means of fractionation. The early eluting SPE fractions exhibited mostly sweet and sour tastes, followed by increasing levels of astringency in the subsequent fractions, and, finally, the last fractions exhibited a bitter taste. This talk will highlight the development of the sensory lexicon used for this project and the first results of the taste-guided fractionation. A comprehensive characterization of the taste chemistry of Chardonnay marc will enable its utilization in commercial food products.

Optimization of formulation and processing techniques for the development of meat-based hummus using response surface methodology **Meena Goswami**[1,2], dr.goswami2008@yahoo.co.in, Rishav Kumar[1], Xin M Teng[1], Ravi Jadeja[1], Gretchen Mafi[1], Morgan Pfeiffer[1], Vikas Pathak[2], Ranjith Ramanathan[1]. (1) Animal and Food Sciences, Oklahoma State Univ., Stillwater (2) Livestock Products Technology, UP College of Veterinary Science and Animal Husbandry Mathura, Uttar Pradesh, India Hummus is one of the most common Middle Eastern and Mediterranean spreads or dips. Hummus has several bioactive biomolecules of health significance. Developing a meat-based hummus by replacing chickpea paste with minced lamb meat may offer a unique change to traditional hummus recipes. Meat-based hummus may provide a novel option for meat enthusiasts looking for alternative ways to enjoy their favorite protein. The objective of the present study was to optimize the formulation and processing techniques for developing meat-based hummus using response surface methodology (RSM). Meat-based hummus was developed, replacing chickpea paste with cooked minced lamb meat and incorporating sodium acid sulfate at different levels, i.e., 25-75% and 0.2-0.6%, respectively. Response surface methodology was used with a Central Composite design to investigate the effect of independent variables, including meat percent (X1), meat cooking time (X2), and sodium acid sulfate % (X3) on response variables, such as pH (Y1), total plate count (log_{10} cfu/g) (0 day) (Y2), total plate count (log_{10} cfu/g) (7^{th} day) (Y3) and (Y4) overall acceptability scores. RSM analysis revealed that experimental results were best fitted into a quadratic polynomial model with regression coefficient values of more than 0.77 for all responses. A total of 20 treatments had microbiological counts within the prescribed limit for cooked meat products, and products with 50% lamb meat and 0.4% sodium acid sulfate showed the highest overall acceptability scores within 20 minutes. By keeping this condition as most desirable on the basis of sensory evaluation, the predicted values and experimental values for pH (Y1), total plate count (log_{10} cfu/g) (0 day) (Y2), total plate count (log_{10} cfu/g) (7^{th} day) (Y3) and (Y4) overall acceptability scores were 4.82, 3.13, 2.56 and 7.46 as well as 4.76, 3.12, 2.543 and 7.846 respectively that confirmed that RSM is a useful tool in optimization the formulation and processing techniques for the development of meat-based hummus. For the first time, a response surface methodology was used to optimize the formulation and processing conditions for meat-based hummus. Meat-based hummus was prepared by replacing 50% chickpea paste with minced lamb meat cooked for 20 minutes and 0.4% sodium acid sulfate. Developing meat-based hummus provides an opportunity to develop healthy bioactive compounds containing food choices.

WEDNESDAY MORNING August 21
Bioproducts From Biomass: Renewable Chemicals & Polymers

High-strength composites from lignin oil and elemental sulfur Katelyn A. Tisdale, Nawoda L. Kapuge Dona, **Rhett C. Smith**, rhett@clemson.edu. Chemistry, Clemson Univ., South Carolina Lignin sequesters ~30% of organic carbon and is the primary biological source of aromatic-bearing polymers. Incorporating lignin into synthetic organic materials in place of petrochemical aromatics could significantly enhance sustainable carbon sequestration technologies. The complex structure and crosslinking inherent to lignin leads to heterogeneity and poor solubility, posing substantial challenges for current industrial processing methodologies. Among various initiatives aimed at enhancing lignin utility are strategies focused on its depolymerization into lower molecular weight fractions to yield lignin-derived oils amenable to conventional solution-phase organic chemistry techniques. Recent investigations have demonstrated that lignin can be efficiently solubilized into an oil form through mild thermolytic solvolysis at low temperatures (100-350 °C) employing environmentally benign solvents like ethanol. In the current work, elemental sulfur, an underexploited byproduct generated at a rate of 70 million tons per year from hydrocarbon refining processes, was investigated as a co-reactant for lignin valorization. Our previous work introduced techniques for synthesizing composites through C–S bond formation involving lignin derivatives and sulfur. Building on these findings, we posited that lignin-derived oil could similarly engage with elemental sulfur to generate novel C–S linkages, thereby producing robust composites exhibiting desirable attributes. The composite designated LOS_{90}

(comprising 90 wt.% sulfur and 10 wt.% lignin-derived oil) was synthesized via the reaction of lignin oil with sulfur at 230 °C. Subsequent assessments of its mechanical, thermal, and morphological characteristics indicated that LOS_{90} competes favorably with commercial materials such as Ordinary Portland Cement (OPC). For instance, whereas OPC mandates a minimal compressive strength of 17 MPa for application in residential building foundations, LOS90 demonstrated a superior compressive strength of 22.1 MPa. Considering the intensive energy consumption (requiring temperatures above 1200 °C), water usage, ecological impact of raw material extraction, and significant CO2 emissions associated with OPC production—accounting for approximately 8% of global carbon dioxide emissions—the comparable structural performance and reduced environmental footprint of LOS_{90} suggest its potential as a carbon-sequestering alternative to conventional building materials.

Intermediate oilseeds as potential substitutes in soybean products **Xianhui Zhao**, zhaox@ornl.gov, Daniel De la Torre Ugarte, Erin Webb, Esther Parish. Oak Ridge National Laboratory, Tennessee Intermediate energy crops can be grown as an extra cash crop during the wintertime in some parts of the US, in between harvesting and planting primary crops. Currently, the most promising intermediate energy crops are non-food oilseed crops such as camelina, carinata, and pennycress. The oil from these crops can be easily converted to sustainable aviation fuel (SAF), and there is potential to develop value-added coproducts from the meal in addition to the oil (e.g., polymer, adhesive). In this work, three intermediate energy crops are studied to investigate their major potential products and associated production costs. Soybean, a traditional oilseed food crop, is used as a baseline feedstock for our analysis. Soybean oils have long been used for a variety of uses, including biodiesel, biofuel, edible oil, plasticizer, adhesive, polymer, and additive. Soybean meal has long been used for two major uses: animal food and adhesives. Among intermediate energy crops, pennycress meal has been explored for various uses, such as animal food, bio-oil, biochar, biofumigant, boiler fuel, bio-based fiber, and biopolymer. The market value of pennycress meal mainly depends on its application, with an estimated selling price of 0.09–0.55 $/kg. The products from the oil and meals derived from the other intermediate energy crops will be investigated. Carinata has already been successfully used for at least two transatlantic flights (the first 2 were in 2018). Also, it has been certified by the Roundtable on Sustainable Biomaterials. In addition, the pre-treatment (if any) and equipment/logistics involved in the production will be studied. The research results will be used to determine if intermediate oilseeds can be used as substitutes in current soybean products, both economically and logistically, to help reduce the cost and enhance the sustainability of SAF production to meet US renewable transportation fuel targets by 2050.

Utilization of brewer's spent grain for isolation of functional components **Madhav P. Yadav**, madhav.yadav@usda.gov, Kalidas Mainali, Brajendra Sharma, Majher Sarker, Helen Ngo. USDA-ARS Eastern Regional Research Center, Wyndmoor, Pennsylvania Brewer's spent grain (BSG) is the main by-product of the beer and distillation industries. BSG is obtained mostly as a solid residue after wort production in the brewing process. It is often used as supplemental animal feed, especially for cattle but at a low cost. BSG is a valuable by-product that is rich in nutrients such as dietary fibers (hemicellulose, cellulose, and lignin), proteins, minerals, vitamins, and lipids. It can be utilized to produce high-value products, such as carbonaceous materials and functional ingredients for use in food and non-food products. In this study, we have isolated four major functional components: hemicellulose A (21.4 %), hemicellulose B (18.5 %), cellulosic-rich fraction (17.4 %), and oligosaccharides (5.5 %) from hexane extracted BSG and characterized them. Component analysis revealed that hemicellulose A contains the highest fixed carbon (20 %), followed by hexane-extracted BSG (17.1 %), cellulose-rich fraction (14.6 %), and hemicellulose B (14.5%). Standard proximate analysis showed that hemicellulose A contains the highest percent of protein (66 %) in comparison to other fractions. Characterization of these fractions shows that these can be used to produce useful carbonaceous materials including nitrogen-doped biochar. Isolating and characterizing the functional components present in the brewing by-products will help increase its value and which will benefit both processors and US farmers.

100% biomass-based sustainable polymers from lignin and raw vegetable oils **Hoyong Chung**, hchung@fsu.edu, Sundol Kim. Dept.of Chemical and Biomedical Engineering, FAMU-FSU College of Engineering, Tallahassee, Florida Lignin is the second most abundant renewable biomass polymer. Although lignin has high potential as a sustainable raw material due to its abundance, low price, and high aromatic concentration, lignin's complex and poorly defined chemical structure and excessive reaction sites limit its applications. Castor oil is a natural vegetable oil that can be converted to many useful chemicals such as ethylene brassylate monomer. Although the castor oil-derived ethylene brassylate was studied as a sustainable raw material in a few previous publications, the pristine castor oil has not been directly used to synthesize a sustainable polymer. In this presentation, we report synthesis and structure-property relationships study of a novel 100% biomass-based polymer, lignin-graft-castor oil. In order to prepare the new polymer, natural lignin was chemically modified by a single step with a succinic acid and acetic acid. The acetic acid caps hydroxyl groups on lignin to reduce unnecessarily excessive reaction sites (-OH) with acetyl group. A carboxylic group on the succinic acid provides chemical functionality to link lignin to castor oil. The castor oil was used in its pristine form of vegetable oil without any modification. These two biomasses are covalently linked through esterification in the presence of organic catalyst to prepare a graft copolymer, lignin-graft-castor oil. The synthesized series of copolymers showed good thermal properties, Tm and Tg, that enable facile thermal processing. The mechanical properties can be precisely controlled by changing the crosslinking density and the mass ratio of lignin and castor oil. The copolymer's highest modulus is 228.43 MPa, which is 40% higher than that of commercial low-density polyethylene (LDPE). Furthermore, its physical properties, including density and water contact angle can be finely tuned by the mol % of the capping agent and the mass ratio of capped lignin and castor oil. The synthesized fully biomass-based polymer, lignin-graft-castor oil, can be a true solution of plastic waste issue, because of their 100% biomass resource with minimal chemical modification to form ester linkage which is readily degradable in natural conditions. In addition, precisely and easily controllable properties offer customized applications in various fields.

Phosphonates from vegetable oils: Synthesis and tribological evaluation **Grigor B. Bantchev**[1], Grigor.Bantchev@USDA.gov, Maria De La Cinta Lorenzo-Martin[2], Oyelayo O. Ajayi[2]. (1) NCAUR-BOR, USDA-ARS Mid-West Area, Peoria, Illinois (2) Argonne National Laboratory, Lemont, Illinois Biobased lubricants are expected to have lower ecological impact. Unfortunately, despite some favorable properties, vegetable oils have drawbacks, most notably oxidative stability and cold-flow properties, that hamper their use as high-quality lubricants. To overcome these drawbacks, researchers seek appropriate chemical modifications. In this presentation, we discuss hydrophosphonylation of oils for obtaining better biobased lubricant – reaction chemistry, analysis, and tribological properties of the product. The synthesized phosphonates, especially from di-n-butyl phosphite, have better oxidative stability, good cold flow properties, low compressibility (high bulk modulus),

and low traction. While the viscosity index is worsened (lowered), it is still acceptable. The phosphonates also showed a good wear reduction in four-ball tester, when used as additive. These properties indicate that phosphonates from vegetable oils have potential as biobased lubricants, and especially as hydraulic fluids.

Chemometric survey of whole stillages and distillers dried grains with solubles from biofuel production reveals processing-related differences in fermentation metabolites **Junwei Zhang**[1], zhan8011@umn.edu, Gerald Shurson[2], Chi Chen[1,2]. (1) Food Science and Nutrition, Univ. of Minnesota Twin Cities, Saint Paul (2) Animal Science, Univ. of Minnesota Twin Cities, Saint Paul Distiller's dried grains with solubles (DDGS) is the major co-product produced from corn-based bioethanol plants. As a staple feed ingredient for livestock and poultry production, the nutrient profile of DDGS is well documented. However, the profile of intermediate metabolites and non-ethanol chemical compounds produced during fermentation, distillation, and other processing steps in DDGS production has not been examined extensively. In the current study, whole stillage and DDGS samples were collected from 10 biofuel plants in eight states of midwestern US and analyzed for nutrient composition as well as chemometric analysis using liquid chromatography-mass spectrometry (LC-MS) and multivariate analysis. The compositional profiles of these samples, including protein, lipid, fiber, and ash contents, were within the expected ranges of values previously reported in the literature. The LC-MS analysis of DDGS samples and whole stillage supernatants identified proline, alanine, asparagine, glutamic acid, and glycine as the most abundant free amino acids (FAA), which was likely due to their high abundance in corn protein. The analysis also identified lactic acid and acetic acids as the most abundant organic acids, as well as the presence of diverse aldehydes and polyamines with highly variable concentrations, which were consistent with their roles as intermediate and fermentation derived metabolites. Interestingly, the principal components analysis-based multivariate modeling revealed the clustering of DDGS and whole stillage samples based on two processing platforms that utilize different amounts of enzymes and heat. This processing-based separation was mainly driven by the differences in multiple essential FAA and other metabolites, including ethanolamine, putrescine, and pentanal. Considering the nutritional and biochemical properties of these metabolites, our observations warrant further investigations on the roles of processing conditions in the formation of these functional molecules as well as the nutritional significance of these differences in DDGS.

Identification of an antifreeze albumin protein from wheat flour and insights from molecular dynamics simulation **Yuan Yuan**[1], yyuan16@vols.utk.edu, Micholas Smith[2], Hari Krishnan[3], Vermont Dia[1], Tong Wang[1]. (1) Food science, The Univ. of Tennessee Knoxville, Knoxville, Tennessee, US(2) Dept. of Biochemistry and Cellular and Molecular Biology, The Univ. of Tennessee Knoxville (3) Plant Genetics Research Unit, USDA Agricultural Research Service, Columbia, Missouri Antifreeze agents that are biobased and derived from food sources are highly desirable in food and biomedical applications. This study demonstrates the extraction, purification, and identification of a water soluble protein from wheat flour that has ice crystal growth inhibition activity. By Osborne fractionation and gel filtration chromatography, wheat albumin was extracted. The extracted protein exhibited the ability to decrease ice crystal size by 40.8, 31.9, and 23.2 % at concentrations of 40, 20, and 10 mg/mL compared to polyethylene glycol (PEG) at the same concentration, respectively, after annealing for 30 minutes at -8 °C. The amino acid sequence of the extracted protein was determined using LC/MS methods. Molecular dynamics (MD) simulations were then employed to analyze its antifreeze activity, providing insights into the microscopic mechanisms of ice-protein interactions. The results demonstrate that the wheat albumin in the protein-ice-water system can inhibit ice formation after 100 ns, whereas almost all water molecules in the system without protein freeze after 50 ns. This highlights the potential of wheat albumin as an effective antifreeze agent in freezing preservation of food and biomaterials.

Succinylation of zein and gelatin hydrolysates improved their ice recrystallization inhibition activity **Yuan Yuan**, yyuan16@vols.utk.edu, Madison Fomich, Vermont Dia, Tong Wang. Food Science, The Univ. of Tennessee Knoxville The goal of this research was to enhance the ice recrystallization inhibition (IRI) activity of zein and gelatin hydrolysates (ZH and GH) by succinylation modification. ZH was prepared by Alcalase treatment for 3 h and then modified by succinic anhydride (SA); whereas GH was made by Alcalase hydrolysis for 0.25 h and succinylated by n-octylsuccinic anhydride (OSA). After 0.5 h of annealing at -8 °C at 40 mg/mL, the modified hydrolysates decreased the average Feret's diameter of ice crystal from 50.2 μm (polyethylene glycol, negative control) to 28.8 μm (SA modified ZH) and 29.5 μm (OSA modified GH). The unmodified hydrolysates had crystal size of 47.2 μm (ZH) and 45.4 μm (GH). Also, the two succinylated samples had altered surface hydrophobicity, which potentially contributed to their enhanced IRI activity. Our results indicate that succinylation of food-derived protein hydrolysates can improve their IRI activity.

Biobased lubricants from non-edible animal fats **Majher Sarker**[1], majher.sarker@usda.gov, Hailemichael Yosief[1], Grigor B. Bantchev[2], Robert O. Dunn[3]. (1) Agricultural Research Service, USDA, Wyndmoor, Pennsylvania (2) ARS-USDA, Peoria, Illinois Natural lipids are renewable resources that are being utilized to generate value-added products. Animal fats have not been as extensively investigated to generate products like lubricants and biofuels as plant based fats and oils. Here we explored the possibility of utilizing chicken fat, beef tallow and lard to produce biolubricants by changing its physical and tribological properties through chemical modification. In this modification, an isopropyl group was introduced on the unsaturated chains of triglyceride molecules. The modified animal fats were characterized using a combination of different analytical techniques including GC-MS, NMR and GPC. In general, the modified animal fats exhibited higher density, better oxidative-stability, higher kinematic viscosity compared to their corresponding unmodified animal fats. This study demonstrated that non-edible animal fats could be chemically modified to improve their physicochemical properties and can be considered as alternative renewable resources for generating value added products such as biolubricants for various applications.

Continuous depolymerization of lignin through a high-pressure screw feeding reaction system **Yanbin Cui**, cuiyb@ms.giec.ac.cn. Guangzhou Institute of Energy Conversion, Guangzhou, Guangdong, China The lignin-first strategy provides a new opportunity for full conversion of biomass, which involves lignin in-situ extraction from biomass and selectively depolymerize into monophenolic compounds, while retaining high quality carbohydrates solid residues. This method typically requires high temperature and high pressure, and reaction system usually uses high pressure reactor in batch mode. However, the extended reaction time inevitably leads to the repolymerization of intermediates/products and the generation of humin, which is a great hurdle for scale-up of the process. In this study, we developed a continuous high-pressure a screw feeding reaction (HPSR) system, consisting of a high pressure feeding unit, a screw reaction unit and a product collecting unit. The reaction system was successfully applied in reductive catalytic fractionation (RCF) and oxidative catalytic fractionation (OCF) in the context of lignin-first strategy, allowing continuous production of aromatic monomers in a rate of 1kg/h. By regulating the feed speed and screw rotation

speed, the residence time of biomass in the reaction area can be regulated. The special design of screw conveyor structure facilitate heat and mass transfer in the three-phase reaction system, promoting the effective biomass structure dissociation and in-situ depolymerization of lignin. In this study, the effects of different reaction conditions and the catalysts on the aromatic monomer yield and the cellulose retention were investigated. In particular, the OCF process can obtain up to 23% yield of aromatic aldehyde monomers at a residence time of 4 minutes under alkaline oxidative condition, and 31% yield of propylphenol monomers catalyzed by Ni/H-β at a residence time of 6 minutes, while high-quality cellulose components retained up to 65%. To sum, for the first time we reported lignin first RCF and OCF process in a continuous mode in a HPSR, providing a new perspective for the scale-up of full conversion of biomass, and supporting the production of biomass-derived high-value aromatic chemicals.

Agricultural biomass based biodegradable films: A sustainable solution to address plastic perils **Srinivas Janaswamy**, Srinivas.Janaswamy@sdstate.edu. Dairy and Food Science, South Dakota State Univ., Brookings Plastic, a byproduct of non-renewable petroleum resources, has become a daily necessity and a "friend" of human civilization. It is portable, durable, lightweight, and is available for further innovation and utility. However, its intrinsic ability to remain dormant (roughly 700-1000 years) to degrade and humans' inability or unwillingness to effectively manage its end-of-life is causing the perilous plastic debris. Despite ongoing recycling, two-thirds of this waste accumulates in landfills or is scattered in the natural environment. It disintegrates gradually into microplastics and nanoplastics and unfolds a multifaceted global problem. These tiny particles not only cripple the lives of millions of species on the Earth but also contaminate the waters and retard the growth and yield of crops. Their entry into humans via food ignites health problems. Although a complete ban is difficult to envision or enact in every sector of its use, replacing plastic in food packages seems an excellent starting point for mitigating environmental damage and improving human health. Indeed, worldwide efforts are progressing and being reported. Among the available choices, cellulose is an excellent resource for solving the problem due to its strong and stiff molecular structure, biocompatibility, biodegradability, and low toxicity. Specifically, cellulosic residues from agricultural products, agricultural processing byproducts, and non-tree-based plant biomass are helpful in formulating biodegradable products, e.g., films. Such a cost-effective and environmentally sustainable plastic replacement solution will benefit current and future generations and offer a unique value-added proposition for the agriculture industry and farmers to increase the profitability of their operations.

Nutritional metal organic framework (NuMOF) as novel fortified supplements **Xin Yang**, xinyang@u.nus.edu, Linzixuan Zhang, Robert Langer, Ana Jaklenec. Massachusetts Institute of Technology, Cambridge Micronutrient deficiencies present a significant health challenge, particularly prevalent among children residing in developing nations, resulting in notable cognitive and physical impairments and imposing a substantial global socioeconomic burden. This issue disproportionately affects low- and middle-income countries, with heightened vulnerability observed among women and children. In response, we propose an innovative approach to tackle this challenge through the development of a novel nutrient delivery system characterized by high water stability and controlled release, termed nutrient metal-organic frameworks (NuMOFs). NuMOFs offer robust protection for multiple essential vitamins and minerals against diverse cooking and storage conditions, while ensuring rapid nutrient release within simulated human digestive environments. The emergence of NuMOFs marks a transformative milestone in combatting the intricate problem of nutrient deficiency. This research signifies a pivotal advancement towards addressing micronutrient deficiencies and holds promise for enhancing global health outcomes, particularly among vulnerable populations.

Elevating Sustainability & Greentech in Agriculture & Plant-Based Foods

Whole plant holistic approach: Utilizing superfruits for healthy foods and using the waste for non-food related applications Keith Bratley[1], Ezra E. Cable[1], Bokary Sylla[1], Kanaya Streeter[1], Ludan Osman[1], William L. Weaver[1], Andrew G. Ristvey[2], **Victoria Volkis**[1], chvolkis2013@gmail.com. (1) Natural Sciences, Univ. of Maryland Eastern Shore School of Agricultural and Natural Sciences, Princess Anne, Maryland (2) Wye Research & Education Center, Univ. of Maryland Extension, Queenstown Superfruits, algae, specialty crops, and medical herbs are used widely in the food industry or as food supplements. Those crops are well-known due to high content of antioxidants, essential oils, terpenes, and other valuable phytochemicals and minerals. However, very limited non-food related applications have been developed so far. As a result, many crops are only partially used, and the major part is wasted. For example, for CBD production only the upper flowering part of the plant is used, while the rest of the plant has a significant amount of essential oils and terpenes, as well as valuable fibers. Limited applications in textile and building were developed, but not widely used and this part is typically thrown away. Aronia mitschurinii, which is a central superfruit of our research, is a crop native to North America, but better known in Eastern Europe. Aronia, along with hascaps, elderberries, and mulberries, makes a new generation of super fruits with the content of phenolic antioxidants much higher than for well-known assai berries, especially the content of anthocyanins. Traditional applications of this fruit in winemaking, juices, and jams only require the juice of the fruit to be used. However, the pulp, that is currently being thrown away, has about 50% of the total antioxidant content. The use of pulp in food products is limited due to the high content of tannins, which are valuable antioxidants with a bitter taste. Here we present some unusual application of juice in all-organic, sugar free, and colorants free power aid drinks and vitamin gummies, while focus more on resin extraction of antioxidants from pulp for pharmaceuticals, application of pulp extracts in the non-toxic antifouling protection, and thermal decomposition study for the optimal pasteurization technology.

Triacylglycerol structure and composition of human milk fat substitute affect the absorption of fatty acids and calcium, lipid metabolism and bile acid metabolism in newly-weaned Sprague–Dawley rats Lin Zhu[1], **Yaqiong Zhang**[1], yqzhang2006@sjtu.edu.cn, Boyan Gao[1], Liangli Yu[2]. (1) Inst. of Food and Nutraceutical Science, School of Agriculture and Biology, Shanghai Jiao Tong Univ., Shanghai, China(2) Univ. of Maryland, College Park In this study, the effect of sn-2 palmitic triacyclglycerols (sn-2 palmitic TAGs) and ratio between the two major sn-2 palmitic TAGs (OPL to OPO ratio) in human milk fat substitute (HMFS) on the growth, fatty acid and calcium absorptions, lipid and bile acid metabolic alternations were investigated in Sprague–Dawley rats. After 4 weeks of high-fat feeding, rats fed with the HMFS containing sn-2 palmitic acid content of 57.87% and OPL to OPO ratio of 1.4 showed the lowest TAG accumulation in livers and hypertrophy of perirenal adipocytes, compared to the groups fed with fats containing less sn-2 palmitic acid content or lower OPL to OPO ratio. Meanwhile, the synergistically improved absorption of fatty acids and calcium, and increased levels of total bile acids (BAs), especially for the tauro-conjugated BAs (TCDCA, TUDCA, TαMCA, TβMCA, TDCA and TωMCA) were observed in rats by both increasing the sn-2 palmitic acid content and OPL to OPO ratio

in HMFS. In addition, the levels of total BAs and tauro-conjugated BAs were negatively correlated with serum TAG, TC, and LDL-c levels and positively correlated with HDL-c level according to a spearman's correlation analysis ($P < 0.05$). Collectively, these findings present new nutritional evidence for the potential effects of TAG structure and composition of human milk fat substitute on the growth, lipid and bile acid metabolism of the host in infancy

Post pH-driven green technology for developing polyphenols-enriched plant-based foods **Hualu Zhou**, hualuzhou@uga.edu. Food Science and Technology, Univ. of Georgia, Athens A post pH-driven (PPD) approach is highlighted to be used for incorporating polyphenols into plant-based foods. The PPD approach inherits several advantages, such as simplicity, speed, and environmental friendliness, as it eliminates the need for heat, organic solvents, and complex equipment. Moreover, the PPD approach can be widely applied to different polyphenols and food systems, enhancing its versatility while also potentially contributing to reducing food waste. This presentation aims to accelerate the implementation of the PPD approach in the development of polyphenol-fortified plant-based foods by providing a comprehensive understanding of its fundamental principles, encapsulation techniques, and potential applications. The PPD approach is based on the polyphenols can be rapidly dissolved into the alkaline solution due to the deprotonation, and then they can be protonated into polyphenol molecules, which can be driven into the homogenized plant-based foods. Based on the PPD approach, we have successfully used this PPD approach to fortify curcumin into a variety of plant-based foods, such as milk and egg analogs. Results show that the curcumin can be efficiently encapsulated into those plant-based foods, and the resulting foods not only had the enhanced water-solubility and bioaccessibility of curcumin in plant-based milks, but also achieved yellow egg analogs to mimic the appearance of egg analog. These findings will provide important implication for the development polyphenols-fortified plant-based foods.

Marine waste-derived chitosan nanocrystals-Zn composites for PFAS removal from water **Xiaoxue Jia**, jiaxx@umd.edu, **Qin Wang**, wangqin@umd.edu. Nutrition and Food Science, Univ. of Maryland, College Park Per- and polyfluoroalkyl substances (PFAS) significantly threaten water quality worldwide. In particular, their presence in irrigation water damages the safety of agricultural produce, presenting a critical challenge for food security and public health. In response, our research introduces a sustainable and green technology approach, synthesizing chitosan nanocrystals (ChsNC) from marine shrimp shell waste and coordinating them with zinc (Zn) to develop an innovative, water-stable polymer composite aimed at PFAS adsorption. We designed this novel composite using molecular simulation techniques, followed by extensive characterization through crystallographic, morphological, and spectroscopic analyses. The highly porous structure of the composites, coupled with the electrostatic interaction of positively charged ChsNC and the cation-bridging effect of Zn, exhibited extreme sorption capacities for both PFOA and PFOS. Moreover, the innovative aspect of this composite material lies in its reusability and capability to biodegrade in soil. This study underscores the pivotal role of sustainable and green technologies in enhancing water health in agricultural environments, setting a new benchmark for eco-friendly innovations in water treatment.

Enhancing emulsifying properties of lentil protein fibrils at pH 3.0 through EGCG mediation and its related mechanism **Xianghui Yan**[1], xianghui_yan@hotmail.com, Zheling Zeng[1], Lingyun Chen[2]. (1) State Key Laboratory of Food Sci. and Resources, Nanchang Univ., Nanchang, Jiangxi, China(2) Dept. of Agricultural, Food and Nutritional Science, Univ. of Alberta, Edmonton, Canada Amyloid-like fibrils derived from plant proteins have provided a strategy to improve the physicochemical performance of plant proteins and have considerable untapped potential for application in the stabilisation of oil-in-water (O/W) emulsions. Therefore, the structural modifications of lentil protein fibrils (LPF) and their emulsifying properties facilitated by EGCG (EGCG-to-protein ratio, EGCG/P = 0.01-0.16) were investigated in this work with the proposal of a possible underlying mechanism. The changes in structure and morphology of LPF were characterized by particle size, Fourier transform infrared (FTIR) spectroscopy, fluorescence spectroscopy, surface hydrophobicity, contact angle, and transmission electron microscopy (TEM). Results showed that the binding of LPF to EGCG was driven by hydrogen bonding and hydrophobic interaction. Both interactions play a pivotal role in the cross-linking of LPF and the transformation of the elongated fibrillar morphology of LPF into fibrillar aggregates networks, and even large-sized non-amyloid fibril aggregates, with particle size increasing from 564 nm to 3221 nm. Droplet size and confocal laser scanning microscopy (CLSM) results showed that the O/W emulsions containing 30% and 50% (w/w) oil stabilized by LPF-EGCG complex at EGCG/P = 0.04 exhibited smallest and uniform droplet sizes (9.25 μm and 11.50 μm, respectively). The reason was that an appropriate concentration of EGCG can fine-tune the hydrophobic/hydrophilic balance and network structures of LPF, thus enhancing the stability of emulsions. Moreover, emulsions containing 30% (w/w) oil stabilized by LPF-EGCG complexes (EGCG/P > 0.02) exhibited rheological behavior similar to emulsions containing 50% oil stabilized by LPF alone, indicating potential applications in the production of fat reduced emulsion with desirable textures. These findings provide a new perspective on the structural remodeling of plant-based protein fibrils mediated by phenolic compounds, expanding their application in the production of fat-reduced emulsion-based food products.

Evaluation of soybean [glycine Max (L.) Merrill] genotypes for salt tolerance in eastern Ethiopia **Azmera Weldeyohanns Ngusse**[1], azmeraw2012@gmail.com, Alem G. Hailu[2]. (1) Adigrat Univ. College of Natural Sciences and Computational Sciences, Adrigrat, Tigray, Ethiopia(2) Chemistry, Adigrat Univ. College of Natural Sciences and Computational Sciences, Adrigrat, Tigray, Ethiopia Soybean [Glycine max (L.) Merrill] is one of the most important legume plants producing essential oil. Salinity is a continuing problem for crop production. Especially for leguminous plants it is a serious threat. It could be alleviated by screening of salt tolerant genotypes. There is a need to confirm the presence of phenotypic variation for salt tolerance among different genotypes of a particular crop that can thrive under saline environmental situations Therefore, this research was carried out to evaluate some genotypes of soybean for salt tolerance under laboratory and greenhouse conditions. Fifteen soybean genotypes were tested during germination and yield and yield related traits at 0, 2, 4 and 8 dsm^{-1} salinity levels. The experiment was carried out using a complete randomized design with 3 replications. Data analysis was carried out using SAS (version 9.2) statistical software. Germination percentage, germination rate, seedling shoot length, seedling root length, seedling shoot dry weight, seedling root dry weight, seedling shoot fresh weight and seedling root fresh weight were measured in laboratory. Number of branches per plant, number of nodes per plant, plant height, number of pods per plant, pod weight per plant, number of seeds per pod, seedling root length, seedling root dry weight, total biological yield and 100 seed weight were measured in green house. The ANOVA for genotypes, treatments and genotype interaction with treatment was found highly significant ($p<0.01$) variation, for all traits recorded. Under the laboratory condition, genotypes Jalale, William, Nova, Belessa-95, Ethioglovisia, Boshe, Cheri and Afgat were found salt tolerant under all level of salinity while genotypes

Crawford, Dedhissa, Clark-63 and Devis were salt sensitive. Under green house conditions genotypes Jalale, William, Afgat and Nova were found salt tolerant while genotype Cheri was salt sensitive. The rest soybean genotypes were moderate salt tolerant. Generally decrease was observed in all traits, depending on increasing NaCl concentration. It could conclude that the highest values were observed in the control (0.ds m^{-1} Na Cl) salinity level while the lowest values were recorded in 8 dsm^{-1} salinity level for all measured traits.

Tuning particle size and morphology in polyelectrolyte complex coacervate microparticles **Nirmala Devi**, nirmaladevi20401947@gmail.com. Dept. of Chemistry, Girijananda Chowdhury Univ., Guwahati, Assam, India Practical application of the encapsulation and controlled release technology in various important fields ranging from agriculture to food and medicine expand myriad research interests worldwide in the area of polyelectrolyte complex coacervation. Designing of the micronscale and nanoscale capsules for encapsulation, tuning their size and control over their properties for practical applications is a great challenge. This paper will illustrate some of the attempts on tuning size and morphology of polymer micro and nanoparticles that have been exploited for encapsulation and designing carriers for controlled delivery applications. Carrier particles with varieties of entrapped solid and liquid active agents were synthesized and tuned for varied sizes (nano/micro), shapes (spherical/needle like) and morphology (core-shell/porous/nonporous) (Fig.1). Polyelectrolyte complex coacervation technique was used for synthesis of carrier particles. Natural polymers such as gelatin, sodium carboxymethyl cellulose, sodium alginate, carrageenan etc. were used for complex coacervation. An overview of our attempts made in encapsulation and size tuning ranging from micro to sub-micrometer and up to nanoscale size, and characterization by SEM,TEM, DLS, FTIR, NMR, XRD and DSC studies will be discussed in this presentation.

Evaluation of roasting temperature influence on the characteristics of cottonseed butter **Zhongqi He**[1], zhongqi.he@usda.gov, Stephen Rogers[1], Sunghyun Nam[1], K. Thomas Klasson[1], O M. Olanya[2]. (1) USDA-ARS Southern Regional Research Center, New Orleans, Louisiana (2) USDA-ARS Eastern Regional Research Center, Wyndmoor, Pennsylvania Roasting is a thermal processing treatment applied in many food applications of agricultural products. Roasting temperature is a critical parameter in plant butter production. This project was designed to evaluate the effects of the roasting temperatures on the morphological and physicochemical characteristics of cottonseed butter. Five batches of glandless cottonseed kernels were roasted in a convection oven for 15 min at 110, 120, 130, 140, and 150 °C, respectively. Transmission Electron Microscopy (TEM) demonstrated that roasting treatment disrupted or ruptured the membranes of oil body, thus making oil spread around cell walls (Fig. 1). Those roasted kernels were then ground and homogenized with additional cottonseed oil, table salt and cane sugar to make the cottonseed butter products. High roasting temperatures deepened the color of these butter products and increased the values of three textural parameters firmness and spreadability, but not the value of adhesiveness. The oxidation stability with a rapid oxygen measurement was gradually reduced from 274 min with 110 °C sample to 176 min with 150 °C sample. Estimated from the rapid oxidation data, the shelf life of the cottonseed butter made by the roasted kernel at 140 °C would be approximately 1 year at 20 °C, and 1.5 years at 25 °C. The water activity of these butter products did not change remarkably, implying that similar storage conditions were applicable to all the butter made at different roasting temperatures. Measurements of more quality parameters are under way.

General Papers

Elemental palette: Ionomic profiling across 500 diverse food samples **Jacqueline M. Chaparro**[1,3], Jacqueline.chaparro@colostate.edu, Rachel R. Jones[1], John C. Evans[1], Macy Gruszcynski[1], Margaret Read[1], Susan B. Mitchell[1], Melanie Odenkirk[1], Corey D. Broeckling[3], Tracy Shafizadeh[2], Steven Watkins[2], Jessica Prenni[1]. (1) Horticulture and Landscape Architecture, Colorado State Univ., Fort Collins (2) Verso Biosciences Inc, Davis, California (3) Analytical Resources Facility, Colorado State Univ., Fort Collins The elemental composition of food is a critical component of nutritional quality. While some minerals are essential, an overabundance of toxic elements or deficiency of essential elements can lead to ill health and malnutrition. The development of the Periodic Table of Food Initiative (PTFI) ionomics method, which quantifies 26 elements of biological importance, offers the potential for large-scale screening of globally relevant foods. This initiative aims to improve our understanding of food composition and create a reference database for the elemental composition of the food we eat.
Here, we analyzed the elemental composition of 500 food types spanning 57 taxonomic familial ontologies that are considered globally relevant. These ontologies include dairy, fruit, meat, eggs, fungi/ mushroom, insects, and vegetables, among others. Multivariate analysis of the first 100 foods (composed of 26 ontologies) revealed that the foods separated into 5 groups based on elemental composition. Group 1 consisted of animal products, group 2 consisted of grains and fruit, group 3 consisted of leafy greens, group 4 consisted of beans and seeds and group 5 consisted of fruits and vegetables. As expected, the variety of foods tested exemplifies the orders of magnitude difference within elements across foods and the variation of elements that can occur within a food type. For example, when quantifying macronutrients (Ca, K, Na) along with trace elements (Cu, and Mo). Our findings demonstrate the robustness and adaptability of this method across diverse food matrices. Furthermore, this method holds promise as an efficient tool for identifying nutrient-rich foods to address mineral nutrient deficiencies and for flagging items warranting further assessment due to their toxic element content.

Characterization of flavor-protein interactions in model aqueous pea protein solutions **Stephanie Almquist**, almquist.14@buckeyemail.osu.edu, Edisson Tello Camacho, Devin G. Peterson. Food Science and Technology, The Ohio State Univ., Columbus The shift towards a more sustainable agricultural system has led to a rise in the need for plant-based protein. However, the utilization of plant proteins in food applications is limited by inferior product quality. The addition of protein to food products is known to bind endogenous flavor compounds resulting in imbalanced sensory profiles that negatively impact consumer acceptance. An improved mechanistic understanding of flavor-protein interactions is needed to predict and control binding within foods. The current project investigated the physical-chemical properties of proteins on flavor binding. Specifically, the impact of protein concentration and solubility on flavor binding using a commercial pea protein isolate was evaluated. In general, increased protein concentrations in aqueous solutions resulted in elevated flavor binding behavior. Furthermore, water-soluble and water-insoluble protein fractions demonstrated unique binding patterns among different chemical classes of flavor compounds. In summary, protein dynamics on flavor binding was further characterized providing novel approaches for the development of mitigation strategies to improve flavor quality and stability in plant protein products.

Quality assessment of soybean oil available in Bangladesh **Zinia Nasreen**, zinia@duet.ac.bd, Md. Arif Hossain, Md. Sofiul Alom,

Masfia Jahan. Chemistry, Dhaka Univ. of Engineering and Technology, Gazipur, Gazipur, Bangladesh Soybean oil is the preferred cooking medium in Bangladesh, with per capita oil consumption standing at 9.2 Kg per annum. The consumption of soybean oil is increasing day by day, making the quality assessment of this type of cooking oil crucial. In this study, we collected different brands of soybean oil from the open market and investigated their physico-chemical properties, including moisture content, density, pH, saponification value, acid value, and iodine value. Moisture content was determined using the oven drying method, while density and pH were measured using a hydrometer and pH meter, respectively. Additionally, saponification value, acid value, and iodine value were determined using ASTM D5558-95 (2017), AOCS Ca 5a-40, and Wiji's solution method, respectively. The moisture content, density, and pH of the oil samples ranged from 0.177% to 1.6%, 0.823 g/cm^3 to 0.97 g/cm^3, and 6.7 to 7.0, respectively. The saponification value, acid value, and iodine value of the oil samples ranged from 257.125 to 269.75 mg of KOH/g oil, 0.32 to 2.05 mg of KOH/g oil, and 54.6 to 66.58 g of I_2/100g of oil, respectively. These values were compared to standard values set by various food regulatory authorities such as the World Health Organization (WHO), the US Dept.of Agriculture (USDA), and the Food and Agriculture Organization (FAO), a specialized agency of the United Nations. The physical properties of the samples exhibited slight deviations from the standard values provided by these food regulatory authorities. However, the chemical properties of the oil samples were found to be higher deviations compared to the standard values.

Agri-waste-based sustainable biofertilizers and biopesticides from lignin **Jayeeta Bhaumik**, jbhaumi@gmail.com, Ravneet Kaur, Anil Kumar Pujari, Kunal Gogde. Bioproduct Chemistry, Center of Innovative and Applied Bioprocessing, Mohali, Punjab, India Lignin, a natural biopolymer, is present in all major agri-residues. Lignin, biodegradable and biocompatible material serves as a great resource for many biomaterials. The extensive use of chemical fertilizers and pesticides is a major threat to the environment. Such chemical crop protection substances also impose health hazards to the farmers and the consumers. Finding out an alternative sustainable source for biofertilizers and biopesticides is not only a boon to the environment, but also a great support to bioeconomy. In this line, agri-waste-based lignin has been used as a raw material to derived biofertilizers and biopesticides which has a great promise to replace conventional chemical crop protectants. Plant-based ingredient neem extract has been used along with nanolignin to construct biopesticides for agricultural applications. Further, lignin-derived metal oxide-based biofertilizer was also developed as a biosafe alternative source to the chemical fertilizers. Overall, the crop-residue based lignin-derived biofertilizers and pesticides can serve as sustainable source to replace their chemical counterparts thus directly contributing to bioeconomy.

Alternaria toxins quantification in America's food industry Ernest Capraro[1], **Xun Fu**[1], Xun.Fu@US.Nestle.com, Ke Du[1], Leland Hunter[1], Andrew Savage[1], Claudia Mujahid[2], Thomas Bessaire[2]. (1) NQAC, Nestle USA, Dublin, Ohio (2) R&D, Nestle SA Research and Development Network, Vevey, VD, Switzerland Alternaria toxins are a group of mycotoxins produced by various species of the Alternaria fungus. These toxins are commonly found in agricultural crops, particularly in vegetables, grains and spices. Alternaria toxins are known to pose health risks to humans when consumed in contaminated food. This study delves into the detection results from a reliable quantification method for the five Alternaria toxins internationally regarded as representative of the toxic risks. An isotope dilution liquid chromatography-tandem mass spectrometry (LC-MS/MS) approach was validated to analyze the five key Alternaria toxins, namely Altenuene, Alternariol, Alternariol monomethylether, Tentoxin, and Tenuazonic Acid in 10 min. The testing covered a wide array of food categories, including 240 cereals, 125 spices, 80 vegetables, 75 fruits, 30 vegetable oils, 20 nuts, and 30 meals. Validation data from two independent laboratories confirmed the robustness of the method. A survey of 600 food items revealed significant variations in Alternaria toxin levels with different food commodities. Typically, Tenuazonic Acid's detection rate is higher than (>) 50% in Vegetable puree/paste (>10 µg/kg), >75% in Grains (>2.5 µg/kg) and >30% in spices (>50 µg/kg). The maximum concentrations of Tenuazonic Acid in commercial seasoning products can be >10000 µg/kg. Altenuene was the least common toxin detected. Monitoring and controlling the levels of Alternaria toxins in agricultural commodities and processed foods thanks to reliable analytical methods are important measures to mitigate the risks associated with these toxins. Our QuEChERS extraction with subsequent LC-MS/MS analysis provides a solid solution for routine and rapid Alternaria toxin monitoring across numerous food commodities. Method performance is satisfactory to meet current international target monitoring levels (commission recommendation (EU) 2022/553) while contributing to safer food practices and public health.

Illuminating food science: unveiling stability with light scattering techniques **Feiqing Shen**, feiqing.shen@bettersize.com. Bettersize Inc., Costa Mesa, California This study explores the versatile applications of dynamic light scattering (DLS), electrophoretic light scattering (ELS), and static multiple light scattering (SMLS) in characterizing food products, particularly emulsions, suspensions, and colloidal systems, to provide valuable insights into the quality and stability of food products throughout their shelf life. These techniques are non-invasive, rapid, and sensitive, making them ideal for studying food systems. DLS, relying on the Brownian motion of particles, is used to determine the size distribution of nanoparticles in food products, which influences their functional properties, such as texture and mouthfeel. ELS, which utilizes the laser Doppler effect, provides information about surface charge and electrostatic interactions. On the other hand, SMLS can simultaneously measure changes in transmission or backscattering intensity relative to sample height and aging time, helping to assess the stability of formulations over time. These techniques can be used together to monitor changes in particle size, zeta potential and stability under different processing conditions (e.g., temperature, pH, shear). The study highlights the use of the BeNano analyzer for measuring the zeta potential of coffee creamer, which is crucial for understanding its stability. Additionally, measurement of milk using the BeNano and the BeScan offers insights into the homogenization process, affecting the milk's texture and viscosity. In soy milk processing, the BeScan stability analyzer monitors the coagulation process and, along with the BeNano, provides valuable information on stability, ensuring high-quality tofu production. In beer production, the BeScan has been employed to study beer foam stability, an essential factor for consumer satisfaction and product quality.

Sustainable antimicrobial packaging films from agro-residue **Jayeeta Bhaumik**, jbhaumi@gmail.com, Seema Kirar, Devesh Mohne, Saswata Goswami. Center of Innovative and Applied Bioprocessing, Mohali, Punjab, India Lignin, a biodegradable and renewable biopolymer, is a cost-effective source for developing eco-friendly packaging materials. In this research, wheat straw was utilized to extract lignin via soda method in good yields. Following purification and characterization, the soda lignin was subjected to the synthesis of lignin nanoparticles and copper oxide nanoparticles. Those lignin-based nanocomposites were utilized in the formation of sustainable packaging films. The lignin-derived nanocomposite films were characterized via FTIR, XRD, TGA, SEM, FE-SEM etc. to validate their material properties. Next, antimicrobial behavior of the

packaging films were established through testing on a Gram-positive and a Gram-negative bacteria. The UV protective nature of these biodegradable films was also validated. Finally, the lignin-based packaging films were subjected to testing their efficacy to improve the shelf-life of a perishable fruit. These lignin-based antimicrobial packaging materials may find their applications in food and agro industry.

Polymeric nanodelivery platform with phytohormones to improve crop growth toward sustainable agriculture **Edwin A. Davidson**, edwin-davidson@hotmail.com. Chemistry, Univ. of Central Florida, Orlando In recent years, the escalating global population presents a significant challenge in ensuring food security worldwide. Hence, an imperative need to improve agricultural practices to boost crop yields and foster sustainable plant growth. Among the strategies employed to stimulate crop growth is the use of phytohormones such as auxins (e.g., Indole acetic acid, IAA). Nevertheless, despite its crucial role in various plant growth processes such as cell division, fruit development, and elongation, the delivery of this phytohormone faces substantial constraints due to its water insolubility causing reduced bioavailability for plant absorption. For this reason, we developed a polymeric nanoscale delivery system to overcome the current disadvantages of IAA in water solubility. Herein, we report a one-step synthesis protocol for capturing IAA in the nanoscale to provide water solubility and enhanced bioavailability. The nanoformulation was characterized through Scanning Electron Microscopy (SEM), Fourier-transformed Infrared (FTIR), Dynamic Light Scattering (DLS), and Zeta Potential. Moreover, we performed Liquid Chromatography-Mass spectrometry (LC-MS) to quantify and measure the encapsulation efficiency of the nano-delivery system. Lastly, we studied the effects on plant growth, phytotoxicity, and germination were assessed. Overall, the potential application of nanodelivery systems offers a promising opportunity to advance agricultural practices towards more sustainable practices.

Investigating the impact of western flower thrips attack on pepper plants: Insights into physiochemical changes and potential applications **Tarun Belwal**[2], tarun.belwal@tamu.edu, David L. Kerns[1], Bhimu S. Patil[2]. (1) Dept. of Entomology, Texas A&M Univ., College Station (2) Vegetable and Fruit Improvement Center, USDA National Center of Excellence Dept. of Horticultural Sciences, Texas A&M Univ., College Station The interaction between plants and pests often triggers complex physiochemical changes in plants, affecting defensive responses, vectored disease transmission, potentially plant survivorship. In this study, we investigated the effects of western flower thrips, Frankliniella occidentalis, on two varieties (thrips susceptible and thrips resistant) pepper plants within a controlled net-cage system in glasshouse settings. The thrips infestation was experimentally induced at ten-day intervals over a four-week period during the plants' flowering stages, with volatile organic compounds (VOCs), the primary compounds induced post-attack, collected using an in-house VOC collection system. The plants with no thrips infestation served as control treatments. Concurrently, pepper fruits were harvested and subjected to morphological and biochemical analyses, including carotenoids, ascorbic acid, capsinoids, capsaicinoids, polyphenols, and amino acids, to differentiate any differences in growth and nutritive attributes along with thrips damage. The results showed a considerable difference among pepper varieties with/without thrips infestation. For instance, a higher level of carotenoids (lutein and beta carotene) was observed in both the pepper varieties subjected to thrips infestation. Similar trends appeared to occur for other phytochemicals and VOCs, but that data is currently being analyzed. This investigation aims to elucidate novel VOCs induced in pepper plants subjected to thrips feeding, with potential applications in developing chemical sensors for early pest detection, facilitating phenotypic variations for elite breeding programs, and developing pest deterrent biochemicals for sustainable pest management strategies in agricultural fields. Also, the differences in the phytochemical profile of pepper plants with/without thrips provide novel insights into the underlying mechanisms of plant defense responses, offering opportunities for the development of targeted pest management strategies and enhancing our understanding of plant resilience to pest infestations.

Processing & the Storage Induced Toxins

Impact of processing on formation of acrylamide in food **Vural Gökmen**, vgokmen@hacettepe.edu.tr. Hacettepe Universitesi, Ankara, Turkey As a probable human carcinogen, acrylamide is formed when food is heated to high temperatures exceeding 100ºC. Basically, acrylamide is formed from free asparagine in the presence of carbonyl compounds such as reducing sugars and their degradation products. Therefore, a key challenge is to “decouple” the mechanistic route to acrylamide from the general Maillard pathway, retaining the desired attributes of cooked food with beneficial nutritional properties and health effects. Although the epidemiological associations have not demonstrated acrylamide to be a human carcinogen, the margins of exposure indicate a concern for neoplastic effects based on animal evidence. There are certain measures designed to achieve reduction of acrylamide in the pertinent food categories, using practical tools and fundamental knowledge attained in mechanistic studies. Using a selection of tools related to agronomy, recipe, processing, and final preparation, food manufacturers have been able to reduce acrylamide levels in the range of 40–90% in certain selected foods. It is obvious that the content of acrylamide increases not only with increasing temperature, but also with the time of heating. Surface of foods reaches high temperatures earlier than interior parts because of simultaneous drying which is promoting the Maillard reaction. This is the reason that acrylamide formation is mainly a surface phenomenon. Hence, if the exposure of surface to high temperatures is limited, excessive accumulation of acrylamide in food can be prevented. Temperature-time programmed processing of foods offers promising technological solutions for the mitigation of acrylamide as successfully demonstrated at laboratory scale.

Agronomic and genetic approaches, including CRISPR, to reducing acrylamide formation in wheat products **Nigel Halford**[1], nigel.halford@rothamsted.ac.uk, Navneet Kaur[1], Natasha Brock[1], Shpresa Musa[2,1]. (1) Rothamsted Research, Harpenden, Hertfordshire, United Kingdom(2) Bioactive and Functional Food Chemistry, Karlsruher Institut fur Technologie, Karlsruhe, Baden-Württemberg, Germany Acrylamide is a carcinogenic processing contaminant that forms from free (soluble, non-protein) asparagine and reducing sugars during high-temperature cooking and processing of grains, tubers, beans, storage roots and other plant products. Food businesses face ever-tightening regulations on acrylamide, with the prospect of Maximum Levels being set by the European Union this year. Compliance would be greatly facilitated by the development of crop varieties with reduced acrylamide-forming potential. We have used CRISPR/Cas9 to knock out the asparagine synthetase-1 and -2 (TaASN1 and TaASN2) genes of bread wheat. Wheat lines with mutations in the A, B and D genome TaASN2 genes have also been identified in a TILLING population produced by chemical mutagenesis, and the mutations have been stacked to produce a total TaASN2 knockout. We have also assessed the effect of a natural deletion that means that the B genome TaASN2 gene (TaASN-B2) is missing in some varieties. Field trials of the knockout lines began in 2021-2022 (the first field trials of CRISPR wheat in Europe). Data from year 1 of the field trials show the CRISPR lines to have

significant reductions in free asparagine concentration and a concomitant decrease in acrylamide formation in heated flour. Results of analyses of grain samples from the 2022-2023 field trial will also be presented, including for the first time the TaASN1/2 CRISPR double knockout and the full TaASN2 knockout TILLING line. These and other genetic approaches are being undertaken alongside experiments on crop management strategies, including fertilisation rates, especially of sulphur, and disease control. The work is being conducted during a period of rapid change in the regulations governing gene edited crops in the UK, culminating in the Genetic Technology (Precision Breeding) Act, which gained royal assent in March 2023.

Analysis and kinetic study of furan contents in various roasted nuts **Kwang G. Lee**, kwglee@dongguk.edu. Food Science and Biotechnology, Dongguk Univ., Jung-gu, Seoul, Korea (the Republic of) This study compared the furan levels and kinetics of various 70 samples of five nuts (peanuts, almonds, cashew nuts, hazelnuts, and sacha inchi) roasted using an air fryer (AF) and microwave oven (MO).
In the five nuts, furan levels ranged from 1.11 to 2.39 ng/g before roasting. As the AF-based and MO-based roasting progressed, the furan levels increased to 6.39–165.52 ng/g and 11.47–183.87 ng/g, respectively. The contents of polyunsaturated fatty acids (linoleic acid and linolenic acid) decreased significantly after roasting but the content of monounsaturated fatty acid (oleic acid) showed only slightly significant differences between the control and roasted nuts. The total phenolic content and antioxidant activity increased by up to 337 % and 218% as roasting progressed but decreased slightly when roasting was performed at 180 C for 20 min in an AF or at 700 or 1,000 W for 5 min in an MO. Nut samples were roasted at 150–200 C for 5–25 min. As the roasting temperature and roasting time increased, the levels of furan in the nuts increased up to 348 ng/g. The concentration of furan was 2.76–224, 0.71–69.0, 1.46–348, 2.68–87.0, and 3.70–94.4 ng/g in almonds, peanuts, cashew nuts, hazelnuts, and sacha inchi, respectively. In kinetics analysis, the chemical reaction responsible for the production of furan in nuts followed the zero-order kinetic model, with reaction constants of 3.26×10^{-9} to 16.5×10^{-9} mol/L.h at 200 C. The apparent activation energy (Ea) was 125.0, 93.6, 86.5, 62.0, and 70.1 kJ/mol for almonds, peanuts, cashew nuts, hazelnuts, and sacha inchi, respectively. This study provides useful information on furan production and the changes in physicochemical properties such as fatty acid composition, colour, BI, TPC, and antioxidant activity of nuts roasted using an AF or MO.

Recent occurrence data on process contaminants in the US food supply and strategies for their mitigation **Victoria Incorvati**, vharrison02@gmail.com, Eileen Abt, Lauren Robin. Office of Food Safety, US FDA, Center for Food Safety and Applied Nutrition, College Park, Maryland Process contaminants are undesired chemical byproducts that can form during food processing, including when heating, drying, or fermenting foods. Some process contaminants, including acrylamide, ethyl carbamate, 3-monochloropropane-1,2-diol esters (3-MCPDE), and glycidol esters (GE), have been linked to potential health effects. FDA has worked with domestic manufacturers and other government agencies to set voluntary limits for ethyl carbamate in domestic alcoholic beverages and has helped develop information for industry on mitigation measures to reduce levels of acrylamide, ethyl carbamate and 3-MCPDE/GE in different foods. This presentation will summarize the key mitigation strategies and provide an overview of recent data collected by FDA on acrylamide, ethyl carbamate, and 3-MCPDE/GE in foods.

Analysis of MCPD and glycidyl esters in infant formula and other compound foods: Recent updates from the U.S. Food and Drug Administration **Jessica Beekman**, jessica.beekman@fda.hhs.gov, Samanta Popol, Iris Yourick. Center for Food Safety and Applied Nutrition (CFSAN), U.S. FDA, College Park, Maryland 3-monochloro-1,2-propanediol esters (3-MCPDE), 2-monochloro-1,3-propanediol esters (2-MCPDE), and glycidyl esters (GE) are process-induced chemical contaminants found in refined edible oils and foods containing these oils. Studies have shown these contaminants may be carcinogenic and/or genotoxic, making their presence in foods a potential health concern. Since 2012, researchers at the U.S. Food and Drug Administration (FDA) have developed and validated methods for the analysis of MCPDE and GE in a variety of matrices and have produced occurrence data for these contaminants in over 1000 food samples, including oils, infant formula, and other processed food products. This presentation will provide a summary of the results of several of the most recent research projects related to the analysis of MCPDE and GE, including a discussion of the most up-to-date occurrence data for U.S. infant formulas. In addition, data will be presented on the impacts of processing on 3-MCPDE/GE concentrations in infant formulas as well as how various types of food preparation can affect levels of these contaminants in frozen fried foods.

Sub-chronic toxicity study of individual and combined oxidized triacylglycerol, 3-chloro-1,2-propanediol esters and aldehydes in 90-day mouse model **Boyan Gao**[1], raphaelgao1985@gmail.com, Chenxu Wang[1], Miao Zhang[1], Hanshu Zhu[1], Wenhao Zheng[1], Yinghua Luo[2], Liangli Yu[3]. (1) Shanghai Jiao Tong Univ., Shanghai, China(2) China Agricultural Univ., Beijing, China(3) Univ. of Maryland, College Park Insufficient research has been conducted on the comprehensive evaluation of in vivo toxicity and interaction mechanisms of multiple types of toxic substances. This study aimed to evaluate the overall toxicology of three groups of toxicants, namely 3-monochloropropane-1,2-diol esters (3-MCPDE), oxidized triacylglycerol (ox-TG), and aldehydes, which are formed during the thermal processing of high-fat foods. The toxicity and interactions resulting from individual and combined exposures to these toxicants were assessed using a 90-day mouse model. Analysis of organ weight data revealed that female mice exposed to ox-TG, ox-TG+3-MCPDE (GM), Aldehyde+3-MCPDE (MA), and ox-TG+Aldehyde+3-MCPDE (GMA) had significantly greater liver weights compared to the control group. Serum biochemical indicators analysis showed potential hepatotoxicity and lipid metabolic disorders. Metabolomics analysis was performed on serum samples collected from different experimental groups to assess and compare the distinct metabolomic profiles affected. In the GMA group, 59 potential differential metabolites were identified, primarily involving phenylalanine, tyrosine, and tryptophan biosynthesis, phenylalanine metabolism, retinol metabolism, and ether lipid metabolism. These results preliminarily reveal the toxicity intensity and mutual interactions of multiple hazardous substances acting in concert.

Data delivery from the US-EPA Center for Computational Toxicology and exposure to support food toxin researchers **Antony J. Williams**[1], tony27587@gmail.com, Janesch Gregory[2], Carr Erik[2], Valery Tkachenko[3]. (1) Center for Computational Toxicology and Exposure, US Environmental Protection Agency, Research Triangle Park, North Carolina (2) Oak Ridge Associated Universities, Oak Ridge, Tennessee (3) ScienceDataExperts Inc, Rockville, Maryland The growth of scientific data and the increasing need for data sharing and collaboration in the field of environmental chemistry has led to the creation of various software and databases that facilitate research and development into the safety and toxicity of chemicals. The US-EPA Center for Computational Toxicology and Exposure has been developing software and

databases that have served the chemistry community for many years. Several web-based software applications have been developed at the US-EPA and made available to the community to provide access to information regarding mycotoxins. This includes related structures, experimental and predicted properties, hazard data and mass spectrometry analytical data and methods. While the primary software application from the Center is the CompTox Chemicals Dashboard (https://comptox.epa.gov/dashboard) almost a dozen proof-of-concept applications have been built serving various capabilities. The publicly accessible Cheminformatics Modules (https://www.epa.gov/chemical-research/cheminformatics) provides access to modules to allow for hazard comparison for sets of chemicals, structure-substructure-similarity searching and batch QSAR prediction of both physicochemical and toxicity endpoints. This presentation will provide an overview of all tools in development that provide access to food toxin related data and the integrated nature of the applications based on the underlying chemistry data set. This will include access to curated chemistry data for food-related toxins, including those generated in storage, analytical chemistry methods for determining the presence of such toxins (harvested from multiple bodies including the Food and Drug Administration), and approaches to harvesting the data en masse for research use and integration into third party informatics systems.

Waste Upcycling, Indoor Farming & Sustainable Agriculture

Upcycling grape pomace waste into food ingredients with solid-state fermentation **Daniel Salta**, dsalta@twu.edu, Danhui Wang, Xiaofen Du. Nutrition and Food Sciences, Texas Woman's Univ., Denton Grape pomace is the major solid waste product of the wine industry. In addition to its high fiber content, grape pomace is rich in polyphenols as these are not fully extracted during winemaking. While grape pomace is used for composting or as animal feed, its use in food products is limited to grapeseed oil and grape pomace flour. The objective of this study was to optimize a solid-state fermentation approach to valorize valuable substances in grape pomace, followed by downstream extraction of metabolites such as polyphenols and other compounds. High-performance liquid chromatography (HPLC) was used to measure concentrations of organic acids and phenolic compounds in the extracts to explore their use as food preservatives, while total phenolic content was measured using the Folin-Ciocâlteu method with modifications to investigate its potential antioxidants. Grape pomace was fermented in with two species of Aspergillus fungi at 30°C and 80% initial moisture content for 6 days and sampled every 24 hours. Extracts of the fermented samples showed significant differences ($p<0.05$) in pH, °Brix, and titratable acidity compared to the control samples over the fermentation period, as well as between the Aspergillus niger and A. oryzae samples. Extracts also showed significant differences ($p<0.05$) in organic acid content as measured through HPLC. Oxalic acid content was increased from approximately 41 mg/L in uninoculated Shiraz pomace extracts to a maximum of 1500 mg/L in A. niger extracts. Meanwhile, the tartaric acid content of Shiraz extracts decreased from 2128 mg/L in controls to approximately 16 mg/L with A. niger and 11 mg/L with A. oryzae. Overall, results showed the potential of Aspergillus in processing grape pomace waste into food ingredients.

Upcycling soybean hulls: A novel material for biodegradable packaging films and raspberries preservation **Sumi Regmi**, sumi.regmi@jacks.sdstate.edu, Srinivas Janaswamy. Dairy and Food Science, South Dakota State Univ., Brookings The rising demand for packaged foods, driven by the need for convenience in busy lifestyles, is worsening the environment due to the non-biodegradable nature of plastics. The presence of microplastics and nanoplastics in the alimentary canal of animals and humans further intensifies the risks. Thus, there is a growing demand for biodegradable alternatives. This research aimed to extract soyhulls cellulosic residue (SCR), soyhulls are a byproduct of the soybean industry, establish its glycosyl and linkage composition and molecular weight, and use it in preparing packaging films followed by application in the preservation of raspberries. The SCR was extracted using alkaline and bleaching treatments, solubilized in a $ZnCl_2$ solution, crosslinked with calcium ions, and plasticized with glycerol to cast films. The films were tested for mechanical, barrier, spectroscopic, hydration, and soil biodegradation properties and raspberry preservation. The glycosyl analysis suggests SCR is a heterogeneous mixture of cellulose, xylan, and mannan, with a molecular weight of 4.68 kDa. An increase in the Ca^{2+} ions and glycerol amount enhanced the mechanical and barrier properties. The film exhibited a water contact angle of 72.6° and biodegraded within 25 days at 24% soil moisture. They preserved raspberries for six days longer than commercial polystyrene films. The outcome offers a waste-free, resource-friendly approach to addressing plastic perils and novel, sustainable, and biodegradable packaging alternatives. It further creates a new income pathway for soybean producers.

Valorization of whey proteins via redox-mediated electrodialysis **Aderiyike Aguda**, faniyan2@illinois.edu, Nayeong Kim, Johannes Elbert, Xiao Su. Univ. of Illinois Urbana-Champaign Whey is regarded as the most polluting byproduct in the dairy industry due to its high chemical and biochemical oxygen demand levels. It requires sequential post-treatment steps for its disposal which is compounded by the large volumes generated – approximately 9 kg of whey per 1 kg of cheese produced. Nonetheless, whey contains valuable proteins with many biological and nutritional benefits such as inhibiting cancer cell growth, boosting immunity, and protection from microbial pathogens and toxins. For the valorization of whey proteins from whey waste, it is essential to remove the high mineral content and organic ions since they affect the flavor and qualities of whey protein products, thereby limiting their use in food applications. Several membrane technologies such as reverse osmosis, nanofiltration, and electrodialysis (ED) have been employed to demineralize whey and valorize proteins to a wider range of food formulations such as dairy products, beverages, desserts, pasta, and most extensively in specialized infant formulas. However, these conventional methods of protein purification encounter challenges such as high energy consumption, high operating cost, and irreversible protein aggregation attributed to the decrease in pH. Redox-mediated electrodialysis (redox-ED) has demonstrated whey valorization with reduced energy usage and without altering pH levels through the utilization of reversible redox reactions for salt removal. Expanding on previous research, we explore whey valorization by investigating various membrane types and configurations within the redox-ED platform. In this study, we aim to enhance economic feasibility while also addressing membrane fouling associated with organic and biological contents. We investigate redox-ED for protein purification using nanofiltration membranes which are resistant to fouling and are 90 – 95% cheaper than ion exchange membranes. Our system seeks to maximize the overall demineralization, as well as the economic viability of redox-ED in whey protein purification.

Water soluble sodium-carboxymethyl cellulosic residue from corn biomass **Santosh Rijal**[2], santosh.rijal8661@jacks.sdstate.edu, Senthil Subramanian[1], Srinivas Janaswamy[2,1]. (1) Dept. of Agronomy, Horticulture and Plant Science, South Dakota State Univ., Brookings (2) Dept. of Dairy and Food Science, South Dakota State Univ., Brookings Cellulose is the most abundant natural polymer, and around 700 billion tons of it are produced yearly. It is predominantly generated from forests and trees. The strong intra- and inter-molecular hydrogen bonds make it water-insoluble. Its modified form, carboxymethyl cellulose, is water-soluble and is used in food,

paint, paper, textile, cosmetics, and pharmaceutical industries due to its binding, thickening, and stabilizing properties. However, forests and their tree products aid immensely in reducing the impact of climate change. Furthermore, several industries are transitioning towards sustainability with an emphasis on an environmentally friendly, clean, and green outlook. In this regard, using cellulosic residue from renewable agricultural residues is sustainable and contributes to the circular bioeconomy. Herein, cellulosic residue was extracted from corn biomass, and a water-soluble system was created by attaching carboxymethyl groups. The cellulosic residue of 5 g was added to 150 mL of ethanol, alkalized with 15 mL of 25% NaOH, and etherified with 6 g monochloroacetic acid. The mixture was kept in a water bath at 55 ºC for 3.5 h and later immersed in 100 mL methanol for 24 h and then neutralized with acetic acid. It was filtered and washed with ethanol three times and dried in the oven at 60 ºC for 4 h. The degree of substitution (DS) was found to be 0.47 and the FTIR analysis confirmed the presence of the carboxyl group on the cellulosic residue. The outcome is deemed to open novel opportunities for agriculture biomass and agricultural processing byproducts in producing water-soluble cellulosic residues and replacing wood cellulose for a variety of food and non-food applications.

Coffee and cacao byproducts as sustainable carbon sources for baker's yeast growth Diana Urbina, Luis Carlos Vesga, Olga Lucia Saavedra, Cristian Blanco-Tirado, Marianny Y. Combariza, **Stelia C. Mendez**, Scmendez@uis.edu.co. Chemistry, Univ. Industrial de Santander, Bucaramanga, Colombia Coffee and cacao bean production in Colombia generates around 80% of residual biomass from both liquid and solid residues. This study aims to explore the feasibility of using these residues as carbon sources for the growth of commercial baker's yeast, a domesticated strain of Saccharomyces cerevisiae that shares genomic ancestry with strains used in European grape wine and Asian rice wine production. Liquid effluents from coffee grain fermentation (Geisha, Caturra, and Castillo varieties) and fermented mucilage/placenta extracts from cacao (FEC2 and CCN51 varieties) were investigated as carbon sources for formulating growth media for S. cerevisiae cultures. We evaluated the influence of media composition (% of coffee, mucilage or placenta extracts) and pH on baker's yeast biomass production. Our findings demonstrate that culture media containing 25% v/v of coffee effluents, without pH adjustment, support S. cerevisiae growth similarly to a standard YPD culture medium. Similarly, fermented mucilage (25% v/v) and placenta extract (50% w/v) from the CCN51 cocoa variety showed significant substrate potential for S. cerevisiae growth. Compositional analysis revealed that coffee effluents from Geisha, Caturra, and Castillo varieties contain 5.97%, 4.93%, and 2.40% of total carbohydrate content, respectively. Fermented cacao mucilage from CCN51 and FEC2 varieties yielded 10.68% and 10.42% total carbohydrates, respectively, while the placenta extract had 2.88% (CCN51) and 4.51% (FEC2). The monosaccharide composition in effluents and extracts was dominated by fructose and glucose except in the Castillo variety, which only contained fructose. The pH values of the initial effluents/extracts ranged from 3.13 to 3.90. Interestingly, we observed that regulating the pH to 5.5 did not affect the growth rates of S. cerevisiae compared to cultures grown at the original pH level. This indicates the possibility of cultivating S. cerevisiae over a wide working range of pH values. Our results highlight the viability of coffee effluents (Geisha and Caturra), fermented mucilage, and cacao placenta extract (CCN51) as carbon sources for S. cerevisiae culture growth. These sources could facilitate the manufacture of commercial bioproducts, such as baker's yeast and alcoholic beverages.

WEDNESDAY AFTERNOON

Elevating Sustainability & Greentech in Agriculture & Plant-Based Foods

Bactris gasipaes epicarp carotenoid-rich emulsion: A circular economy approach Jader Martínez-Girón[2], Yolima Baena[3], Luis Eduardo Ordóñez-Santos[4], **Coralia Osorio Roa**[1], cosorior@unal.edu.co. (1) Dept. de Química, Univ. Nacional de Colombia, Bogota (2) Tecnología de Procesamiento de Alimentos, Univ. del Valle, Cali, Colombia(3) Grupo de Investigación en Tecnología de Productos Naturales, Dept. de Farmacia, Univ. Nacional de Colombia, Bogota (4) Facultad de Ingeniería y Administración, Dept. de Ingeniería, Univ. Nacional de Colombia-Sede Palmira, Univ. Nacional de Colombia, Palmira The epicarp of peach palm (Bactris gasipaes) is a by-product that is generated after the consumption and/or transformation of this exotic fruit and is a potential source of carotenoid pigments, which can be used to give added value to different foods and in cosmetic or pharmaceutical formulations. This work aimed to produce a carotenoid-rich emulsion (O/W) with sunflower oil. The oil enriched in carotenoids from B. gasipaes epicarp was used as the lipid phase, in combination with water and a mixture of xanthan gum and soy lecithin as emulsifying agents. Emulsification parameters were optimized using response surface methodology (RSM) and central composite design (CCD). The emulsification parameters were ultrasonic power (W), time (min), oil content (%), and emulsifiers (%). The optimized emulsion had a total carotenoid content of 67.61 µg/g, droplet size of 502.23 nm, polydispersity index of 0.170 and zeta potential of -32.26 mV. Finally, it was found that the emulsion was chemically and physically stable for 35 days at 30 ± 2°C in darkness.

Leveraging plant proteins and polyphenols for enhanced functionality of emulsion-based foods **Kacie Ho**, kacieho@hawaii.edu. Univ. of Hawai'i at Manoa, Honolulu There is a growing interest in substituting animal-derived proteins in food emulsions with plant proteins due to their clean label reputation and potential sustainability. Among these, soy and pea proteins have garnered attention for their ability to stabilize oil-in-water (O/W) emulsions. However, plant proteins are susceptible to forming insoluble clumps that compromise physical stability. One approach to address this issue is the addition of polyphenols, which may enhance the emulsifying properties of these proteins. This presentation will highlight findings from two separate studies. The first study aimed to explore the effects of soy protein-isoflavone complexes on emulsion stability and wettability. Isoflavones were complexed to soy proteins, and physical characteristics of the resulting emulsion droplets were evaluated. Results indicated that isoflavone addition enhanced emulsion stability and significantly altered the contact angle ($P<0.001$) of sessile drops towards neutral wettability. The second study investigated the effects of pea protein-catechin complexes on O/W emulsion stability, non-adsorbed protein fractions, and lipid oxidation. Varying concentrations of green tea catechins were complexed to pea proteins, and physical characteristics of the resulting emulsion droplets were evaluated. Results indicated that moderate catechin addition significantly ($P<0.05$) reduced non-adsorbed protein. Catechin concentration was not correlated with lipid oxidation. This suggests that aside from polyphenol concentration, factors such as non-adsorbed protein may influence the stability of these systems. Results from both studies underscore the potential of leveraging plant-derived proteins and polyphenols to enhance the functionality of emulsion-based systems. These findings offer insights into developing stable emulsions for sustainable food and health applications.

Standard-based tools toward the goals of food security **Zhuohong Xie**, kyx@usp.org. The US Pharmacopeial Convention, Rockville, Maryland The Food Chemicals Codex (FCC) is a

compendium of internationally recognized standards for the purity and identity of food ingredients and chemicals used in food processing. By providing test methods and specifications, it serves as a crucial reference for helping to ensure the safety, quality, and regulatory compliance of food products worldwide. While the FCC's primary focus is on quality and safety standards rather than direct hunger alleviation, its role in maintaining a robust and trustworthy food supply chain contributes significantly to food security efforts globally. Additionally, as part of sustainability efforts, the US Pharmacopeia (USP) has published tests to reduce or eliminate the use of hazardous reagents. This presentation will highlight the importance of standard-based tools and provide examples of our collaborative effort toward tackling food fraud, reducing contaminants, as well as modernization toward environmental and sustainability goals.

Influence of polysaccharide addition on the cohesiveness of plant-based meat analogue **Min Li**, mli63@vols.utk.edu, Tao Wu. Food Science, The Univ. of Tennessee Knoxville Institute of Agriculture The textural properties of plant protein-based meat analogues are critical for their market success, with cohesiveness being a notable challenge. Incorporating polysaccharides is a practical way to improve the cohesiveness of plant protein-based products, but the underlying mechanism is not well understood. This study explores the effects of various polysaccharides on the cohesiveness of such analogues and seeks to elucidate the underlying physical chemistry mechanisms. A model plant-based meat analogue was created using soy protein isolate (SPI) emulsion gel, composed of 20% SPI and 5% soybean oil. Polysaccharides were incorporated at concentrations of 0.2%, 0.5%, and 1.0%. The viscosity and hydrophobicity of polysaccharides were analyzed through rheology and surface tension analysis, respectively. Gelation was induced by heating, and the cohesiveness of the SPI emulsion gels with added polysaccharides was assessed using a texture profile analyzer. Our findings revealed that only methylcellulose and hydroxypropyl methylcellulose enhanced cohesiveness. In contrast, other tested polysaccharides (chitosan, carrageenan, sodium alginate, xanthan gum, low acyl gellan gum, konjac gum, carboxymethyl cellulose, etc.) did not improve cohesiveness at 0.2% concentration and even diminished it at higher concentrations. The improvement in cohesiveness was not correlated with the solution viscosities of polysaccharides and the polysaccharide/protein mixtures. Only two polysaccharides, methylcellulose and hydroxypropyl methylcellulose with high hydrophobicity, improved cohesiveness, underscoring the essential role of hydrophobic interactions in the texture of plant-based meat analogues.

Protein complexation as a strategy for enhancing the nutritional and functional effects of blueberry polyphenols Miranda Symcox[1], Ana Rodriguez-Mateos[2], Sarah Johnson[1], **Charlene Van Buiten**[1], charlene.vanbuiten@gmail.com. (1) Food Science and Human Nutrition, Colorado State Univ., Fort Collins (2) Nutritional Sciences, King's College London, United Kingdom Dietary polyphenols are a diverse class of phytochemicals found in plant-based foods. Despite poor bioavailability upon digestion, these compounds are broadly associated health benefits including cardiometabolic protective effects. However, blueberries are and other polyphenol-rich foods are often consumed simultaneously with other foods, allowing for interactions between polyphenols and other nutrients. As plant-based proteins are embraced as alternatives for foods traditionally sourced from animals, there is a critical need to understand the underlying influence of differences in protein structure and source on nutrient interactions and functionality. The objectives of this study were to compare interactions between blueberry polyphenols and proteins from plant-based sources versus animal sources and evaluate the effect of these interactions on polyphenol bioavailability in vitro. To model a protein-rich food with blueberries, we combined dietary protein with blueberry polyphenol extract at a ratio of 1 mg protein to 33 mg polyphenols. Using a variety of spectroscopic approaches, we compared interactions between blueberry polyphenols and protein from whey, pea and hemp and determined that the structural differences between the proteins drove differences in binding affinity. We hypothesized that these differences in interaction would modify the health benefits of the polyphenols involved in the interactions. Using an in vitro model of the intestinal barrier paired with UPLC-QQQ-MS, we determined that the type of protein used in complexation drove differences in the metabolism of anthocyanins. Overall, protein complexation of polyphenols decreased concentrations of protocatechuic acid and 2,6-dihydroxybenzoic acid. Hemp was the only protein source which influenced uptake of parent anthocyanins, but whey, pea and hemp increased concentrations of isourolithin A, DL-p-hydroxyphenylacetic acid and enterolactone sulfate, respectively. This suggests that complexation with different proteins may affect the functionality of blueberry polyphenols. Pilot data from a clinical trial where healthy adults were fed a protein smoothie with blueberries suggests that protein complexation does not affect the cardiometabolic influence of blueberry polyphenols (e.g., anti-hypertensive effects), but ongoing analysis of clinical samples will allow for investigation of the impact of complexation on polyphenol bioavailability in vivo as well as effects on the gut microbiome.

Afoot: Amino-acid-based, food and agricultural-targeted, organic nanozyme for allergic biomolecule detection in food **Dong Hoon Lee**, dhl5@illinois.edu, Mohammed Kamruzzaman. Dept. of Agricultural and Biological Engineering, Univ. of Illinois Urbana-Champaign There are several nanozymes developed in the 2020s using organic materials, however, the range of the materials is limited due to nanozyme fabrication with primitive strategies. Additionally, most organic nanozymes are neutral and positively charged; there is also a need to provide the negatively charged organic nanozyme for further biomedical, environmental food, and agricultural applications. To address these needs, we have proposed a new class of sustainable/green material based (e.g., amino-acid), negatively charged, organic nanozyme (OA nanozyme) with peroxidase-like activity. We designed a chelation-based, relatively short (~2 hours), fabrication process to provide the spherical homogenous nanozyme (approximately within 80nm, mean diameter), which conjugated with metallic element successfully. Using the unique surface function with their durability, we integrated the OA nanozyme with the simplified colorimetric sensing platform for allergic biomolecules detection for further food and agricultural safety applications. This system promotes rapid (up to 2 minutes) and selective detection (among ~7 relative biomolecules) of allergic biomolecule detection (detection limit = at least 25 pg mL^{-1}(histamine)). This sensing platform also enables the detection of target allergic biomolecule in a mixture of chemicals, providing their potential for real-sample applications. We envision that the amino acid-based, organic nanozyme can be utilized in further practical applications.

Chemical compositions of edible spice extracts & their potentials in suppressing the SARS-CoV-2 spike protein-ACE2 binding, inhibiting ACE2, and scavenging free radicals **Huan Wu**[1,2], wuhuancpu@ahtcm.edu.cn, Liangli Yu[1]. (1) Dept. of Nutrition and Food Science, Univ. of Maryland, College Park (2) Anhui Univ. of Chinese Medicine, Hefei, China COVID-19 is initiated by binding the SARS-CoV-2 spike protein to angiotensin-converting enzyme 2 (ACE2) on the host cells. Food factors capable of suppressing the binding between the SARS-CoV-2 spike protein and ACE2 or reducing the ACE2 availability may potentially reduce the risk of SARS-CoV-2 infection and COVID-19. In this study, the chemical compositions of clove, cinnamon, honeysuckle, rosemary, thyme, dill

and parsley extracts were investigated, along with their potentials in suppressing SARS-CoV-2 spike protein−ACE2 binding, ACE2 inhibition, and scavenging free radicals. Most of the chemical components of these edible spices are polyphenols. The extracts dose-dependently suppressed SARS-CoV-2 spike protein binding to ACE2 and inhibited ACE2 activity at the testing concentrations. Both of the water and ethanol extracts of clove and cinnamon, as well as the water extract of honeysuckle, rosemary and thyme had a total phenolic content greater than 20 mg GAE/g. In addition, their relative scavenging capacities against HO, DPPH and ABTS cation radicals were more than 583.1 μmol TE/g, 58.4 μmol TE/g and 145.3 μmol TE/g, respectively. The results indicated that these spices have significant levels of polyphenols, free radical scavenging ability, and significant ability in reducing the SARS-CoV-2 infection and the development of severe COVID-19 symptoms.

Seed priming with nitrogen-doped carbon dots enhances production, reduces pungency, and improves the postharvest quality and storability of onion bulbs **Deepak Jha**, deepakkumar.jha@ag.tamu.edu, Jashbir Singh, Bhimu S. Patil. Vegetable and Fruit Improvement Centre, Dept. of Horticultural Sciences, Texas A&M Univ., College Station Seed nanopriming is an emerging agricultural technique with the potential to enhance seed germination, growth, and yield while providing resistance to biotic and abiotic stressors through the induction of secondary metabolite biosynthesis, which plays a dual role in plant protection and health promotion. Despite its numerous benefits, concerns about potential toxicity associated with the use of metal nanoparticles are often raised. The use of carbon dots as a green priming agent can potentially eliminate or minimize these concerns, but its efficacy on crop production and postharvest attributes is largely unexplored. This study investigates the effects of seed priming with nitrogen-doped carbon dots (N-CDs) on production of onions, an economically vital crop in Texas. N-CDs were synthesized using a green approach employing phenylalanine (180 mM) and citric acid (270 mM) in a 95:5 ratio. The resulting N-CDs were used as priming agents for two commercial yellow onion varieties (Legends and Pecos) and two Texas A&M-developed varieties (TAM53Y (yellow) and TAM23W (white)). The analysis included germination percentage, seedling growth, yield, and postharvest attributes such as pungency, ascorbic acid, flavonoids, and shelf-life. N-CD treatment significantly ($P \leq 0.05$) enhanced germination, seedling growth, and yield across all cultivars, especially increasing these parameters by over 1.7-fold in Pecos and TAM53Y varieties. Pungency was reduced in all cultivars with N-CD treatment (ranging from 1.3-1.5-folds), significantly in Legend. Additionally, N-CD priming increased levels of ascorbic acid (9.5–10.8 mg/100 g FW) compared to control (7.7 mg/100 g FW) and flavonoids, especially quercetin, quercetin-3,4-di-glucoside, and quercetin-4-O-glucoside with varied titers among cultivars. Higher levels (~1.8-fold) of quercetin and quercetin-3,4-di-glucoside were observed in TAM53Y after seed priming. Moreover, levels of quercetin 4-O-glucoside were 1.5-fold higher than unprimed controls in TAM23W and 1.4-fold higher in TAM53Y. Delayed ethylene evolution and respiration rates were observed in N-CD-primed onion bulbs, indicating extended shelf life, most prominently in the TAM53Y cultivar compared to the control. Overall, N-CD priming shows promise for enhancing onion production, enriching health-promoting compounds, and extending shelf life, with potential applications in other crops.

General Papers

Green pH-based approach for solubilizing curcumin molecules into delivery systems **Xiping Gong**, xipinggong@umass.edu, Hualu Zhou, Anthony Suryamiharja, Koushik Adhikari. Food Science and Technology, Univ. of Georgia, Griffin With the increasing global population, there is a growing demand for nutritious diets. Plant-based nutraceuticals, such as polyphenols derived from plants, have garnered attention for their potential to enhance attributes like color, nutrition, flavor, and preservation in food products. However, conventional production methods for plant-based foods often involve the use of organic solvents and other undesirable processes, depleting valuable resources. Thus, there is an urgent need to develop sustainable and efficient production approaches that maximize the use of food ingredients to improve the functional attributes of foods. To address this challenge, we proposed a pH-based approach to solubilize curcumin into emulsion systems, aiming to enhance the color and health benefits of plant-based foods. In our method, insoluble curcumin crystals are initially dissolved in an alkaline solution. Subsequently, a rapid acidification process is applied to yield more water-soluble curcumin molecules. This cycle of alkali-acid processing results in a curcumin solution that can efficiently dissolve in delivery systems containing lipophilic phases, such as emulsions and milks. Through the alkali-acid process, we observed the formation of smaller curcumin nanoparticles initially, which subsequently grew into larger particles over time. The initial particle size is closely related to the initial concentration of curcumin dissolved. However, even at high concentrations (1 mg/mL), the formulated curcumin particles can be effectively dissolved in lipophilic delivery systems, such as emulsions and milks. Furthermore, the microstructure analysis revealed a transformation from the original crystallized structure to a particle-like structure in the pH-treated curcumin solution. Fluorescence imaging demonstrated the hydrophobic encapsulation of curcumin molecules into the lipid phase of emulsions, resulting in stable curcumin-encapsulated emulsion systems. Our findings indicate that this pH-based approach offers an effective means to encapsulate curcumin molecules into emulsion systems. This innovation holds promise for potential applications in a variety of sectors including food, cosmetics, and pharmaceuticals, contributing to the development of more functional and sustainable products.

Solution is in sourdough: harnessing microbial diversity for unique chemical composition of bread **Eva Keohane**[1], Eva.Keohane@colostate.edu, Jacqueline M. Chaparro[1], Melanie Odenkirk[1], Arpana Vaniya[2], Joesphine Wee[3], Charlene Van Buiten[4], Jessica Prenni[1]. (1) Horticulture, Colorado State Univ., Fort Collins (2) Chemistry, Univ. of California Davis (3) Food Science, The Pennsylvania State Univ., Univ. Park (4) Food Science and Human Nutrition, Colorado State Univ., Fort Collins Bread is a staple-food product worldwide and consumer demands are changing for breads that suit specific quality and health requirements. Preliminary studies suggest a relationship between the composition of the sourdough microbiome and quality metrics of sourdough bread, presenting an opportunity to intentionally use fermentation as a technology to produce bread with nutritional functionality. Towards this goal, we utilized standardized methods of the Periodic Table of Food Initiative (PTFI) to evaluate the relationship between the composition of 20 divergent sourdough microbiomes and the phytochemical composition of sourdough bread and dough. Twenty sourdough starters and 3 commercial baker's yeasts were used to produce dough baked into sourdough bread. Triplicate preparations (dough and bread) were produced for each sourdough starter and were analyzed using standardized PTFI methods. Reverse phase separation was performed using Agilent Zorbax SB-Aq column and data (MS1 and MS2 in DDA mode for pooled QCs) were collected by a Waters Synapt G2 Q-TOF mass spectrometer. 16S rRNA sequencing demonstrates significant variation in the composition of the 20 sourdough starter microbiomes. Overall, the metabolomes of dough and bread were diverse based on the detection of compounds including phenolics, terpenes, and alkaloids. Breads and doughs from yeast controls were highly different from those made with sourdough

starters. Compound annotation was performed by matching MS1 data to the PTFI consensus library which is populated by the analysis of authentic standards across laboratories and consensus formula "unknowns" detected across laboratories using PTFI analytical workflows. MS2 data was explored using the global product social molecular networking (GNPS2) toolset for additional discovery of novel compounds. Multivariate hierarchical clustering was employed to evaluate the correlation between the sourdough microbiomes and phytochemical composition of the dough and bread. This analysis revealed the correlation of compounds with known anti-inflammatory, anti-bacterial, and antioxidant properties with specific microbiome compositions. Taken together, our results underscore the significance of how a distinct microbiome can influence the chemical composition of bread. Moreover, results from this study show the use of PTFI analytical methods and data analysis can provide in-depth characterization of a complex food sample.

Effect of lactic acid bacteria fermentation on volatile compounds, α-dicarbonyl compounds, and antioxidant activity of Robusta coffee beans **Siyeon Park**, siyeongood@naver.com, Kwang G. Lee. Food Science and Biotechnology, Dongguk Univ., Jung-gu, Seoul, Korea (the Republic of) In this study, the effects of lactic acid bacteria (LAB) fermentation on the flavor, α-dicarbonyl compounds (α-DCs), and antioxidant activity in robusta (C. canephora syn. Coffea robusta) beans were investigated. Robusta beans were fermented with three LAB strains (Pediococcus acidilactici HW01, Leuconostoc citreum HW02, and Lacticaseibacillus rhamnosus GG) for 0, 6, 12, 24, and 36 hours. A total of 23 volatile compounds were identified in the Robusta coffee. Furfural and 5-methyl furfural, dominant volatile compounds in Arabica coffee, increased after LAB fermentation. In Robusta coffee fermented by Leu. citreum HW02 for 36 hours, furfural and 5-methyl furfural increased by 308% and 400%, respectively, compared to the control (Robusta). α-dicarbonyl compounds (glyoxal, methylglyoxal, and diacetyl) were significantly decreased in all Robusta coffee after LAB fermentation. In Robusta coffee fermented by Leu. citreum HW02 for 36 hours, α-dicarbonyls decreases by up to 32%, compared to the control. The antioxidant activity was analyzed by DPPH radical scavenging activity. In Robusta coffee fermented by P. acidilactici HW01 for 36 hours, antioxidant activity increases 35% compared to the control. This study suggest that LAB fermentation could be a promising pretreatment method for improving the quality of Robusta coffee.

Functional Plant protein fibers obtained by microfluidic spinning technology: an insight into the fabrication, characterization, and mechanism Ren Li, Yulin Feng, Jing Wang, Lingxiao Gong, Jie Liu, **Huijuan Zhang**, zhanghuijuan@th.btbu.edu.cn. Beijing Technology and Business Univ., Beijing, China Although protein-based biomimetic fibers are available, green and inexpensive protein-based fibers remain a challenge to develop. Therefore, we designed a microfluidic chip and prepared plant protein-based fiber using plant-derived proteins, including wheat gluten, zein, soy protein, pea protein, and rice bran protein as the main material. The results showed that plant protein fibers prepared by microfluidic spinning had smooth and dense surfaces, strong mechanical properties, high thermal stability, high antioxidative activity, good digestibility, and low sensitization. Additionally, we revealed that the strong hydrodynamic shear force produced during microfluidic spinning changed the secondary structure of the plant protein, which promoted the binding of plant protein to cellulose nanofibers, thus enhancing the molecular orientation of both plant protein and nanofiber. Therefore, these findings can provide theoretical guidance for promoting the development of natural, environmentally friendly and functional protein-based fibers and their applications in drug delivery, tissue engineering and food health.

AI-driven enzyme discovery: transforming the fight against food contaminants **Dachuan Zhang**, zdc_futurefood@outlook.com, Ye Tian, Aibo Wu, Qian-Nan Hu. Chinese Academy of Sciences, Shanghai, Shanghai, China **Background** Chemical contamination in food and feed is a persistent threat to human health and animal welfare, necessitating effective mitigation strategies. Enzymatic degradation presents a specific and environmentally friendly solution to this issue. However, the identification of suitable enzymes for degrading contaminants has been a bottleneck in food safety efforts. Traditional methods are labor-intensive and time-consuming, limiting the scope of enzyme discovery. In response to this challenge, we propose an AI-driven approach, PU-EPP, to accelerate the identification of degrading enzymes for food contaminants. **Methods** PU-EPP leverages deep learning and a comprehensive database of enzyme-substrate pairs to predict enzyme activity. In this study, we focused on two mycotoxins, ochratoxin A and zearalenone, known for their high health risks. Using PU-EPP, we screened enzymes capable of degrading these contaminants and synthesized promising candidates using a cell-free protein expression system. **Results** The PU-EPP model demonstrated exceptional predictive performance, achieving a receiver operating characteristic area under the curve of 0.985. Based on PU-EPP's predictions, we successfully identified nine enzymes specific to zearalenone and six enzymes specific to ochratoxin A within a short timeframe of 29 days. Furthermore, six of these enzymes exhibited the ability to degrade over 90% of their respective contaminants within three hours. **Conclusions** The development of PU-EPP represents a significant advancement in enzyme discovery for food contaminant mitigation. By harnessing the power of AI, PU-EPP offers a scalable and efficient solution to the longstanding challenge of identifying degrading enzymes. Beyond mycotoxins, PU-EPP holds promise for addressing a wide range of food contamination challenges, including pesticides and environmental pollutants. We anticipate that the widespread application of PU-EPP could lead to enhanced food safety and reduced food waste caused by chemical contamination.

Advancing Disinfection: Acetylperoxyborate powders as a novel alternative to liquid peracetic acid formulations **Vaidehi Pandit**, vaidehi.pandit@vuronyxtech.com, Sandip Agarwal, Yudhisthira Sahoo. Chemistry, Vuronyx Technologies, Woburn, Massachusetts Peracetic acid (PAA) stands as a potent chemical sterilant and disinfectant, exhibiting efficacy against a broad spectrum of microorganisms, including bacteria, viruses, fungi, and spores. This versatility has fueled a surge in interest and application of PAA for disinfection and sterilization purposes. Notably, PAA offers environmental friendliness, breaking down into harmless residues of acetic acid, water, and oxygen, without leaving behind coagulated tissues or fixed residues. Various formulations of PAA have secured registration with regulatory bodies like the US Environmental Protection Agency and Health Canada, marking their recognition as effective general disinfectants. PAA's extensive track record spans applications in animal husbandry, healthcare, the food industry, and wastewater treatment, underlining its reliability across diverse sectors. However, liquid PAA formulations encounter challenges related to stability, especially at higher concentrations, due to its gradual decomposition into acetic acid. To address this, Vuronyx has developed acetylperoxyborate (APB) powders as an alternative. These powders offer notable advantages over liquid formulations, including enhanced stability and greater convenience in terms of transportation and storage. The development of APB powders represents a significant advancement in disinfection technology, providing a stable and efficient substitute for liquid PAA formulations. This advancement holds promise for improving convenience and effectiveness across diverse industries and applications. This presentation will delve into the synthesis of APB

powder, its stability, and its efficacy in disinfection tests against various pathogens such as E. coli, SARS-CoV-2 virus, among others.

Improving astronaut diets in space: Enhanced preservation and nutrition through plasma-treated peas **Lin-Yong Aaron Chen**, aaronlinyong@gmail.com, Yu-Jou Chou, Yuwen Ting. Institute of Food Sci. and Tech., National Taiwan Univ., Taipei In the context of space exploration, ensuring the preservation and enhancement of nutritional content in astronaut food presents significant challenges. Prolonged missions and the confined environment of space necessitate high-nutrient diets that can withstand the rigors of space travel while maintaining palatability and nutritional value. Peas, with their rich protein and essential nutrient content, emerge as promising candidates to meet these dietary requirements. However, traditional food preservation methods encounter limitations in terms of shelf life, nutrient retention, and palatability. To address these challenges, plasma technology has emerged as a cutting-edge processing technique with vast potential applications in food preservation. Plasma is the fourth state of matter, consisting of ionized gas with unique properties and versatile applications in various fields, including technology, medicine, and food preservation. Plasma jet technology, in particular, offers a promising avenue for enhancing the quality, safety, and nutritional integrity of space foods. By subjecting peas to controlled plasma treatment, both physical and chemical modifications can be induced, aimed at improving antimicrobial activity and spoilage resistance while preserving nutritional content. By employing protein assays and SDS-PAGE analysis, we evaluate the efficacy of plasma treatment in preserving the structural integrity and nutritional content of proteins in peas over time. Our results reveal a significant improvement in protein structure preservation and nutrient retention following plasma treatment, surpassing outcomes achieved through conventional preservation methods. The enhanced shelf life and minimal loss of nutritional value observed in plasma-treated peas underscore the viability of plasma jet technology as a promising alternative for improving the quality of food in space exploration. These findings not only offer a solution to the challenges of astronaut food systems but also pave the way for more nutritious dietary options for astronauts, thus advancing the prospects of sustained human presence in space.

New type of pH adjusted casein extrudate **Mike J. McAnulty**, mcmike6@gmail.com, Benjamin Plumier, Amanda L. Miller, Peggy Tomasula. USDA Agricultural Research Service, Wyndmoor, Pennsylvania The main protein of milk, casein, has been well-characterized for use in edible films. However, it has only recently been described in formulations that can be extruded while maintaining shape post-extrusion, allowing for 3D printed structures. Certain formulations even display slow dissolving characteristics, unlocking applications in which a structure maintains its shape when in contact with a flowing stream. One such formulation with Bingham plastic properties will be described. Instead of depending on a gelation event to transition an extrudable liquid material to a more solid-like material that maintains shape, this thixotropic formulation depends on shear in the form of pre-mixing to temporarily grant extrudable properties. Immediately after pre-mixing, the complex modulus and viscosity increase to such an extent that the extruded materials maintain shape, while the yield stress is still low enough to allow for pneumatic extrusion with applied pressures well below 7 atm. The rheological properties, as well as textural attributes and structural fidelity of 3D printed objects characterized by solubilization rates and swelling in standing and shaken water as functions of formulation pH, will be discussed.

Use of hydrogen sulfide to increase plant growth and harvest yields **Ned B. Bowden**, ned-bowden@uiowa.edu. Chemistry, Univ. of Iowa, Iowa City Hydrogen sulfide is a key gasotransmitter in plants, and results over the last 20 years have shown that its application at small amounts can greatly improve the growth and survival of plants. A challenge in this field is that hydrogen sulfide is a poisonous gas that has a strong, offensive odor. Chemicals to apply hydrogen sulfide directly to plants to avoid a burst release of hydrogen sulfide have been developed but many are expensive or result in pollution. The use of dithiophosphates has been shown to be a solution to this problem. Dithiophosphates slowly release hydrogen sulfide and the rate of release in water can be controlled by varying the functional groups on the chemicals. These chemicals have been shown to increase the growth and harvest yields of a range of crops including corn, soybeans, wheat, and more. This presentation will emphasize the impact of dithiophosphates on plant growth and how they improve crop yields.

Processing & the Storage Induced Toxins

Ethyl carbamate: A feed toxin dilemma in distillers grains co-products **Scott L. Crain**, scrain@veriprime.com, Robert T. Coffey. Research, Veriprime, Meade, Kansas In 1991 there were 2.1 million metric tons (MMT) of distillers grains co-products (DGC) produced by the ethanol industry fed to livestock. By 2019 there were 39 MMT of DGC fed to livestock with 44% going into beef production. According to the USDA Feedlot 2011 report, 90.5% of all feedlots were using some form of DGC. We have identified a new toxin, ethyl carbamate (EC), in DGC. It can be found in fermented foods and spirits and is regulated in many countries. EC is readily formed via the reaction of ethanol, urea, and heat. When EC was found to be a carcinogen in laboratory animals its general use in human medicine ceased in the mid-1970's. In 2007 EC was classified as a Group2A human carcinogen. There is renewed concern about ethyl carbamate being a food and environmental toxicant exacerbating lung disease. We have found EC in the following DGC: wet distillers grains with solubles (WDGS, corn and milo), dried distillers grains with solubles (DDGS), condensed distillers soluble (CDS, syrup), and manufactured feed products containing CDS. When EC is present it is absorbed into the blood and can be evenly distributed in most tissues. Our concern is that EC and its metabolism to its toxic metabolites can be a predisposing factor to bovine respiratory disease and other cattle diseases as well as the presence of a human carcinogen in food products.

Formation of chemical byproducts in foods due to nonthermal processing technologies and chemical treatments **Xuetong Fan**, xuetong.fan@usda.gov. USDA-ARS Eastern Regional Research Center, Wyndmoor, Pennsylvania The presentation will discuss the formation of furan as a result of ionizing irradiation and ultraviolent processing, and chlorine byproducts due to washes with chlorinated water and fumigation with gaseous chlorine dioxide. Results showed that low levels of furan were induced by ionizing irradiation and UV in sugar-rich foods. For example, 3.6 ng/g of furan was found in grapes after 5 kGy gamma irradiation, and 60 ng/ml was detected in apple cider upon exposure to 8.8 J/cm^2 UV-C. Various chlorine by-products have been detected in wash water and fresh produce after sanitation with chlorine. Citric acid, a pH regulator commonly used to maintain the pH of chlorinated water, reacted with chlorine. More than 1000 ng/ml trichloromethane was produced after 30 min of reaction between citric acid and chlorine. Chlorine dioxide fumigation led to the formation of chlorate and other chlorine byproducts. For example, 26.4 μg/g chlorate was found on almonds after treated with gaseous chlorine dioxide at conditions that achieved a 4-log reduction of Salmonella spp. Means and conditions that minimize the formation of the undesirable chemical byproducts will also be discussed.

Differential disposition of deoxynivalenol in nursery and grow-finish pigs under sulfonation-based mitigation treatments revealed by metabolomic profiling **Wes Mosher**[1], moshe096@umn.edu, Dan Yao[1], Molly McGhee[2], Donald Giesting[2], Chi Chen[1,3]. (1) Food Science and Nutrition, Univ. of Minnesota Twin Cities, Minneapolis (2) Cargill Animal Nutrition, Minneapolis, Minnesota (3) Animal Science, Univ. of Minnesota Twin Cities, Minneapolis Deoxynivalenol (DON) is a highly reactive epoxy-sesquiterpenoid mycotoxin commonly present in cereal feed ingredients. Dietary DON contamination negatively affects feed intake, growth, and health status in all stages of swine production. Both in vivo biotransformation, including somatic xenobiotic metabolism and microbial metabolism, and ex vivo chemical mitigation reactions, such as bisulfite-based sulfonation, have been shown to reduce the reactivity and bioavailability of DON and alleviate its toxicity in pigs. However, whether age and growth could affect DON metabolism and chemical mitigation in pigs has not been examined previously. In two feeding trials, 48 nursery pigs and 60 grow-finish pigs, respectively, were fed DON-contaminated feeds with or without bisulfite agents. DON and its mitigation products in feeds, as well as their metabolites in excreta samples (feces and urine), were determined by liquid chromatography-mass spectrometry-based metabolomic analysis. The results showed the abundant presence of DON glucuronides in urine and the absence of free DON in feces, indicating extensive absorption and metabolism of DON occurred in both nursery and grow-finish pigs. Nevertheless, the presence of free DON in urine and de-epoxy deoxynivalenol (DOM) in feces only occurred in nursery pigs, while grow-finish pigs excreted more DOM glucuronides in urine than nursery pigs. Bisulfite additives effectively and dose-dependently decreased DON in pig feeds by forming DON sulfonates (DON-S), including DON-S2 and DON-S3. These DON-S were further enriched and concentrated in feces by the formation of DON-S1 and the increase of DON-S2, potentially through the reactions in the digestive system. In addition, bisulfite additives in feed decreased the urinary excretion of DON and its glucuronides in both nursery and grow-finish pigs, but only increased the fecal excretion of DOM in nursery pigs. Overall, compared to nursery pigs, grow-finish pigs might be more efficient in the microbial conversion of DON to DOM, DOM absorption, and somatic production of their glucuronides, which potentially contribute to their differences in DON disposition after bisulfite mitigation treatments.

Determination of patulin in apple juice and apple-derived products using a robotic sample preparation system and LC-APCI-MS/MS

Kai Zhang, kai.zhang@fda.hhs.gov, Lauren Zhang. Center for Food Safety and Applied Nutrition, US Food and Drug Administration, College Park, Maryland Patulin, a toxic mycotoxin, can contaminate apple-derived products. The FDA has established an action level of 50 ppb (ng/g) for patulin in apple juice and apple juice products. To effectively monitor this mycotoxin, there is a need for adequate analytical methods that can reliably and efficiently determine patulin. In this work, we developed an automated sample preparation workflow followed by liquid chromatography-atmospheric pressure chemical ionization tandem mass spectrometry (LC-APCI-MS/MS) detection to identify and quantify patulin in a single method, further expanding testing capabilities for monitoring patulin in foods compared to traditional optical methods. Using a robotic sample preparation system, apple juice, apple cider, apple puree, apple-based baby food, applesauce, fruit rolls, and fruit jam were fortified with ^{13}C-patulin and extracted using dichloromethane (DCM) without human intervention, followed by LC-APCI-MS/MS analysis in negative ionization mode. The method achieved a limit of quantification of 4.0 ng/g and linearity ranging from 2 to 1,000 ng/mL (r2>0.99). Quantitation was performed by isotope dilution using ^{13}C-patulin as internal standard and solvent calibration standards. Average recoveries (relative standard deviations, RSD%) in seven spike matrices were 95% (9%) at 10 ng/g, 110% (5%) at 50 ng/g, 101% (7%) at 200 ng/g, and 104% (4%) at 1,000 ng/g (n=28). The ranges of within-matrix and between-matrix variability (RSD) were 3-8% and 4-9%, respectively. In incurred samples, the identity of patulin was further confirmed by comparison of the information-dependent acquisition-enhanced product ion (IDA-EPI) MS/MS spectra to a reference standard. Metrological traceability of the patulin measurements, 21.1 ± 8.0 µg/g and 56.6 ± 15.6 µg/g (k=2, 95% confidence interval) were established using a certified reference material and calibration data to demonstrate data confidence intervals.

Bacterial endotoxin lipopolysaccharide increases anti-inflammatory tristetraprolin and proinflammatory tumor necrosis factor and cyclooxygenase 2 gene expression in mouse macrophages **Heping Cao**, heping.cao@usda.gov. Southern Regional Research Center, USDA Agricultural Research Service, New Orleans, Louisiana Food with bacterial contamination may generate large quantity of bacterial endotoxin lipopolysaccharide (LPS), a heat-stable endotoxin derived from gram-negative bacterial cell wall. LPS from intestinal and oral bacteria contribute to the inflammatory burden and disease development. LPS induces a strong immune response in normal mammalian cells. The objective was to investigate LPS regulation of anti-inflammatory tristetraprolin (TTP/ZFP36) family gene and TTP-targeted gene expression in mouse RAW264.7 macrophages. MTT assay showed that LPS was not toxic to cell viability under LPS treatment up to 1000 ng/mL for 2-24 h. LPS mildly affected the soluble protein content in the cells. qPCR assay showed that LPS stimulated TTP mRNA rapidly but not sustainably with 40, 10, and 3 fold of the DMSO control after 2, 8 and 24 h treatment, respectively. Immunoblotting confirmed qPCR results on LPS stimulation of TTP gene expression in the mouse macrophages. LPS exhibited minimal effects on ZFP36L1, ZFP36L2 and ZFP36L3 mRNA levels. LPS increased mRNA levels of TNF, COX2, GM-CSF, INFγ and IL12b up to 311, 418, 11, 9 and 4 fold, respectively. The results that LPS increased both TTP and TTP-mediated TNF and COX gene expression appear to contradictory to the proposed role of TTP effects on destabilizing proinflammatory mRNAs. However, this phenomenon agrees with the well-known fact that most of the other chemicals and agents increase both the anti-inflammatory TTP gene expression and some TTP-mediated proinflammatory gene expression in mammalian cells. In conclusion, this study demonstrated that LPS did not affect macrophage viability, dramatically increased anti-inflammatory TTP gene expression as well as proinflammatory TNF and COX2 gene expression but had only mild effects on TTP homologues and other proinflammatory cytokine gene expression in the mouse macrophages. The results support the concept of feedback inhibition of some proinflammatory gene expression by the anti-inflammatory TTP family proteins.

Evaluating the release of nanomaterial hazards from food packaging using advanced analytical techniques **Tianxi Yang**, tianxi.yang@ubc.ca. Faculty of Land and Food Systems, The Univ. of British Columbia, Vancouver, Canada Food packaging is integral to increasing food safety and quality, extending shelf life and minimizing food waste. Incorporating nanomaterials into polymers-based packaging may improve food quality and safety, but these nanomaterials may leach from the packaging into foods, leading to human exposure to engineered nanomaterials and posing potential health risks. Additionally, conventional petroleum-based plastic packaging may release micro-and nano-plastics, the emerging hazardous materials in food supply chain. The precise amounts and behaviors of these released materials in real food contexts remain largely unknown, possibly due to analytical method limitations. As

such, it is important to develop novel analytical methods for a deeper understanding of nanomaterial release from packaging into different food environments and its implications. In this presentation, I will discuss the recent progress of my research on developing advanced analytical approaches, such as fluorescence spectroscopy, surface-enhanced Raman spectroscopy, and inductively coupled plasma mass spectrometry for investigating the release of engineered nanomaterials (silver nanoparticles), and micro-and nano-plastics from food packaging. Our findings can enhance hazardous nanomaterial detection, improving risk assessment and management of nanomaterials released from packaging in food.

Transfer of toxic elements to beverages from processing aids used during filtration treatments **Lauren Jackson**, Lauren.Jackson@fda.hhs.gov. U.S. FDA, Bedford Park, Illinois Juices, wine and beer can contain elevated levels of toxic elements due to transfer of these contaminants from filtering aids used to clarify these beverages. Several studies were performed to understand the levels of toxic elements found in common filtering aids and the factors that influence transfer of toxic elements from filtering aids to selected beverages. Different types and grades of filtering aids (diatomaceous earth, perlite, cellulose, rice hulls) were first analyzed for total concentrations of arsenic, lead and cadmium. In general, diatomaceous earth (DE) filtering aids had higher arsenic levels than perlite, while lead levels were greater in perlite than DE. Levels of arsenic in cellulose filter aids were the lowest among the surveyed filter aids. All food-grade DE samples were below the U.S. Pharmacopeia limits of 10 µg/g of total leachable arsenic and lead. Using a lab-scale filtration system, experiments evaluated transfer of arsenic, lead and cadmium from food-grade DE to apple and grape juices, beer (ale, lager) and wine (white, red). Use of DE with >3 µg/g inorganic arsenic resulted in significant increases in arsenic levels in the filtered beverages, and the amount of arsenic increased with the amount of DE used during filtration treatments. Beverage pH and soluble solids content did not significantly affect toxic element transfer to the studied beverages. Washing treatments for filtering aids had varying effects on removal of toxic elements. In general, washing DE with water, a citric acid solution or a EDTA solution was successful at decreasing arsenic levels in this filtering aid, while only an EDTA solution reduced lead levels in DE. Cadmium levels in DE were not affected by washing treatments. These studies indicate that steps can be taken to minimize transfer of toxic elements to beverages during filtration treatments.

Waste Upcycling, Indoor Farming & Sustainable Agriculture

Enhanced wound healing efficacy of electrospun porous bilayer nanofibrous fish collagen/PCL bio-composite scaffolds with covalently linked chitooligosaccharides **Seung Hee Moon**, msh7636@naver.com, Won-Kyo Jung, Pathum Chandika. Pukyong National Univ., Busan, Korea (the Republic of) The development of tissue-engineered biodegradable artificial tissue substitutes with extracellular matrix-mimicking properties that govern the interaction between the material and biological environment is of great interest in wound-healing applications. In the present study, novel bilayer nanofibrous scaffolds composed of fish collagen (FC) and poly(ε-caprolactone) (PCL) were fabricated using electrospinning, with the covalent attachment of chitooligosaccharides (COS) via carbodiimide chemistry. The architecture and fiber diameter of the non-cross-linked nanofibrous scaffolds remained consistent irrespective of the polymer ratio under different electrospinning conditions, but the fiber diameter changed after cross-linking in association with the FC content. Fourier-transform infrared spectroscopy analysis indicated that the blend of biomaterials was homogenous, with an increase in COS levels with increasing FC content in the nanofibrous scaffolds. Based on cytocompatibility analysis (i.e., the cellular response to the nanofibrous scaffolds and their interaction), the nanofibrous scaffolds with high FC content were functionally active in response to normal human dermal fibroblast-neonatal (NHDF-neo) and HaCaT keratinocyte cells, leading to the generation of a very effective tissue-engineered implant for full-thickness wound-healing applications. In addition to these empirical results, an assessment of the hydrophilicity, swelling, and mechanical integrity of the proposed COS-containing FC-rich FC/PCL (FCP) nanofibrous scaffolds confirmed that they have significant potential for use as tissue-engineered skin implants for rapid skin regeneration.

Molecular Networking LC-HRMS as a tool for discovering novel potential bioactives in Bell pepper **James Redwine**[3,1], jredwine@kalsec.com, Cristina Matias Sainz[1,2], Wouter de Bruijn[1]. (1) Food Chemistry, Wageningen Univ. & Research, Wageningen, Gelderland, Netherlands(2) Centro Nacional de Tecnologia y Seguridad Alimentaria, San Adrian, Navarra, Spain(3) Kalsec Inc, Kalamazoo, Michigan Bell peppers are a nonpungent variety of Capsicum annuum of high culinary and commercial importance. As one of the most cultivated non-caloric crops (by weight), they also represent a very abundant biomass for production of natural products. Previous studies have done a great job in tracing the production of various compounds of known importance for human health, such as vitamins, pigments, and potentially bioactive phenolics. However, little nontargeted work has been performed to understand a wider array of secondary metabolites. This work uses LC coupled with high resolution mass spectrometry (LC-HRMS) to perform nontargeted analysis of fresh and roasted bell peppers. Feature based molecular networking (FBMN) via tools available through GNPS were used to analyze the resulting data. A previously noted class of bioactive compounds known as acyclic diterpene glycosides (DTGs) was identified as being highly represented in the dataset, and much more complex than previously reported. Several previously unreported species within this class were discovered using the FBMN approach. These DTGs have previously been shown to have important activities for plant defense, and potential antimicrobials. It is hoped that the tools used in this study can help improve future nontargeted metabolic studies of peppers and other agricultural products. Several method and analysis optimizations will be demonstrated that helped to optimize discovery of the new components of this compound class. It is noted that the tools demonstrated in this study are highly scalable, flexible, and rely on open source, vendor agnostic data analysis software. These types of tools serve well to identify potential targets for waste stream valorization, or potential inputs for downstream processing such as enzymatic treatments.

Impact of salinity stress on growth, aroma, and gene expression of hydroponic fennel (Foeniculum vulgare Mill.) **Jingsi Liu**[1], jingsi@vt.edu, Adam Sumner[2], Alex Harris[2], Wangyi Wei[1], Bastiaan Bargmann[2], David Haak[2], Yun Yin[1]. (1) Food Science and Technology, Virginia Polytechnic Institute and State Univ., Blacksburg (2) School of Plant and Environmental Sciences, Virginia Polytechnic Institute and State Univ., Blacksburg Water salinization poses a major threat to the agricultural and food systems. Previous research has shown that fennel can be utilized as a salt-tolerant plant to grow in arid regions. However, the impact of salinity stress on fennel aroma and genes underlying these changes is still unknown. The objective of this study was to investigate the effects of salinity stress on the growth, volatile aroma compounds, and gene expression of fennel (Foeniculum vulgare Mill., cultivar Grosfruchtiger) cultivated with nutrient film technique (NFT) hydroponic systems in a greenhouse environment. The experiment followed a randomized block design with four salinity treatments. Fennel was grown under varying salinity levels, with electrical conductivity controlled at 1.4, 3.4, 5.4, 7.4 dS/m, representing 0, 20, 40, and 60 mM additional

NaCl. After 3 and 6 weeks of exposure to salinity stress, fennel samples were harvested. Plant growth parameters were measured upon harvest, and aroma characterization of fennel leaves was performed using headspace solid phase microextraction – gas chromatography – mass spectrometry – olfactometry (SPME-GC-MS-O). Quantitation of aroma compounds was performed using standard addition methods. RNA sequencing (RNA-Seq) and bioinformatics analysis were performed to study the changes in gene expression levels. The results showed that the salinity stress caused a significant decrease in plant height, plant width, number of branches, and fresh biomass ($p<0.05$) in both week 3 and week 6 samples. Based on preliminary GC-O, the most representative fennel aroma compounds, including 3 monoterpenes, 4 alcohols, 1 ketone, and 5 phenylpropanoids, were selected and quantified. Two-way ANOVA showed that salinity induced significant changes in the concentrations of α-pinene, α-phellandrene, cis-3-hexenal, and apiol ($p<0.05$). However, the overall content of aroma-active compounds was not significantly discriminated by either salinity level or harvest time. RNA-Seq and gene expression analysis will help understand how salt stress regulates corresponding genes. The results are useful for breeding work and decision-making in sustainable agriculture. The present study demonstrates the utilization of indoor farming techniques and chemistry tools to evaluate the influence of abiotic factors on crop flavor quality.

Comparison of physiochemical properties of lettuces from open field and various hydroponic conditions Elizabeth Kwock[1], Genhua Niu[2], **Xiaofen Du**[1], xdu@twu.edu. (1) Texas Woman's Univ., Denton (2) Texas A&M AgriLife Research and Extension Center, Dallas Most lettuce produced in the US is grown using conventional agricultural methods, namely large-scale open field farming. However, due to climate change and water scarcity, there is an increasing interest in controlled environment agriculture technology, such as hydroponics. This study aimed to compare effects of growing conditions and variety on lettuce physiochemical properties. Rex and Rouxai cultivars were grown under four growing conditions (open field, hydroponic in 30°C nutrient solution, and hydroponic in 20°C nutrient solution) at Texas A&M AgriLife, Dallas Center. Pigment concentrations, total polyphenols, and antioxidant capacities were determined with spectrophotometric methods, while soluble sugar and organic acid contents were quantified with high performance liquid chromatography (HPLC). Standard hydroponics produced the most total polyphenols in the Rex cultivar (0.665-0.748 mg/100g GAE) and pigment compounds (2x concentration increase from open field); open fields produced the most total polyphenols in the Rouxai cultivar (1.286-1.303 mg/100g GAE) and the highest antioxidant capacity (10x concentration increase from hydroponics). The 20°C-solution in hydroponics produced the most soluble sugars (total concentration approx. 285 mg/g FW); The 30°C-solution in hydroponics produced the most organic acids (total concentration 54.227-66.286 mg/g FW). These results will help lettuce producers determine how different growing condition(s) affect the quality of the lettuce they produce.

Controlled environment agriculture: Supplemental blue and UV-B light modulates tomato phenolic compounds and antioxidant activity in a variety-dependent manner **Samikshya Bhattarai**[1,2], bsami@tamu.edu, Deepak Jha[1,2], Shuyang Zhen[1], Bhimu S. Patil[1,2]. (1) Dept. of Horticultural Sciences, Texas A&M Univ., College Station (2) Vegetable and Fruit Improvement Center, Dept. of Horticultural Sciences, Texas A&M Univ., College Station Controlled environment agriculture (CEA) is gaining momentum as a sustainable approach to address food security challenges amidst changing climatic conditions and demographics. Environmental factors, particularly light, can influence crop quality by altering the plant's physio-biochemistry in a genotype-dependent manner. Several studies have emphasized the role of light quality, intensity, and duration as major determinants of the overall quality of commodities. However, research on the effects of supplemental blue and UV-B light on important quality traits such as antioxidant activity (AA) and phenolic content (PC) of greenhouse-grown tomato fruits remains limited. Thus, the current study was conducted with three tomato varieties (Celebrity, Plum Regal, and TAM Hot-Ty) exposed to supplemental blue, UV-B, a combination of blue and UV-B, or control (no supplemental lighting) to assess changes in AA and PC and examine their relationship. Additionally, the antioxidant kinetics were also measured. Our findings revealed that UV-B exposure consistently led to a higher accumulation of PC and an overall increase in AA. However, blue light supplementation and the combination showed varied responses in a variety-dependent manner. AA exhibited a mostly hyperbolic pattern with varying kinetic slopes. Upon linearization, different slope values emerged. Notably, UV-B and blue light treatment had a higher slope than the control, indicating higher antioxidant accumulation along with phenolics. Furthermore, PC and AA exhibited a strong correlation ($R^2>0.9$), but the slope values varied, implying the involvement of other bioactive compounds alongside phenolics in AA. Overall, our study highlights the significance of optimizing the growth environment to enhance the quality of tomatoes, a practice applicable to a range of other commodities.

Flavor composition and shelf-life of cherry tomatoes (Solanum lycopersicum var. cerasiforme) grown in field and controlled environment **Isabel Gutierrez**[1], isabelg@vt.edu, Joseph Eifert[1], Sean F. Okeefe[1], Kaylee South[2], Michael Evans[2], Yixiang Xu[3], Thomas Kuhar[2], Yun Yin[1]. (1) Food Science and Technology, Virginia Polytechnic Institute and State Univ., Blacksburg (2) School of Plant and Environmental Sciences, Virginia Polytechnic Institute and State Univ., Blacksburg (3) Healthy Processed Foods Research Unit, USDA-ARS Western Regional Research Center, Albany, California Cherry tomatoes (Solanum lycopersicum var. cerasiforme) are one of the most highly consumed vegetable crops worldwide and have gained popularity as a snack or topping on salads, but commercially available tomatoes are often perceived as bland, leading to consumer dissatisfaction. Understanding the flavor profile of cherry tomatoes and the impact of Controlled Environment Agriculture (CEA) will help guide quality production of cherry tomatoes. Two cultivars, Red Velvet and Micro Tom, of cherry tomatoes were harvested from two conventional farms and two indoor hydroponic systems. Volatile compounds in cherry tomatoes were characterized by gas chromatography-mass spectrometry coupled with olfactometry (GC-MS-O). Non-volatile-metabolic profile analysis used liquid chromatography-mass Spectrometry (LC-MS). Physiochemical parameters, including total soluble solids (TSS), titratable acidity (TA), and shelf-life indicators such as percent weight loss (PWL), were measured over a 5-week storage period. Season 1 findings suggested hydroponic cherry tomatoes have higher concentrations of characteristics aroma compounds including hexanal ("freshly cut grass"), 2-hexenal ("fruity", "apple"), and 2-isobutyl thiazole ("ripe tomato") compared to those grown from conventional farms ($p<0.05$). TSS and TA were significantly higher in both cultivars grown in indoor hydroponic system with complete artificial lighting, suggesting higher sweetness and acidity. The shelf-life study showed higher weight loss in conventionally farmed tomatoes (up to 80% PWL) compared to the hydroponic tomatoes (up to 45% PWL) after 5 weeks. Hydroponic systems may provide comfortable growing conditions for fruits and vegetables to focus more on phytochemical production instead of combating adverse environments providing a possible reasoning for the observed results. Hydroponic cherry tomatoes showed promise as an alternative to conventional farming in terms of storability and flavor.

VIRTUAL SESSION
Virtual Graduate Students Symposium in Asia-Pacific Region on Agricultural & Food Chemistry

Energy status regulated umami compound metabolism in harvested shiitake mushrooms (Lentinus edodes) with spores triggered to release **Rongrong Xia**, xiarr0823@163.com, Heran Xu, Guang Xin, Zhenshan Hou, Miao Yan, Yafei Wang, Guanlin Qian, Yitong Qiao. Shenyang Agricultural Univ., Shenyang, Liaoning, China The molecular mechanisms of energy status related to the umami taste of postharvest shiitake mushrooms during spore release remain poorly understood. In this study, the variations of energy status and umami taste of mushrooms were measured at 25 °C. At 24 h storage, slight spore prints of mushrooms were first pictured, respiration peaked. Significant ATP decrease and ADP increase were also observed as the initiation of postharvest senescence ($P < 0.05$). Meanwhile, the activities of phosphohexoseisomerase, succinate dehydrogenase, glucose-6-phosphate dehydrogenase and cytochrome c oxidase and the contents of umami nucleotides and amino acids were maintained at higher levels in mushrooms with spore release. Notably, the equivalent umami concentration (EUC) was strongly correlated with energy levels ($r = 0.80$). Fifteen related gene expression levels in the energy metabolism pathway were downregulated. LecpdP1 and LeAK were significantly expressed in the conversion of ATP into AMP and played key roles in connecting the energy state and umami level. These results provided valuable insights on the umami taste associated with energy metabolism mechanism during postharvest mushroom spore release. Hypothetical model of the molecular mechanism of umami compounds metabolism of shiitake mushrooms during spore release.

Analytical strategies for detecting low molecular weight toxicants in food matrices by MALDI-TOF MS **Xi Zeng**[1,2], lovelyzeng@126.com, Yu Wang[2], Zhen-Lin Xu[1]. (1) South China Agricultural Univ. College of Food Sci., Guangzhou, Guangdong, China(2) Guangzhou Institute of Food Inspection, Guangzhou, Guangdong, China Matrix-assisted laser desorption ionization-time of flight mass spectrometry (MALDI-TOF MS) is a soft ionization biological technique widely used in macromolecules which ensures the integrity of target molecule better without fragment ions and shows great advantages and potential in analysis and identification of small molecular compounds with its superior selectivity, sensitivity, high-throughput, impurity tolerance and advantage of simple preparation and less sample consumption. In this work, 19 toxic compounds were selected to explore the possible application with proper optimize of matrix type and solvent, laser intensity and spotting methods of MALDI-TOF MS. We achieved excellent results using 1,5-naphthalenediamine (1,5-DAN) for the screening and semi-quantitative of five perfluoroalkyl acids in fish and meat with the regression coefficients (R) were all above 0.985 at the linear range from 100 to 1000 mg/L. α-Cyano-4-hydroxycinnamic acid (CHCA) was effectively employed for the simultaneous determination of three anti-hypertensive drugs in dietary supplements, demonstrating low limits of identification (LOI) (0.005-0.25 μg/g) and the good recoveries (67.56%-104.70%) among real samples. Similarly, sinapinic acid was selected for the simultaneous determination of ten aphrodisiac drugs in food with the limits of detection (LOD) and recoveries were 0.1-1.0 ng/mL and 73.4%~109.9% for health wine, soft capsule and coffee samples. Furthermore, we developed a methyl-functional flexible crystalline microporous Cu-based mental organic frameworks (MOFs) for the analysis of reserpine, achieving a high regression coefficient (R value) and recoveries (85.9%-96.3%) in a linear range of 10-100 ng/mL among real samples. Additionally, CHCA also showed superior performance of determination of cereulide, an exotoxin secreted by Bacillus cereus, in cooked rice and dairy products, with the LODs and recoveries in the range of 3.0-5.0 ng/mL and 73.3%-118.2%, respectively. These findings represent preliminary explorations into the determination of detrimental compounds in food science using MALDI-TOF MS, offering new insights and applications for small molecular analysis and contributing to the advancement of food safety and quality control.

Study on the hypolipidemic effect of lotus seed resistant starch and sodium lactate regulating intestinal flora and metabolism in hyperlipidemia rats **Lu Liu**[1,2], liulufst@163.com, Zebin Guo[1,2], Baodong Zheng[1,2], Hongliang Zeng[1,2], Yi Zhang[1,2]. (1) College of Food Sci., Fujian Agriculture and Forestry Univ., Fuzhou, Fujian, China(2) Fujian Provincial Key Laboratory of Quality Science and Processing Technology in Special Starch, Fujian Agriculture and Forestry Univ., Fuzhou, Fujian, China In this study, RS3-type lotus seed resistant starch (LRS3) and sodium lactate (SL) were used to intervene in high-fat diet-induced hyperlipidemic SD rats. Based on the determination of physiological indices in rats, the mechanism of LRS3 and SL in regulating intestinal flora and metabolism-mediated lipid-lowering effects in hyperlipidemic rats was investigated by combining high-throughput sequencing and non-targeted metabolomics techniques. The results showed that LRS3 and SL synergistically controlled body weight gain, regulated blood lipid levels, reduced fat accumulation in hepatocytes, and ameliorated inflammation and injury in cardiac arteries, liver, small intestine, and colon tissues of hyperlipidemic rats. LRS3 and SL synergically promote the growth of Ruminococcus and Treponemas and inhibit the growth of Romboutsia, thereby promoting the production of carvacrol, estrone glucuronide, palmitic acid, ricinoleic acid, and other metabolites in the intestinal tract of rats, reducing the contents of androsterone, acetylcysteine, and other substances, and affecting glutathione metabolism. Pentose and glucuronic acid mutual conversion, taurine and taurine metabolism, and other lipid, amino acid, and carbohydrate metabolism pathways, to achieve the effect of lowering blood lipid.

Bifidobacterium lactis Probio-M8 relieved acute Respiratory tract infections in children possibly by modulating the gut microbes and metabolites Yalin Li[1], **Xuan Shi**[1], shixuan981101@163.com, Teng Ma[1], Weiwei Hu[1], Hao Jin[1], Heping Zhang[1], Mintze Liong[2], Zhihong Sun[1]. (1) Inner Mongolia Agricultural Univ., Hohhot, Inner Mongolia, China(2) Univ. Sains Malaysia, Penang, Malaysia Respiratory tract infections constitute a significant global public health concern, accounting for around 20% of child fatalities worldwide. Modulating the gut microbiota have the potential to serve as a promising strategy for both the prevention and treatment of respiratory infections. According to our prior research, the consumption of Bifidobacterium lactis Probio-M8 can notably enhance symptoms associated with respiratory tract infections in infants and young children. The current study is a follow-up work aimed at exploring the functional role of the gut microbes in the observed beneficial effects. We analyzed the fecal metagenomes of patients in both the probiotic group (n=50) and the placebo group (n=49). The results showed that Probio-M8 intervention may regulate the host inflammatory response by regulating the balance of intestinal microorganisms, bioactive metabolites and related pathways. Provides new insights into the study of probiotics in alleviating diseases related to the gut-lung axis.

Predicting Lactobacillus delbrueckii subsp. bulgaricus-Streptococcus thermophilus interactions based on a highly accurate semi-supervised learning method **Shujuan Yang**, 13948471644@163.com, Mei Bai, Weichi Liu, Zhihong Sun. Inner Mongolia agricultural Univ., Hohhot, China Lactobacillus delbrueckii subsp. bulgaricus (L. bulgaricus) and Streptococcus thermophilus (S. thermophilus) are commonly used starters in milk

fermentation. Fermentation experiments revealed that L. bulgaricus-S. thermophilus interactions (LbStI) substantially impact dairy product quality and production. However, an artificial intelligence-based method for screening interactive starter combinations is lacking. This study aimed to develop a semi-supervised learning framework for predicting LbStI using genomic data from 362 isolates (181 per species). The framework consisted of a two-part model: a co-clustering prediction model (based on the Kyoto Encyclopedia of Genes and Genomes dataset) and a Laplacian regularized least squares prediction model (based on k-mer analysis and gene composition of all isolates datasets). To enhance accuracy, we integrated the separate outcomes produced by each component of the two-part model to generate the ultimate LbStI prediction results, which were verified through cross-validation, machine learning, and milk fermentation experiments. The first two validation approaches demonstrated that our accuracy reached 93.68% and 89.47%, respectively. Validation through milk fermentation experiments confirmed a high precision rate of 85% (17/20; validated with 20 randomly selected combinations of expected interacting isolates). Our data suggest that the biosynthetic pathways of cysteine, riboflavin, teichoic acid, and exopolysaccharides, as well as the ATP-binding cassette transport systems, contribute to the mutualistic relationship between these starter bacteria during milk fermentation. However, this finding requires further experimental verification. The presented model and data are valuable resources for academics and industry professionals interested in screening dairy starter cultures and understanding their interactions.

Super antibacterial capacity and cell envelope-disruptive mechanism of ultrasonically grafted n-Halamine PBAT/PBF films against escherichia coli **Xinhui Zhang**, 21913086@zju.edu.cn, Mingming Guo. Zhejiang Univ., Hangzhou, Zhejiang, China Antibacterial materials are urgently needed to combat bacterial contamination, growth, or attachment on contact surfaces, as bacterial infections remain a public health crisis worldwide. Here, a novel ultrasound-assisted method is utilized for the first time to fabricate oxidative chlorine-loaded AH@PBAT/PBF-Cl films with more superior grafting efficiency and rechargeable antibacterial effect than those from conventional techniques. The films remarkably inactivate 99.9999% Escherichia coli and Staphylococcus aureus cells, inducing noticeable cell deformations and mechanical instability. The specific antibacterial mechanism against E. coli used as a model organism is unveiled using several cell envelope structural and functional analyses combined with proteomics, peptidoglycomics, and fluorescence probe techniques. Film treatment partially neutralizes the bacterial surface charge, induces oxidative stress and cytoskeleton deformity, alters membrane properties, and disrupts the expression of key proteins involved in the synthesis and transport of the lipopolysaccharide and peptidoglycan, indicating the cell envelope as the primary target. The films specifically target lipopolysaccharides, resulting in structural impairment of the polysaccharide and lipid A components, and inhibit peptidoglycan precursor synthesis. Together, these lead to metabolic disorders, membrane dysfunction, structural collapse, and eventual death. Given the films' antibacterial effects via the disruption of key cell envelope components, they can potentially combat a wide range of bacteria. These findings lay a theoretical basis for developing efficient antibacterial materials for food safety or biomedical applications.

Spoilage mechanism of effctor protein Hap secreted by Aeromonas salmonicida on chilled meat **Liangting Shao**, 707075714@qq.com, Huhu Wang. Nanjing Agricultural Univ., Nanjing, Jiangsu, China The dominant microorganisms are the primary determinant of the spoilage process of chilled meat and losses of edible quality. Aeromonas is a ubiquitous aquatic bacteria, and it has been discovered to be involved in the dynamics of meat spoilage during processing and consumption, but its related knowledge is quite limited. In this study, a total of 12 isolates of Aeromonas from the chilled chicken were tested to characterize the heterogeneity and strength of spoilage in vitro and in situ. On the basis of obtaining Aeromonas salmonicida 29/57 with strong/weak spoilage ability, the spoilage effector protein hemagglutinin protease (Hap) belonging to the M4 family metallopeptidase (Accession number: WP_087757239.1) was identified from the extracellular secretions of A. salmonicida by multi-omics and protein purification technology, respectively. The results revealed that Hap played a determining role in the process of meat spoilage, which has strong spoilage activity and meat proteolytic activity on chilled meat, and its amino acid sequence is conserved in common dominant spoilage bacteria. Further investigation found that Hap could significantly degrade myofibrillar proteins (MPs), which could alter MPs' tertiary structure, secondary structure, and sulfhydryl groups, focusing primarily on myosin heavy chain (MHC) and actin. These findings will provide a primary basis for further exploration of the mechanisms of Aeromonas spoilage and and provide candidate genes and strategies for future prevention and control technology development.

Screening of probiotics producing biofilm and evaluation of their probiotic properties **Yinxue Liu**, liuyinxue_1121@126.com, Yisuo Liu, Jiayuan Cao, Huaxi Yi. Ocean Univ. of China, Qingdao, Shandong Probiotics, as important microorganisms in the food industry and human gut, can better perform their probiotic effects if they exist in the biofilm state. Currently, there are few research reports on probiotics that produce biofilm. In this study, the excellent strains with high yield of biofilm were screened, and the probiotics properties of the biofilm and planktonic strains were evaluated respectively. The high yield biofilm of Lacticaseibacillus casei SB27 and Lactiplantibacillus plantarum FWDG were screened by crystal violet staining. Under the environment of heat, acid, bile salt, and simulated artificial gastrointestinal fluid, both of probiotics in the biofilm state exhibited stronger stress resistance and higher survival rate than that of the planktonic state. The results of surface property measurements showed that both of probiotics had stronger self-aggregation ability, while there was no significant difference in surface hydrophobicity. In the Caco-2 cell adhesion experiment, both strains showed stronger adhesion and colonization ability. In vivo adhesion experiments, it revealed that the two strains of the biofilm state adhered to the gastrointestinal tract of mice higher than those in the planktonic state. The above studies showed that the two probiotics could better exert their beneficial properties in the biofilm state compared with the planktonic state, which provided a new idea for the development of high-vitality probiotics.

Simple and effective probiotic single-cell encapsulation system based on milk exosomes **Hao Linlin**, haoqh5la@163.com, Yinxue Liu, Jiayuan Cao, Yisuo Liu, Huaxi Yi. College of Food Sci. and Engineering, Ocean Univ. of China, Qingdao, Shandong Oral administration of probiotics is a promising way to regulate the balance of intestinal flora. Nevertheless, the poor stability of probiotics during oral administration and high sensitivity to the gastrointestinal environment can affect their activity, resulting in low bioavailability. We developed a simple and effective probiotic single-cell encapsulation system. Based on the click reaction of phenylboric acid, a layer of exosomes was deposited on the surface of probiotics, so that the exosomes acted as armor modification and protected the probiotics from the adverse environment of the gastrointestinal tract. The loading efficiency of Bifidobacterium lactis BB12 and Akkermansia muciniphila could reach more than 80%. This encapsulation does not affect the growth of probiotic strains, and can significantly improve the survival ability of probiotics in harsh

environments. At the same time, under the modification of milk exosomes, the adhesion of probiotics to intestinal cells is improved, which helps to prolong the residence time of probiotics in the intestine and enhance its regulatory effect on the intestinal environment. In addition, milk exosomes are non-toxic and have good bioavailability, ensuring their safe use in vivo. This work provides a simple and feasible scheme to achieve precise delivery of probiotics.

Effects of psyllium husk and Ligilactobacillus salivarius Li01 in relieving loperamide induced constipation and regulating metabolism **Lvwan Xu**, 2673287101@qq.com. Zhejiang Univ., Hangzhou, Zhejiang, China Constipation is a gastrointestinal disease characterized by difficult defecation, abdominal pain and distension, which seriously affects the physical and mental health of patients. Treatments with laxatives may have side effects. Ligilactobacillus salivarius Li01 (Li01) is a probiotic known to prevent constipation in mice. Psyllium husk (PSH) is a dietary fiber with water retention and intestinal lubrication. We explored whether they could play a synergistic role in relieving constipation. In vitro, Li01 can produce short chain fatty acids (SCFAs) in MRS medium and ferment PSH. In mice model of constipation induced by loperamide, Li01 combined with PSH alleviated constipation, increased serum substance P (SP) and gastrin (GAS), activated interstitial cells of Cajal (ICCs), altered transcription of genes in colon tissue, and increased hyodeoxycholic acid (HDCA). When gut microbiota was exhausted by antibiotics, Li01 combined with PSH can still effectively relieve constipation in mice, restore intestinal microecology, and increase the level of SCFAs. Our results showed that Li01 combined with PSH could relieve constipation through regulating microecology and metabolism independent of the normal flora.

Identification, characterization, and receptor binding mechanism of new Umami peptides from traditional fermented soybean paste (Dajiang) **Kaixin Cao**[1], ckx0624@163.com, Feiyu An[1], Junrui Wu[1], Shuaiqi Ji[1], Yaozhong Rong[2], Yuchen Hou[1], Xuwen Ma[1], Wenxin Yang[1], Longkun Hu[1], Rina Wu[1]. (1) Shenyang Agricultural Univ., Shenyang, Liaoning, China(2) Shanghai Totole Food Co., Ltd., Shanghai, China Dajiang, a traditional Chinese condiment, is made from fermented soybeans. It is highly popular among consumers as a result of its delicious umami flavor, which mainly originates from umami peptides. To examine the mechanism of umami taste in Dajiang, we selected Dajiang samples with strong umami taste and subjected them to purification and identification analysis using ethanol precipitation, gel chromatography, reversed-phase high-performance liquid chromatography, and ultraperformance liquid chromatography–tandem mass spectrometry. Subsequently, on the basis of toxicity and umami prediction analysis, we screened, synthesized, and characterized three novel bean umami peptides in Dajiang: TLGGPTTL, 758.4174 Da; GALEQILQ, 870.4811 Da; and HSISDLQ, 911.4713 Da. Their sensory threshold values were 0.25, 0.40, and 0.17 mmol/L, respectively. Furthermore, molecular docking results showed that hydrogen-bonding and hydrophobic interactions are important interaction forces in the binding of umami peptide to taste receptors. Ser147 and Glu148 of the T1R3 taste receptor are important amino acid residues for binding of the three umami peptides. This study uncovers the mechanism of umami-peptide-driven flavor in fermented soybean products.

Construction of interface-enhanced curcumin-loaded nanostructured lipid carriers and their multi-responsive microspheres **Dian Liu**[1], liudian145@163.com, Liqiang Zou[1], Chunyang Li[2], Jin Feng[2], Jing Zhang[2]. (1) College of Food Sci. and Tech., Nanchang Univ., Nanchang, Jiangxi, China(2) Institute of Agro-product Processing, Jiangsu Academy of Agricultural Sciences, Nanjing, Jiangsu, China In this work, the interfacial structure of nanostructured lipid carriers (NLCs) stabilized by whey protein isolate was modified with polysaccharide through two approaches: 1) electrostatic deposition of a polysaccharide layer onto the surface of NLCs; 2) heating the protein-polysaccharide complexes to promote biopolymer assembly, which were utilized as emulsifiers for NLCs. The type 2 strategy enabled a more compact and elastic stabilization layer than the type 1 method and thus the prepared NLC has higher stability. Both approaches could slow down the lipolysis rate as well as decrease the lipolysis degree of NLCs during simulated digestion, while increase the bioavailability of the entrapped Cur. Further, the electrospray method was used to compound Cur-NLCs and magnetic gelatin to construct microspheres with multiple responsiveness. The stability of the microspheres was good during the storage process, and the Cur retention rate was above 80% after 28d storage. The multi-responsivity study showed that the microspheres were sensitive to magnetism, temperature, acidity and NaCl. The in vitro release experiments showed that the microspheres had an S-shaped Cur release curve, and the pH and NaCl of the release medium affected the release of Cur. This study is insightful for the development of a highly stable Cur delivery system and the construction of its intelligent delivery route.

Structure and antioxidant activity analysis of the different black beans protein hydrolysates **Lulu Li**, lilulushunliyitain@163.com, Na Zhang, Yang Yang, Chun-Min Ma, Bing Wang, Xing Bian, Guang Zhang. Harbin Univ. of Commerce, Harbin, Heilongjiang, China This study aimed to hydrolyze black bean protein using five enzymes (alcalase, pepsin, chymotrypsin, papain, and bromelain) in order to obtain five enzymatic hydrolysates and to elucidate the effect of enzymes on structural and antioxidant activities of the resulting hydrolysates. The antioxidant of the black bean protein hydrolysates was evaluated through in silico analysis, revealing that the alcalase hydrolysate exhibited the highest potential, followed by the papain and bromelain hydrolysates. Subsequently, the degree of hydrolysis (DH), molecular weight distribution (MWD), amino acid composition, structure, antioxidant activities in vitro of black bean protein hydrolysate were analyzed. After enzymatic treatment, the particle size, polymer dispersity index (PDI), ζ-potentials, β-sheet content and α-helix content of black bean protein hydrolysates was decreased, and the maximum emission wavelength of all black bean protein hydrolysates exhibited red-shifted, which all suggesting the structure of bean protein hydrolysates was unfolded. More total amino acids (TAAs), aromatic amino acids (AAAs), and hydrophobic amino acids (HAAs) were found in alcalase hydrolysate. For 1,1-Diphenyl-2-picrylhydrazyl (DPPH) radical scavenging activity, metal ion chelating activity, 2,2'-Azinobis-3-ethylbenzthiazoline-6-sulphonate (ABTS) radical scavenging ability and hydroxyl radical scavenging ability, alcalase hydrolysate had the lowest IC50, and the results revealed that alcalase hydrolysate exhibited the antioxidant activities.

Effect of subzero temperatures on the properties and structure of soy protein isolate emulsions **Haiyue Hu**, helen_hu1997@163.com. Tianjin Univ. of Science and Technology, Tianjin, China Different freezing temperatures (-5, -20, -40 and -80°C) could change soy protein isolate (SPI) structure and emulsion properties. After freezing at -5°C and -20°C, the structure of the SPI loosened, the fluorescence intensity was red shifted, and the proportion of Phe, Tyr and Trp exposed increased. With decreasing temperature, the surface hydrophobicity (H_0×100), the number of sulfhydryl groups and the number of disulfide bonds all rose, then fell (-40°C), and rose again (-80°C). The β-sheet content in the protein secondary structure increased from 32.71% (control) to 50.66% (-40°C) and then decreased to 37.05% (-80°C), while the β-turn and random coil contents showed the opposite pattern, which also

confirmed aggregation. The emulsification performance of SPI after freezing treatment was decreased. The results of this study provide theoretical support for future production of frozen foods with added SPI.

Role and mechanism of three bile salt hdrolases in bile tolerance of Lactobacillus acidophilus ATCC 43121 **Hua Wu**, 1012718686@qq.com. Northwest A&F Univ. College of Food Sci. and Engineering, Yangling, Shaanxi, China Bile salt hydrolase (Bsh) plays an important role in bile acid-mediated signaling pathways. According to studies, Bsh possesses dual roles in bile acid metabolism, including deconjugation activity and bile acid amine N-acyltransferase activity. There are, however, many studies that conflict on the relationship between Bsh activity and intestinal bacterial tolerance to bile salts. Herein we reported that Bsh deconjugation activity is related to bile salt tolerance in Lactobacillus acidophilus ATCC 43121. A study specifically tested the conjugation abilities of four bsh knockout strains and three bsh complementation strains of Lactobacillus acidophilus ATCC 43121 to show that Bsh3 plays a major role in bile salt tolerance and Bsh has a higher substrate specificity to glycine-conjugated bile salts. Molecular docking and molecular dynamics simulations revealed that the active pocket of Bsh3 is most tightly bound to substrate, providing further evidence that Bsh3 contributes to bile salt tolerance. It was determined through the determination of bile salt tolerance and cell biological indicators that bile salt hydrolase is capable of resisting bile salt stress by maintaining the integrity of the cell membrane, transmembrane potential difference, transmembrane pH gradient, and intracellular ATP level. As a result of these studies, it has been confirmed that bile salt hydrolase has a direct relationship to bile salt tolerance in Lactobacillus acidophilus ATCC 43121, and that the mechanism of bile salt hydrolase action is fully explained.

Emulsifying properties of Maillard reaction products from brewer's spent grain protein and gum Arabic **Mingyu Kim**, 123atom99@naver.com, Kwang G. Lee. Food science and Biotechnology, Dongguk Univ., Jung-gu, Seoul, Korea (the Republic of) In this study, emulsifying and flavor properties of Maillard reaction product (MRP) from brewer's spent grain (BSG) protein and gum arabic (GA) were investigated. Brewer's spent grain protein was extracted by adjusting pH of BSG solution, then lyophilized. BSG protein and GA were dissolved in phosphate buffer (0.2 M, pH = 7.2) to make 1% (w/w) of each solution. Same volume of each solution was mixed. Resulting solutions were conventionally heated by water bath for 1, 3, 5, 7 hours at 90 degrees Celsius. Heating assisted by ultrasound was also conducted for 15, 30, 45 min with intensity of 44.2 ± 0.1 W/cm^2 at 90 degrees Celsius. As a control group, unheated protein solution and protein-GA mixture were chosen. Intermediate MRPs and melanoidin content were increased as the heating time increased. This phenomenon was observed in both conventional heating and ultrasound-assisted heating. Degree of grafting was also increased by increment of heating time. Emulsion activity index (EAI) and emulsion stability index (ESI) were significantly improved by Maillard reaction. With conventional heating samples, sample heated for 3 hours featured highest EAI (67.9 ± 0.3 m^2/g) and ESI (45.3 ± 0.7 min). And among the samples with ultrasound treatment, sample treated for 45 min showed highest EAI (70.0 ± 0.6 m^2/g) and ESI (23.1 ± 0.3 min). Particle size of emulsion showed smaller in heated samples. In conventionally heated samples, 5 hour heated sample appeared smallest droplet size (389.9 ± 54.1 nm), and ultrasound-assisted samples treated for 30 min were found to have the smallest droplet size (489.8 ± 43.0 nm). Zeta potential of emulsion droplets in conventionally heated samples for 3 hours and ultrasound-treated samples for 30 min were observed to have higher absolute value for -40.0 ± 0.4 mV and -39.1 ± 0.2 mV respectively, than protein and GA mixture. This study suggests a potential approach for enhancing the emulsifying properties of BSG.

THURSDAY MORNING August 22
Elevating Sustainability & Greentech in Agriculture & Plant-Based Foods

Characterization of glandless cottonseed protein in fortified beverages **Heping Cao**, heping.cao@usda.gov, Kandan Sethumadhavan, H.N. Cheng. Southern Regional Research Center, USDA Agricultural Research Service, New Orleans, Louisiana Cotton (Gossypium hirsutum L.) produces 50 million metric tons of seed annually. Among them, about 10 million metric tons of protein could be produced from glanded cottonseed. This vast protein resource could potentially meet the protein needs of half a billion people. However, high levels of toxic gossypol in glanded seed limit its use primarily for feeding ruminants. Glandless cottonseed may be useful as human food and non-ruminant animals feed sources due to only trace levels of gossypol. Our objective was to develop acidic juices and drinks fortified with glandless cottonseed protein. However, little was known about the solubility and compositional changes of glandless cottonseed protein in beverages. In this study, we characterized the solubility and compositional changes of glandless cottonseed protein in beverages and buffers. Protein isolate was purified from glandless cottonseed by alkaline solution and added to 4 types of beverages at a final concentration of 10%: apple juice, grape juice, orange juice, and Pepsi soda. Soluble protein was determined with four different protein assays. The results showed that ~10% of the protein was soluble, indicating low solubility of cottonseed protein in the beverages. Therefore, cottonseed protein solubility was optimized with different temperatures, buffer pH, and detergents. The protein had the highest solubility at extreme low or high pH buffers and the lowest solubility in near neutral pH buffers. The protein solubility was significantly increased by size reduction of protein particles and incubation temperature. Most of the detergents increased the solubility of the protein but anionic detergents decreased the solubility. Gel electrophoresis confirmed the effects of various treatments on protein solubility and revealed that high molecular mass polypeptide were extracted by alkali buffers and cationic detergents. The results provide useful information for increasing the solubility of glandless cottonseed protein for developing acidic juices and drink and suggest that the food-compatible detergent ethyl lauroyl arginate may be used to improve glandless cottonseed protein isolate for food purposes.

Re-thinking use of salicylic acid-based poly(anhydride-ester)s: From biomedical to agricultural applications **Victoria Batiz**[1], vbati001@ucr.edu, Mariana Reis Nogueira de Lima[1], Gloria Regalado[2], Lema Safi[1], Thomas Eulgem[2], Kathryn Uhrich[1]. (1) Chemistry, Univ. of California Riverside (2) Botany and Plant Sciences, Univ. of California Riverside Current global climate trends and population growth models suggest the need for improvement in food insecurity and clean water availability around the world. The agriculture industry, a major user of fresh water supply, faces the challenge of meeting these production needs due to climate change. Salicylic acid (SA), well known for its biomedical applications, is a phytohormone in plants which has potential for use in agriculture. SA can reduce negative effects of drought stress on crops by regulating processes such as photosynthesis, membrane permeability, and transpiration. In this project, salicylic acid-based poly(anhydride ester)s (SAPAE)s was applied exogenously to micro-tom tomato plants and its effects were analyzed. Results were evaluated with special attention to duration of plant survival with no water, and plant growth behaviors during and post dosage. SA was harmful when applied directly to plants in powder form, whereas plants that received SA via the SAPAE controlled-release exhibited

little to no stress and behaved similarly to control groups during the dosage period. At the early stages of the drought period, SAPAE groups were observed to outgrow all other groups. SAPAE groups were also observed to survive the longest amount of time without being watered. It is hypothesized that SAPAE plant groups will outperform all other groups in terms of plant mass and production of fruit, however further investigation is being performed with more replicates to confirm. SAPAEs have potential to revolutionize the impact of the agriculture industry on climate change, and additionally help to combat global food insecurity.

Protein-phenolic interactions in plant-based foods **Esra Capanoglu**, capanogl@itu.edu.tr, Deniz Gunal-Koroglu. Istanbul Teknik Univ., Istanbul, Turkey Proteins and phenolic compounds naturally present together in many foods or food mixtures. Phenolic compounds, found in vacuoles in the plant cell, are not in contact with other macronutrients such as proteins. However, after the plant tissue is broken down by means of food processing or digestion, these phenolics in the vacuoles are released and interact with the storage proteins in the plants and the proteins in the food to which they are added, or with the food proteins or enzymes released in the digestive system. Complex formation occurs reversibly with non-covalent interactions (hydrogen bonding, hydrophobic bonding, Van der Waals forces, ionic interactions), and irreversibly with covalent interactions. As a result of the interaction of proteins and phenolics, important properties of proteins such as secondary structures, zeta-potential, surface hydrophobicity, and denaturation temperature are affected. On the other hand, functional properties such as solubility, emulsifying, and foaming properties are also changed. This change observed in functional properties depends primarily on the native structure of the protein, type of the phenolic compound, and especially the protein/phenolic ratio.
Due to the formation of these complexes, phenolics present in plant sources significantly affect the digestibility of proteins. First of all, the secondary and tertiary structures of proteins and protein-based enzymes in the digestive system change depending on the complex formation mechanism. These changing structures may cause an anti-digestive effect by causing the active sites in the protein to be hidden or the catalytic activity of the enzyme to decrease. On the other hand, widening the active sites of proteins, easier access of enzymes to the active sites of the protein and increasing catalytic activity by affecting the enzyme structure also increase digestion rates and are generally observed with non-covalent interactions. In summary, food matrix composition, together with the type, content, and ratio of phenolics and proteins, significantly affect the bioactivities and functional properties of both compounds. Therefore, identifying the effects of protein-phenolic interactions during food processing is of great importance in terms of final product quality

Upcycling protein-rich agri-food resources to produce novel materials for health enhancement **Chibuike Udenigwe**, cudenigw@uottawa.ca. Univ. of Ottawa, Ontario, Canada The agri-food industry generates large amounts of undervalued resources and byproducts. These food resources contain large amounts of biomacromolecules, including proteins, that can be utilized in formulating novel food products, such as bioactive peptides and protein-based packing materials and nanodelivery systems. To promote circular agri-food systems, efficient processing methods are needed to enhance downstream processing to convert these protein constituents into valuable biomaterials. This presentation provides a roadmap for the fabrication of plant proteins into functional biomaterials for the delivery of water insoluble nutraceuticals. First presented is the understanding of guest-host interactions in the protein-based delivery complexes, particularly the structural basis of interactions between plant proteins and various lipophilic nutraceutical compounds. Our findings showed that the chemical interactions between the guest (encapsulated compound) and host (protein carrier) during nanoparticle fabrication determine the loading and encapsulation efficiencies and controlled release profiles. The influence of guest-host chemistry on nano-bio interactions, especially on how the protein-based colloidal systems interact with physiological/biological structures, using giant unilamellar vesicles as the model biomembrane, is also discussed. The protein-nutraceutical interactions also influence the rate of in vitro protein digestibility, which presents several biological implications, especially for the gut microbiota, for future edible applications. The findings present tremendous opportunities in upcycling of protein-rich foods, thus enabling effective resource utilization, towards the development of novel food hydrocolloids and functional biomaterials.

Study the molecular structure and gelling properties of dry fractionated pea protein by air classification **Samitha M. Kottage**[1], samitha@ualberta.ca, Anusha G. Samaranayaka[2], Pankaj Bhowmik[2], Lingyun Chen[1]. (1) Agricultural, Food & Nutritional Science, Univ. of Alberta Faculty of Agricultural Life and Environmental Sciences, Edmonton, Canada(2) National Research Council of Canada, Saskatoon, Saskatchewan Dry fractionation, known for its eco-friendly and cost-effective nature, emerges as a methodical approach for separating protein fractions. While extensive research has focused on understanding the structure and functionality of pea protein isolates (PPI), there's a notable scarcity of information concerning dry fractionated pea protein (DFPP). This study undertook a comparative analysis between DFPP, comprising 50.7% protein content (PC) and 17% insoluble fiber, and PPI, possessing a PC of 80.1% and 8.33% insoluble fiber, with a particular emphasis on protein structure, solubility, and heat-induced gelation. Assessments utilizing SDS-Page, size-exclusive chromatography, and Fourier-transform infrared spectroscopy revealed that DFPP retained major pea protein components in their native structures, contrasting with PPI, which experienced protein loss during wet extraction alongside partial unfolding and aggregation. Notably, DFPP exhibited significantly higher solubility (44.64±0.55%) compared to PPI (12.09±1.42%) under neutral pH conditions. Of interest, DFPP demonstrated robust gelling properties, as evidenced by lower gelling concentration and increased gel mechanical strength and elasticity compared to PPI-derived gels. DFPP gels exhibited twice the mechanical strength (7.71±0.21kPa) of those derived from PPI at pH 7, with similarly robust gels achieved at pH 5. Morphological analysis unveiled phase separation between proteins and polysaccharides upon heating, with stick-shaped fibers (10-25μm) dispersed within continuous protein networks. Ultimately, the inclusion of polysaccharides, including fiber and starch, contributed to strengthening the gel network by acting as fillers. These findings not only expand the potential applications of DFPP as a gelling agent in food formulations but also provide the industry with opportunities to leverage the concurrent presence of dietary fiber in protein for developing healthier food products through a comprehensive approach.

Interactions between oat protein isolate and high methoxyl pectin and their potential applications as nutraceutical delivery systems **Chen Yang**, yangchen32384@hotmail.com, Yening Qiao, Haiyue Hu, Aitong Li, Jianming Wang. College of Food Sci. and Engineering, Tianjin Univ. of Science and Technology, Tianjin, China Preheated oat protein isolate (OPI) had great potential to interact with other biopolymers since its hexameric structure could be destroyed into a dimer after heating, which exposed more reaction sites. The interactions between OPI and biopolymers not only improved the functionalities of the complex, but also allow it to be used as nutraceutical delivery systems. In this work, an oat protein isolate (OPI)–high methoxyl pectin (HMP) complex was constructed by changing the pH, and the interactions, formation mechanism and

potential use of the OPI–HMP complex as nutraceutical delivery system were explored. The presence of HMP caused structural changes in the OPI, and the changes were pH dependent. When the OPI to HMP mass ratio was 3:1, the critical pH for the phase behavior of OPI–HMP was 5.0. When the pH was greater than 5.0, the OPI and HMP were co-dissolved in the composite system mainly through electrostatic repulsion. When the pH was 5.0, a soluble OPI–HMP complex was formed by a combination of electrostatic attractions, hydrophobic interactions and hydrogen bonding. At pH values below 5.0, other aggregates of HMP and OPI were generated through electrostatic attraction and hydrogen bonding and formed insoluble aggregates. When the OPI to HMP mass ratio was 3:1 and the pH was 5.0, the particle sizes of the emulsion were the smallest at 8.75 μm due to the strong electrostatic interactions. The emulsifying activity and stability were much higher than those of the OPI, and they formed dense osmotic networks, which protected the functionality of curcumin. The encapsulation efficiency and retention reached 83.87 ± 1.50% and 88.70 ± 2.50%, respectively, and the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging rate was maintained at a high level (approximately 72%) after 7 days of storage. According to further investigation, OPI-HMP complex with different particle size had great ability to stabilize pickering emulsions, which exhibited good controlled release properties in the simulated gastrointestinal tract. These results confirmed the possibility of using the OPI-HMP complex emulsions as excellent stable nutraceutical delivery systems for lipid soluble bioactive compounds in food and biomedical applications.

Use of zein-based assemblies for encapsulating, protecting and delivering bioactive components **Li Liang**, liliang@jiangnan.edu.cn. Jiangnan Univ., Wuxi, Jiangsu, China
Zein, a prolamin in corn, contains 50% hydrophobic amino acids and easily assembles into nano-/micro-particles for the encapsulation and delivery of bioactive components. Zein solid particles were coated with alginate and chitosan to improve the stability and bioaccessibility of resveratrol. In zein homogenous particles, resveratrol was encapsulated at the portion between the hydrophobic core and the surface of zein particles, while α-tocopherol was encapsulated in the core. The co-encapsulation in zein particles improved the stability of resveratrol and α-tocopherol simultaneously. Furthermore, zein hollow particles were prepared using sodium carbonate as a template, and the coating with chitosan improved the physical stability of hollow particles and their protection and controlled release of resveratrol. Zein-whey protein hybrid hollow particles were also fabricated for the effective encapsulation of curcumin. The results are useful for the development of prolamin-based carriers.

General Papers

Pulse protein hydrolysates exhibited ice recrystallization inhibition activity after immobilized metal affinity separation **Tong Wang**[1], twang46@utk.edu, Joshua Saad[1], Vermont Dia[1], Murillo Longo Martins[2]. (1) Food Science, The Univ. of Tennessee System, Knoxville (2) The Univ. of Tennessee System, Knoxville
Creating molecules capable of inhibiting ice recrystallization is an active research area aiming to improve the freeze-thaw characteristics of foods and biomedical materials. Peptide mixtures have shown promise in preventing freezing-induced damage, but less is known about the relationship between their amino acid compositions and ice recrystallization inhibition (IRI) activities. We used Ni2+ immobilized metal affinity chromatography (IMAC) to fractionate pulse protein hydrolysates, created by Alcalase and trypsin, into mixtures lacking or enriched in His, and Cys residues. This fractionation successfully produced chemically distinct fractions of peptides, differing by their molecular weights, amino acid composition, and IRI activities. Unexpectedly, Ni2+ IMAC fractionation induced IRI activity in all of the evaluated soy, chickpea, and pea protein hydrolysates regardless of their amino acid composition.

A water soluble protein fraction from black soldier fly larvae has strong antifreezing activity **Tong Wang**[1], twang46@utk.edu, Madison Fomich[1], Vermont Dia[1], Hari Krishnan[2]. (1) Food Science, The Univ. of Tennessee System, Knoxville (2) ARS, USDA Agricultural Research Service, Columbia, Missouri
We report the presence of black soldier fly larvae protein complex that is water soluble and has strong ice recrystallization inhibition (IRI) activity. The processes of extraction, enrichment, characterization and identification are demonstrated. The IRI activity at different concentration (1-4%) under different pH (3-9) and salt condition (NaCl at 10-200 mM) were also examined, and these factors influenced the IRI activity (40-80% reduction in ice crystal size when compared to PEG negative control). The ice binding test by sucrose sandwich assay showed rigid and hexagonal ice morphology that is indicative of ice binding specifically to the prism plane of the ice crystal.

Suggested pathways to waterpipe tobacco reference products **John H. Lauterbach**, john@lauterbachandassociates.net. Chemistry & Toxicology, Lauterbach & Associates LLC, Deland, Florida
Reference products have a long history of use in the tobacco industry. Since tobacco is naturally variability, no two cigarettes or portions of other tobaccos of the same brand-style are exactly alike. Thus, reference products are often used as control samples that are included with each analytical run of samples for analytes in the tobacco products, and/or emissions for smoked products, and/or extractables for oral tobacco products. The design and production of reference tobacco products is resource-intensive and has been done by the major tobacco manufacturers. Unlike cigarettes, dry and moist snuff, and more recently, machine-made cigars, there are no major tobacco companies involved in the productions of waterpipe (shisha) tobaccos, and none of the shisha manufacturers have the resources to devote to the design, production, packaging, and testing of the shisha analogs to the other tobacco reference products. Therefore, laboratories need other sources of shisha reference products. We have developed several approaches to the production of such products that takes into account country-specific restrictions on importation of raw tobaccos and certain ingredients that are used in the manufacture of shisha tobaccos. We have developed an approach where one could start with no (or low) additive pipe tobaccos (or even the powdered reference tobaccos), glycerol, propylene glycol, fructose, glucose, sucrose, and common single component flavors to create reference products that would behave similarly to commercial products for analytical studies on the products and their emissions. Examples of production and testing of samples prepared on a 100-g and 1000-g basis will be provided along with test results for shisha and shisha emissions testing for relevant analytes. The test results show how reference samples produced by our approaches provide analytical results similar to those for commercial products.

Curcuminoids analysis of turmeric roots and dietary supplements **Devanand Luthria**, dave.luthria@usda.gov. USDA Agricultural Research Service, Washington, D.C.
Turmeric (Curcuma longa L.) is a spice commonly used in curry preparation. In Indian Ayurvedic medicine, turmeric has been used for treating wound healing, rheumatoid arthritis, urinary tract infections, and liver ailments for several decades. Currently, it is also used as a dietary supplement for arthritis, respiratory infections, liver disease, and other health conditions. Turmeric bioactivity is primarily attributed to three bioactive polyphenols, called curcuminoids (curcumin, demethoxycurcumin, and bisdemethoxycurcumin). We recently

analyzed curcuminoid contents in 12 commonly used dietary supplements in the US and over 45 root samples collected from five different countries. The results show significant variation in the curcuminoid content (1.3 to 69.8 mg/100g) and ratio of the three curcuminoids. An untargeted analysis of root extracts resulted in the putative identification of 53 metabolites (27, positive ionization; and 26, negative ionization) belonging to the classes of polyphenols, organic acids, and sugars. Principal component analysis of untargeted metabolites showed significant separation among root samples from different locations. These results will be of significant value to consumers and turmeric producers.

Investigating interaction of purple wheat anthocyanin extract with ferulic acid or resveratrol for improving product stability **Elsayed M. Abdelaal**, elsayed.abdelaal@agr.gc.ca, Tamer H. Gamel. Agriculture and Agri-Food Canada - Guelph Research and Development Centre, Gouvernement du Canada Agriculture et Agroalimentaire Canada, Guelph, Ontario Our previous research has shown the ability of purple wheat convenience bars to modulate inflammation markers and reduce blood glucose in overweight and obese adults. But further improvement of anthocyanin stability during the processing of purple wheat would additionally result in more beneficial products. This study is aimed at improving the stability of purple wheat anthocyanins through intermolecular interactions or copigmentation with phenolic compounds. Anthocyanin ethanolic extracts from purple wheat bran were copigmented with either ferulic acid or resveratrol at either pH 1 or 3, then stored at ambient temperature (23 ±2°C) in a dark environment for up to 720 hrs and monitored at 0, 2, 24, 72, 168, and 720 hrs. Copigmentation effects were assessed based on changes in reaction kinetics, UV-vis absorption properties and scavenging capacity of free radical 2,2-diphenyl-1-picrylhydrazyl radical ($DPPH^{\cdot}$). Additionally, an authentic cyanidin-3-glucoside compound was included in the study as a model system for comparison purposes. The control anthocyanin extracts (no copigment) exhibited higher degradation rates and a lower half-life than that of the anthocyanin-copigment system. A similar trend was also observed for the pure cyanidin-3-glucoside system. In other words, the addition of ferulic acid or resveratrol resulted in improved stability of purple wheat anthocyanin extracts during storage for 30 days. Ferulic acid was more effective in preserving purple wheat anthocyanins via co-pigmentation compared with resveratrol. The addition of ferulic acid or resveratrol to anthocyanin extract or cyanidin-3-glucoside solution also resulted in improved DPPH free radical scavenging activity during storage for 30 days. Slight changes in hyperchromatic and bathochromic effects were observed in the presence of ferulic acid either with purple wheat anthocyanin extracts or cyanidin-3-glucoside solutions. The results suggest improvements in the stability of purple wheat anthocyanins in the presence of ferulic acid or resveratrol, but more research is needed to enhance copigmentation interactions.

Continuous flow high-pressure homogenization's impact on grapefruit juice quality: preserving nutrition and reducing furanocoumarins **Jayashan Adhikari**[2,1], jadhikari@tamu.edu, Koushik Adhikari[3], Rakesh K. Singh[4], Bhimu S. Patil[2,1]. (1) Food Science and Technology, Texas A&M Univ., College Station (2) Vegetable and Fruit Improvement Center, Dept. of Horticultural Sciences, Texas A&M Univ., College Station (3) Univ. of Georgia College of Agricultural & Environmental Sciences, Griffin (4) Food Science and Technology, Univ. of Georgia, Athens Grapefruit, well-known for its tangy flavor and nutritional richness, contains health-promoting compounds such as vitamin C, limonoids, flavonoids, β-carotene, and lycopene, which have been associated with reducing the risks of colon cancer and cardiovascular diseases. Despite their benefits, furanocoumarins in grapefruit juice can interact with medications by inhibiting intestinal cytochrome P450 enzymes needed for drug metabolism. Juice processing plays a pivotal role in maintaining the nutritional quality during storage while decreasing the amounts of compounds such as furanocoumarins. However, for grapefruit, thermal processing has many limitations and limited research has been conducted on alternatives to thermal processing. To address these challenges, we investigated continuous flow high-pressure homogenization (CFHPH) processing as an alternative to thermal processing of grapefruit juice under market storage conditions for 45 days. Three independent processing factors, pressure (200, 250, 300 MPa), inlet temperature (4 or 22 °C), and flow rate (0.75, 1.125, 1.5 L/min) were studied. CFHPH at 300 MPa demonstrated significantly higher ($P \leq 0.05$) retention of vitamin C and carotenoids during 45 days of storage, while effectively lowering furanocoumarin levels compared to high-temperature short time processing. Furthermore, CFHPH reduced polyphenol oxidase activity and maintained antioxidant activity during storage conditions. These findings suggest that CFHPH processing of grapefruit juice is an excellent alternative to thermal processing in maintaining nutritional quality while lowering the levels of undesirable compounds such as furanocoumarins, thereby providing nutrition-rich and safe food products to consumers.

High fried food consumption and acrylamide raises nonalcoholic fatty liver disease through energy disorders and PGE2-PPARα pathway **Xuzhi Wan**, xuzhiwan@zju.edu.cn, Xiaohui Liu, Jingjing Jiao, Yu Zhang. Zhejiang Univ., Hangzhou, Zhejiang, China Fried foods and their contaminants such as acrylamide are adversely linked to human health risks. However, the long-term effects of habitual fried food consumption on nonalcoholic fatty liver disease (NAFLD) and underlying mechanisms remain unclear. Here we report the relationship between fried foods and NAFLD risk among a nationwide scale of 208,673 UK participants. Frequent fried food consumption, especially fried potato consumption, is associated with 15% higher risk of NAFLD. The significant relationships were mainly mediated by body mass index and serum triglyceride, total cholesterol, and high-density lipoprotein cholesterol. Consistently, long term exposure to dietary acrylamide significantly increased the body weight, serum lipids and glucose levels, promoted lipid accumulation in liver, and damaged liver function in the mice. Acrylamide exposure inhibited white adipose beiging and caused energy metabolism disorders by down-regulating the expression of thermogenic genes in white adipose, including Prdm16, Pparγ, Cebpβ and Pgc1α. Multi-omics integrative analyses revealed chronic exposure to acrylamide induced arachidonic acid metabolism disturbance and inflammation. Mechanistically, acrylamide promoted the production of inflammatory mediator Prostaglandin E2 (PGE2) by up-regulated COX2 and mPGES protein expression, which induced inflammatory response in liver. Notably, PGE2, when coupled with EP4, suppresses the activity of PPARα protein, disrupting lipid synthesis and oxidation processes, consequently contributing to disorders in liver lipid metabolism after chronic exposure to acrylamide. Collectively, these results both epidemiologically and mechanistically provide strong evidence to unravel that acrylamide increase the NAFLD risk by PGE2-PPARα axis, and highlight the significance of reducing fried food consumption for maintaining healthy liver function.

Habitual daily intake of fried foods raises transgenerational inheritance risk of heart failure through Notch1-triggered apoptosis **Anli Wang**, anliwang@zju.edu.cn, **Yu Zhang**, y_zhang@zju.edu.cn. Zhejiang Univ., Hangzhou, Zhejiang, China Western diet has been unfavorably linked with high risk of developing cardiovascular diseases (CVD). Heart failure (HF) as a CVD subtype is a growing global pandemic with high morbidity and mortality. However, the causal relationship between long-term fried food consumption and incident HF remains unclear. Our population-

based study revealed that frequent fried food consumption is strongly associated with 15% higher risk of HF. The causal relationship may be ascribed to the dietary acrylamide exposure in fried foods. Further cross-sectional study evidenced that acrylamide exposure is associated with an increased risk of HF. Furthermore, we discover and demonstrate that chronic acrylamide exposure may induce HF in zebrafish and mice. Mechanistically, we reveal that acrylamide induces energy metabolism disturbance in heart due to the mitochondria dysfunction and metabolic remodeling. Moreover, acrylamide exposure induces myocardial apoptosis via inhibiting NOTCH1-PI3K/AKT signaling. Additionally, acrylamide exposure could affect heart development during early life stage and the adverse effect of acrylamide exposure is a threat for next generation via epigenetic change evoked by DNMT1. Collectively, these results both epidemiologically and mechanistically provide strong evidence to unravel the mechanism of acrylamide-triggered HF, and highlight the significance of reducing fried food consumption for lower the risk of HF.

Applying the idea of directed revolution in industrial biosynthesis: Flexible production of fermentation products
Ningyu Liu[1,2], ningyuliuur@outlook.com. (1) Jiangnan Univ., Wuxi, Jiangsu, China(2) HNIC, Zhengzhou, China In recent years, synthetic biology methods have increasingly been applied in the industrial production of natural products, gradually replacing conventional chemical synthesis or extraction techniques. In comparison to traditional chemical synthesis methods, biological approaches often exhibit lower energy consumption, milder conditions, and greater environmental friendliness. Moreover, scientists have directed considerable effort towards complex molecules relevant to the biomedical industry which could only be extracted from natural materials, such as paclitaxel, aiming to achieve industrial production efficiencies far beyond those attainable through natural product extraction. Additionally, products primarily produced through biotechnological fermentation processes stand to benefit significantly from synthetic biology, offering substantial enhancement potential. To apply synthetic biology technology in industrial production also entails drawbacks, such as significant equipment investments due to market uncertainties. Flexible manufacturing can effectively spread the costs of equipment, mitigating this issue. In the production of sugars, feed additives, and food additives using fermentation, many sugar alcohols and vitamins utilize similar raw materials and process flows, enabling flexible manufacturing. Therefore, a solution is proposed using the directed evolution approach. Directed evolution is a method used in protein engineering, and my past research work has involved utilizing this approach to develop non-natural biocatalytic reactions for synthesizing chiral small molecules. We have found that when improving industrial production technologies using directed evolution, besides modifying the proteins themselves to directly enhance production efficiency, this approach can also be leveraged to upgrade process conditions. Several relevant examples will be demonstrated, including how to efficiently synthesize various vitamins and sugar alcohols using biological methods, and how to arrange these products on the same production line for flexible manufacturing.

µBites: The chemo-bio hybrid process to generate next generation food ingredients from waste polymers
Lahiru N. Jayakody[1,2], lahiru.jayakody@siu.edu. (1) School of Biological Sciences, Southern Illinois Univ. Carbondale (2) Fermentation Science Institute, Southern Illinois Univ. System, Carbondale It is becoming increasingly clear that developing new technologies that combine the recycling of carbon-based waste products with food security is necessary to safeguard the future of humankind. We have invented the µBites system that integrates the novel technology of oxidative hydrothermal dissolution (OHD) with synthetically optimized yeast to produce nutritive raw materials (such as proteins, lipids, vitamins, and sugars) from natural and synthetic carbon polymers (like lignocellulose or plastic). The µBites system was initially designed to provide the daily nutrition requirements for four astronauts on a three-year mission to Mars under the NASA-Deep Space Food Challenge (2021). To prove this concept at the kitchen scale, we have successfully 3D-printed µBites protein cookies with the system (UPT patent application No. 63/437,051) using waste bio and synthetic polymers. As far as we know, this is the first-ever, safe-to-eat edible protein cookie with a hedonic scale of >6.5 from repurposed waste biomass and plastic. The µBites can provide a protein source with nearly zero greenhouse gas emissions, waste generation, minimum water (<0.5 gallons for 1 kg of protein), and energy use relative to current protein production technologies. One food production cycle requires approximately 24-48 hours, and the AI algorithm can monitor various unit operations and micro-Raman to ensure the quality and safety of food products. Regarding terrestrial applications, the compact and portable µBites systems could be installed on remote military bases, naval ships, or resource-limited remote locations such as the Arctic and Antarctic. This would provide a customized, nutritious, and reliable food source from the waste feedstock. The µBites strategy is a paradigm-shifting technology providing customizable, nutritious, and reliable next-generation food. This will contribute to crew health, morale, and productivity on long-duration missions and revolutionize the waste management and food manufacturing system.

Nanoemulsion with Lactobacillus-derived exopolysaccharide potentiates the antimicrobial activity of eugenol to protect fresh produce against foodborne pathogens and biofilms
Sangeeta Balyan[1,2], sangeetabalyan05@tamu.edu, Vikas Dadwal[2,3], Bhimu S. Patil[2,1,3]. (1) Dept. of Food Sci. & Tech., Texas A&M Univ. System, College Station (2) Vegetable and Fruit Improvement Center, Texas A&M Univ. System, College Station (3) Dept.of Horticulture Science, Texas A&M Univ. System, College Station To address challenges associated with foodborne microbes and biofilms in food processing, in this study, we encapsulated the natural antimicrobial compound eugenol into a nano-emulsion using Lactobacillus-derived exopolysaccharide (EPS) as a natural emulsifier. Eugenol has bactericidal and antioxidant properties, but its uses are limited by its low solubility and stability. To overcome these limitations, a eugenol-nanoemulsion was developed using an ultrasonic emulsification technique, incorporating EPS isolated from Lactobacillus plantarum as an emulsifier. The nanoemulsion displayed a droplet diameter of 192 ± 1.9 nm, a polydispersity index of 0.36 ± 0.01, and a ζ-potential of -32 ±1.9 mV, indicating a stable formulation. The nanoemulsion demonstrated potent bactericidal effects against different strains of Escherichia coli, Listeria monocytogenes, and Salmonella. The tested pathogens showed substantial variation in biofilm-forming abilities when treated with the EPS-eugenol emulsion. Certain strains exhibited resistance to the emulsion, while others showed significant reductions in cell count within biofilms. L. monocytogenes V7 and Scott A strains displayed a minimal reduction of 2.8 log CFU/cm^2 on stainless-steel surfaces, whereas other E. coli and Salmonella strains showed a 3 to 4.5 log CFU/cm^2 reduction. Plastic surface biofilm inhibition averaged 85% for most strains, except for L. monocytogenes strains, which showed lower inhibition, likely due to differing cell membrane integrity. Moreover, the emulsion's efficacy against biofilms was notably enhanced compared to non-encapsulated eugenol. The emulsion was applied to fresh produce (tomatoes, blueberries, lettuce, and queso fresco cheese), where it significantly inhibited the growth of the tested pathogens. Overall, this novel eugenol nanoemulsion appears to be a promising solution for addressing biofilm-related challenges in food processing environments. Its comprehensive benefits include

improved stability, enhanced bactericidal activity against diverse pathogens, and effective disruption of biofilm matrices. This research holds the potential to advance food safety and hygiene standards, with practical applications in preserving fresh produce and disinfecting surfaces.

THURSDAY AFTERNOON
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Characterizing different probiotic-derived extracellular vesicles as a novel adjuvant for immunotherapy **Yingjie Huang**, huangyingjiev@163.com, Ping Li. School of Food Sci. and Biological engineering, Zhejiang Gongshang Univ., Hangzhou, Zhejiang, China Probiotics play a pivotal role in modulating the immune response of the host against various pathogens. Among them, the extracellular vesicles (EVs) derived from probiotics have garnered significant attention as crucial mediators of host-pathogen interactions. To investigate the potential of probiotic-derived EVs in the treatment of immune diseases, we employed an ultrasonic-assisted ultracentrifugation method to extract and characterize the EVs derived from Lactobacillus rhamnosus H1 and Lactiplantibacillus plantarum H2. In addition, their biological functions were thoroughly studied to clarify their therapeutic potential. The results showed that compared with traditional ultracentrifugation, ultrasonic-assisted ultracentrifugation could significantly increase the yield of EVs, H1 secreted the largest amounts of EVs, whereas all the EVs showed comparable particle diameters and particles. The median particle sizes of H1-EVs and H1-EVs were approximately 120.2±82.9 nm and 131.7±79.7 nm, respectively. The particle sizes were 3.0×10^{12} particles/mL and 2.7×10^{12} particles/mL, respectively. Western Blot analysis showed that both of them could specifically express CD63, CD81 and Tsg101, which were consistent with the characteristics of EVs. In the LPS-induced RAW264.7 cell inflammation model, both H1-EVs and H2-EVs significantly reduced the levels of NO and ROS, and reduced the mitochondrial damage. The results of qPCR showed that both could significantly inhibit proinflammatory cytokines (TNF-α, IL-6, IL-8) and promote the expression of anti-inflammatory cytokines (IL-10), indicating that probiotic-derived EVs could significantly inhibit LPS-induced cell inflammatory damage and had good anti-inflammatory potential. In summary, this study provided a theoretical basis for the application of probiotic-derived EVs in the treatment of immune-related diseases, and was expected to become a new immunomodulator with wide application prospects.

Effect of chlorogenic acid on lotus seed starch gelatinization behavior and complexation mode during microwave treatment **Xiangfu Jiang**, JXF020@126.com, Baodong Zheng, Xu Lu. College of Food Sci., Fujian Agriculture and Forestry Univ., Fuzhou, Fujian, China The pasting behavior and changes in intermolecular forces were compared between microwave (MW)- and hydrothermal (hot water; HT)-treated chlorogenic acid (CA)/lotus seed starch (LS)/water mixtures, by rheological, spectroscopic and microscopic analysis. MW treatment directly heated polar molecules throughout the starch granules producing even heating, compared with HT treatment in which heat transfer was limited to conduction from the granule surface. MW treatment more rapidly disrupted the starch double helical structure and liberated many starch chains that formed larger amounts of a non-covalent inclusion complex with CA than HT treatment. In addition, MW treatment produced a coating of LS-CA complex on the starch granule surface which modified the pasting properties of the starch. The LS-CA complex had a denser structure than LS, which enhanced the thermal stability and crystalline water binding capacity of LS. The non-covalent complexes were stabilized by hydrogen bonding and electrostatic interactions between starch chains, hydrophobic interactions between the caffeic acid residue in CA to the starch chain hydrophobic helical cavity and attraction of the hydroxyl groups at the reducing end of the LS chains to the H^+ on the CA (electrostatic interaction). Of these, hydrogen bonding and electrostatic interactions were the main intermolecular forces between LS chains. These findings contribute to clarification of the mechanism of action of polyphenols on the starch gelatinization process and will help to improve the formulation of functional starch products.

Metabolite fingerprints identification of Citri Reticulatae Pericarpium with different aging years using feature-based molecular networks and metabolomics **Kunli Xu**, eliauklily@gmail.com, Zhijie Yang, Yadong Wang, Haoying Han, Fanyu Meng, Bei Wang. Beijing Technology and Business Univ. School of Food and Health, Beijing, China The rich medicinal value and unique flavor attributes of Citri reticulatae pericarpium (CRP) are widely acknowledged to be associated with its aging years, however, there is limited knowledge about the non-volatile metabolites that contribute to its flavor formation mechanism. This study utilized metabolomics and feature-based molecular networks (FBMN) in conjunction with multivariate statistical analyses to elucidate the molecular disparities in chemical compositions of CRP at different aging years. A comprehensive total of 1073 metabolites have been identified, covering 11 subclasses. Multivariate statistical analyses revealed that 189 metabolites were significantly different during aging, including Lipids and lipid-like molecules, Phenylpropanoids and polyketides, and Benzenoids. Combined with the results of KEGG pathway analysis, Phenylpropanoid biosynthesis, Flavonoid biosynthesis, and Flavone and flavonol biosynthesis were the main enrichment pathways during the aging process of CRP. Overall, the findings of this study have deepened our understanding of the mechanisms of non-volatile metabolite fingerprinting changes and flavor formation during the aging process of CRP.

Investigating the interaction and antimicrobial mechanism of α-lactalbumin-carvacrol/thymol complexes **Mengxue Diao**, diaomx18@163.com, Runhao Zhou, Ziwei Li, Tiehua Zhang. College of Food Sci. and Engineering, Jilin Univ., Changchun, Jilin, China Food contamination and poisoning caused by bacteria will endanger human health, and the development of natural antibacterial agents is a pressing issue. We prepared α-lactalbumin-carvacrol/thymol complexes and demonstrated their formation by multi-spectroscopy techniques and localized surface plasmon resonance experiments. Computer simulations have shown that van der Waals forces dominate the interaction between α-lactalbumin and carvacrol/thymol. The antibacterial activities of α-lactalbumin-carvacrol/thymol complexes against Staphylococcus aureus and Escherichia coli were higher than that of single action. Combined with bacterial membrane potential, membrane permeability, morphological structure of bacteria, and crystal violet assay analysis to further investigate the disruptive effect of the α-lactalbumin-carvacrol/thymol complexes on the cell membranes of Staphylococcus aureus and Escherichia coli. The bacterial membrane disruption effect, which leads to the rupture of the cell membranes and thus the death of the bacteria may be the antimicrobial mechanism of the complexes. Overall, this work demonstrated that the α-lactalbumin-carvacrol/thymol complex had significantly higher antibacterial activities than carvacrol and thymol, further advancing the development of natural antibacterial agents.

Combined analysis of horse milk fat differences based on transcriptomics and metabolomics techniques **Xueyan Li**, 13139883908@163.com. Xinjiang Agricultural Univ., Urumqi,

Xinjiang, China Horse milk consists of milk fat, lactose, milk protein, non-fat solids and water and other nutrients. Horse milk is rich in nutrients and similar in composition to human milk, with high lactose, high unsaturated fatty acids, low fat, low protein and low mineral properties, and is easily digested and absorbed. Milk fat is one of the important components of horse milk, and the rate of milk fat in horse milk is 0.4%~1.9%, which is an important reference index for evaluating milk quality. In this study, 12 Kazakh horses were selected for the study, and their milk samples were collected for milk composition analysis, and the 12 horses were divided into high milk fat rate group (HF) and low milk fat rate group (LF) according to milk fat rate. The important pathway for mammalian milk fat synthesis is the extraction of long-chain fatty acids from blood and fatty acid synthesis from scratch. The key genes and key metabolites that regulate genes related to milk fat synthesis and metabolism were screened by collecting blood for combined transcriptomics and metabolomics analysis. The results showed that AMPK signaling pathway and FcγR-mediated phagocytosis were the important regulatory pathways for milk fat deposition. Meanwhile, the expression levels of arachidonic acid, leukotriene and betaine in the plasma of Kazakh horses in the HF group were higher than that of the LF group, and the candidate genes EDN1, PIK3R1, PPP1R16B and FABP3 were also proved to have the function of regulating the deposition of milk fat in the level of metabolites, which was hypothesized to be the cause of milk fat deposition. It's speculated that the above genes and metabolites are partly responsible for the differences in milk fat in Kazakh horses. The present study is helpful to investigate the role of different metabolites and core genes in plasma on the regulation of milk fat deposition, which is of great theoretical significance for the subsequent in-depth study of the nutritional regulation of equine milk and the improvement of the nutritional value of equine milk.

Ursolic acid protects against chronic alcohol consumption-induced fatty liver disease in mice **Jiannan Qiu**[1,2], qjntcm@163.com, Songtao Li[2]. (1) School of Life Science, Zhejiang Chinese Medical Univ., Hangzhou, Zhejiang, China(2) School of Public Health, Zhejiang Chinese Medical Univ., Hangzhou, Zhejiang, China Ursolic acid (UA) is widely present in various Chinese herbs and fruits, and its strong antioxidant ability has been reported to significantly improve various chronic metabolic diseases. As the main source of intracellular ROS, mitochondria are highly susceptible to oxidative stress attacks. Mitochondrial dysfunction has been considered a hallmark of metabolic diseases such as alcoholic fatty liver disease (AFLD). This study mainly explores the main mechanism by which UA improves mitochondrial homeostasis imbalance in AFLD mice. A C57BL/6J mouse AFLD model was induced using a Lieber-Decarli liquid feed diet. UA was administered by gavage from the second week of modeling for 4 consecutive weeks, and Drp1 inhibited Midiv-1 by intraperitoneal injection from the fourth week of modeling, 3 times a week for 2 weeks. Through modeling and medication intervention, we found that UA can significantly reduce alcohol induced hepatic steatosis and inflammatory damage, including improving lipid metabolism related gene disorders and mitochondrial damage. Mechanistically, UA improves AFLD by regulating mitochondrial homeostasis through Drp1. In vivo experiments have shown that inhibiting Drp1 activity significantly inhibits the protective effect of UA on liver lipid accumulation and inflammatory damage in AFLD mice. In vitro, Drp1 knockdown reversed the protective effect of UA on ethanol induced liver cell damage and lipid accumulation. However, inhibiting the activity of Drp1 hindered the improvement effect of UA on the mitochondrial membrane potential and mt-ROS release in AML-12. In summary, UA significantly improves

Structure and digestive characteristics of Butyrylated rice starch with different degree of substitution **Qiaoyan Wu**, wuqiaoyan0929@163.com, Na Zhang, **Zhong Xu**, 1318129690@qq.com, **Yang Yang**, foodyangyang@163.com, Chun-Min Ma, Xing Bian, **Bing Wang**, iceking85@163.com, Guang Zhang. Harbin Univ. of Commerce, Harbin, Heilongjiang, China Rice is a highly starchy food, with a starch content of more than 75% of rice (dry matter content). Butyric acid is the main energy source for colonic epithelial cells and has the highest utilisation rate among all short-chain fatty acids, which plays a crucial role in maintaining human intestinal health. Butyric anhydride and rice starch were used to prepare butyrate rice starch by the aqueous phase method, and the structural properties of butyrate rice starch with different degrees of substitution and its antidigestive properties were determined, respectively. The results showed that the degree of substitution of butyrate rice starch increased with the addition of butyric anhydride, but when the concentration of butyric anhydride increased to a certain degree, the degree of substitution no longer changed. The substitution of the butyryl group at the C6 position was comparable to the sum of the substitutions at the C2,3 positions. During the butyrylation process, the surface of the starch ester started to become rough. The FT-IR spectra proved the formation of ester bonds. XRD results showed that the butyrylation process destroys the crystal structure of the natural starch. The high degree of butyrylation changed the crystalline form of the natural rice starch from the C-type to the V-type, and the relative crystallinity of the natural rice starch decreased with the increase of DS. The relative crystallinity of the natural rice starch decreased with the increase in DS. The relative crystallinity of the natural rice starch decreased with the increase in DS. The intensity of the C6 position peak decreased significantly with increasing DS. The results of the NMR analysis also confirmed that new ester bonding groups were attached to the starch. NMR analysis also confirmed that new ester bonding groups were attached to the starch. The molecular weight Mw decreased significantly during the butyrylation process, and the starch granules swelled to form larger aggregates. The in vitro antidigestive properties of the butyrate starch showed that the substitution degree of the butyrate starch increased and its resistant starch content increased, indicating the effectiveness of the butyrate starch in targeting the colon. The above results showed that the distribution ratio of butyryl groups at different carbon positions had a significant effect on the properties of butyrate rice starch.

Preparation and stability analysis of cannabidiol microcapsules **Rui Yu**, yuruieraser@163.com, Zhanmei Jiang. Northeast Agricultural Univ., Harbin, Heilongjiang, China Cannabidiol (CBD), as a non-addictive component of cannabis, has broad application prospects in food, cosmetics and health care products due to its physiological activities such as anti-oxidation, anti-cancer, anti-anxiety and anti-inflammation. Due to the low solubility in water and poor stability of CBD, it is susceptible to the influence of external environment (temperature, light, oxygen), food processing and storage conditions and digestive tract environment (pH, enzyme and other substances), leading to many restrictions in the application of CBD. Therefore, in order to improve its water solubility, stability and bioavailability, the preparation of embedding technique can be used to carry CBD by microcapsules or solid delivery preparations ways. However, CBD-embedded agents usually have disadvantages such as low drug load, low water solubility and poor stability. How to obtain CBD preparation with high drug load, good solubility and stability is an urgent problem to be solved. In this experiment, whey protein maillard reaction products (MRPs) and mesoporous silica nano-particles (MSN) were used to make MRPs-CBD and MSN-CBD microcapsule. To enhance their embedding rate and drug load, single factor testing and optimization of response surface were chosen to determine the optimum preparation conditions. Finally, MRPs-CBD

and MSN-CBD microcapsule were researched on physical and chemical properties, stability, release regularity in simulated gastric and intestinal fluid.

Effect of wheat aleurone on lard emulsions during in vitro digestion **Xinyue Diao**, 2021208012@stu.njau.edu.cn, Chunbao Li. Nanjing Agricultural Univ., Nanjing, Jiangsu, China Dietary wheat aleurone has been shown to affect lipid metabolism and reduce the incidence of obesity. However, the underlying mechanisms are not fully understood. This work aimed to investigate how whole wheat aleurone affects lipolysis during the whole digestion process in vitro. The physicochemical and microstructural changes and the lipolysis kinetics of different lard emulsion mixtures were determined. The results showed that the lipolysis rate and degree are inversely proportional to the amount of wheat aleurone. Wheat aleurone and flour promoted the aggregation and flocculation of lipid droplets by increasing the viscosity. More importantly, the dietary fibers released from aleurone digestion can reduced the binding of lipase to lipid droplets by adsorbing lipid droplets to increase the steric hindrance effect. These results provide a better understanding of how whole grains affect lipid digestibility and will further contribute to the development of functional foods and the improvement of individual health.

Dynamic changes of gut microbiota following short-term, high-dose probiotic consumption **Xin Shen**, shenxin0813@163.com, Hao Jin, Feiyan Zhao, Zhihong Sun. Inner Mongolia Agricultural Univ., Hohhot, Inner Mongolia, China Gut microbiota plays an important role in health, and probiotics as one of the ways of targeted regulation of gut microbiota has attracted more and more attention. Notably, the interaction between probiotics and the native gut bacteria, along with the variation in response across different populations, is essential for the probiotic effects to manifest. However, the specifics of how probiotics interact with and alter the native gut microbiota during administration periods remain underexplored. This study employed a high-dose probiotic regimen over a 7-day period with healthy volunteers, during which fecal samples were collected once a week for metagenomic sequencing analysis. The results indicate that probiotic consumption could significantly increase the diversity of gut microbiota and affect the nucleotide variation, growth rate, and network interaction of intestinal indigenous bacteria. Adaptive changes in the gut microbiota to high-dose probiotic consumption reveal the swift evolutionary responses of native bacteria to the ecological presence of probiotics, with microbial ecological adjustments potentially preceding evolutionary changes. Overall, our study proved the changes in probiotic consumption and indigenous bacteria, providing a foundational understanding of their relationship and laying the groundwork for future explorations into probiotic applications in gut health.

Identification of umami peptides based on peptidomics and virtual screening from strengthened fermented soybean paste **Guo Yang Pan**, 1520153648@qq.com, **Jinhui Jiang**, 737165358@qq.com, **Feiyu An**, anfeiyv@163.com, **Junrui Wu**, junruiwu@126.com, **Rina Wu**, wrn6956@163.com. Shenyang Agricultural Univ., Shenyang, Liaoning, China Soybean paste is popular among consumers because of its unique umami, in which the umami peptide plays a crucial role. The results of previous studies have shown that Tetracococcus halophilus has the ability to enhance the taste quality of fermented soybean products, among other things. Therefore, in this study, we applied virtual screening tools such as peptidomics as well as machine learning to identify and screen umami peptides by using Tetracococcus halophilus fortified fermented soybean paste. The flavouring mechanism was analyzed through molecular docking techniques while the flavouring effect was verified based on sensory evaluation and e-tongue validation. In this study, four umami peptides (LLYGKVVKKT, DKKVSVGT, TRKQALLN and QKNSHQ) extracted from fortified fermented soybean paste were successfully identified and confirmed by sensory evaluation of umami thresholds in the range of 0.02 ~ 0.14 mmol/L. Among them, LLYGKVVKKT and DKKVSVGT also have the ability to enhance umami taste, which can improve the umami taste of complex systems such as soy sauce. Molecular docking revealed that they bind to T1R1/T1R3 receptors through various interactions such as hydrogen bonding, in which the main binding sites for T1R1 are ARG 249, GLN 250, and TYR 192, and the main binding sites for T1R3 are TYR 198, ALA 282, VAL 257, and HIS 258, and it was found that GLN 250 and VAL 257 may be the potential key active sites for T1R1/T1R3.The relevant research results provide an important theoretical and practical basis for the development and utilisation of high-yielding strains of umami peptides, as well as new ideas and methods for the development and rapid screening of peptides in soybean paste.

Optimization of ultrasound-assisted extraction of fatty acids from royal jelly and its effect on the structural and antioxidant property **Xinyu Yu**, yuxinyu@zju.edu.cn, Shanshan Li, Shiqin Peng, Lingchen Tao, Fuliang Hu. College of Animal Science, Zhejiang Univ., Hangzhou, Zhejiang, China Royal jelly (RJ) is a yellowish, creamy, and acidic substance secreted by mandibular and hypopharyngeal glands of young worker bees. It was widely attracted due to its biological activities such as anti-inflammatory, immunomodulatory, antimicrobial activity. Fatty acids are key components of RJ and play an important role in various biological activities. In this study, a novel ultrasound-assisted extraction (UAE) method was established to extract fatty acids from RJ and their structural and antioxidant property were further evaluated. The optimum extraction conditions were as follows: liquid-to-solid ratio of 10:1, ultrasonic power of 450 W and ultrasonic duration of 20 min, resulted in better extraction yield of 16.48% and 10-hydroxy-2(E)-decenoic acid (10-HDA) content of 4.12%. Furthermore, compared with solvent extraction method, the antioxidant activity of extract by ultrasound was enhanced significantly by at least 448%. GC-MS showed that ultrasound didn't change the chemical composition of fatty acids, while it significantly increased the content of fatty acids. And FT-IR spectroscopy analysis further confirmed that the primary structures of RJFA extracts were not changed in both methods. SEM images illustrated that extracts by UAE showed a rougher, looser microstructure compared to solvent method, which facilitated the infiltration of ethanol into the RJ and accelerated the extraction process. Overall, these findings suggest a promising UAE method was established to extract RJFA, offering improved efficiency, reduced time and solvent consumption. This served as a scientific reference for bioactive RJFA extraction, promoting its utilization in food, health, and cosmetic industries.

Red, firm, non-exudative and pale, soft, exudative pork have different in vitro digestive properties of protein **Shanshan Li**, 2021208014@stu.njau.edu.cn, Chunbao Li. Nanjing Agricultural Univ., Nanjing, Jiangsu, China Pale, soft and exudative (PSE) meat has worse edible quality than red, firm and non-exudative (RFN) meat, but their difference in nutritional values is still unclear. In this study, the differences in digestive properties between PSE and RFN pork were explored, and the potential mechanisms were analyzed in terms of protein conformation. The PSE pork showed significantly higher digestibility and smaller particle size compared with RFN pork ($P<0.05$) after gastrointestinal digestion. Mechanistically, the PSE pork had lower viscosity in digestion system. At the same time, the protein of PSE pork showed relatively disordered structure with weaker hydrogen bond and ionic bond before and after heating. In addition, the protein (mainly salt-soluble protein) of PSE pork was

highly oxidized. It can be considered that higher level oxidation in PSE pork leads to the destruction of the molecular forces, resulting in the impaired protein conformation and disordered protein structure. The serial changes contribute to the proteins more accessible to digestive enzymes, thus improving the digestibility. The findings provide new insights into the evaluating the quality of PSE meat.

Lactobacillus rhamnosus ZJUIDS07 ameliorates type 2 diabetes in mice in association with modulation of gut microbiota **Zeyu Wu**, 16616000333@163.com, Jiting Gao, Daxi Ren. Zhejiang Univ. Institute of Dairy Science, Hangzhou, Zhejiang, China Diabetes is globally recognized as the third most prevalent non-communicable chronic metabolic disease, with its prevalence escalating and posing a significant threat to human health. Probiotics, known as natural, safe, and minimal side-effect microorganisms, have emerged as a promising intervention for alleviating diabetes. This study investigated the therapeutic potential of Lactobacillus rhamnosus ZJUIDS07 in type 2 diabetes (T2D) induced by a high-fat diet (HFD) and streptozotocin (STZ) in C57BL/6 mice. Administration of L. rhamnosus ZJUIDS07 (10^9 CFU/day) resulted in a substantial reduction of diabetic symptoms, including the reversal of weight loss, improvement in hyperglycemia and insulin resistance, alleviation of glucose and lipid metabolism disorders, and reduction in oxidative stress and inflammation levels. Furthermore, 16S rRNA gene sequencing demonstrated that L. rhamnosus ZJUIDS07 could restore intestinal microbiota dysbiosis in T2D mice by altering the structure and composition of intestinal microbiota, and increase short-chain fatty acids (SCFAs) levels. Specifically, L. rhamnosus ZJUIDS07 significantly decreased the abundance of harmful bacteria like Staphylococcus, Corynebacterium, and Odoribacte, while increased the abundance of beneficial bacteria (especially SCFAs-producing bacteria) such as Muribaculaceae_norank, Dubosiella, Clostridium sensu stricto 1, Lactobacillus, and Faecalibaculum. Our findings support L. rhamnosus ZJUIDS07 as a promising strategy for the future treatment of T2D.

NMN relieves progression of alcoholic liver disease via a hamp-involved mechanism in mice **Feiwei Cao**, caofeiwei@zju.edu.cn, Xinxuan Ge, Songtao Li. School of Public Health, Zhejiang Chinese Medical Univ., Hangzhou, Zhejiang, China Long term alcohol consumption leads to alcoholic liver disease (ALD) with inadequate therapeutic options. The aim of this study was to investigate the effect of nicotinamide mononucleotide (NMN) on ALD mice model, and to explore its mechanism. The ALD model was established by feeding C57BL/6 mice with a Lieber-DeCarli liquid alcohol diet for 8 weeks. Compared with the AF group, NMN supplementation every two days for 8 weeks (500 mg/kg) effectively inhibited the decrease in body weight as well as the increase in liver indexes and hepatic lipids. The alcohol-stimulated oxidative stress and the disrupted expression of associated genes were reversed by NMN supplementation. Besides, liver transcriptome sequencing and qPCR validation showed that six alcohol-disturbed genes were significantly reversed by NMN intervention. The five top expression genes were selected for further investigation. Among them, Hamp was significantly downregulated by alcohol treatment in both the liver and cultured hepatocytes. Besides, the Hamp knockdown aggravated alcohol-induced intracellular lipid accumulation, as well as lipid metabolic-related gene disorders in vitro, implying the involvement of Hamp in NMN-protected ALD. Mechanistically, NMN treatment activated AMPK (AMP-activated protein kinase) and suppressed the expression of p-STAT3 (phosphorylated signal transducer and activator of transcription 3) expression in the livers in ALD mice. In conclusion, NMN intervention alleviated chronic alcohol consumption induced liver dysfunction in mice. Hamp is a potential novel target for ALD prevention that contributes to NMN-improved ALD via AMPK/STAT3 pathway. NMN supplementary might be a promising choice for ALD management.

Recent development on anti-obesity effects of postbiotics **Jing Zhang**, z1241742925@163.com, Juncai Hou. Northeast Agricultural Univ., Harbin, Heilongjiang, China Obesity is caused by long-term excessive energy accumulation, which can lead to various diseases and greatly threaten human health. Postbiotics refer to inactivated probiotic cell components and their associated metabolic by-products that provide a variety of things for host health. It is better than probiotics in terms of safety and stability and has been widely used to prevent and treat various diseases. This review systematically summarizes the possible mechanism of the anti-obesity results, focusing on the predominant roles and mechanisms of postbiotics in anti-obesity and achievable advantages, to supply a reference for its software lookup in weight problems regulation. Among them, the health mechanism of human obesity is still not completely clear, and future research is necessary to pay more attention to the comprehensive treatment strategy of postbiotics to optimize the different treatment methods involved in related obesity syndromes. Postbiotics are supposed to be an effective alternative to replace live bacteria therapy or other drug therapy to improve obesity.

KCl enhances the germination of superdormant Clostridium perfringens spores **Qing Xiao**, xiaoqing0715@163.com. Hefei Univ. of Technology, Anhui, China Clostridium perfringens is a common cause leading to bacterial foodborne disease in the meat industries. The superdormant spores have the property of being difficult to germinate, which affects the inactivation effect under low-temperature sterilization. The survive spores can slowly germinate and outgrow, resulting in food poisoning. The report investigated the germinants requirement for superdormant spores, and explored the mechanism of induced germination. The results showed that KCl can induce more than 99% of SD spores germination of C. perfringens, and led to reduction of exceeding 2 log CFU/mL after being subjected to 90°C for 20 min. A significant up-regulation of gerKA, gerKC and gerAA relative expression ($P < 0.05$) suggested that the germinant KCl can promote spore germination. Meanwhile, there was an observed rise in the release of pyridine-2,6-dicarboxylic acid, accompanied by a steady decline in refractivity ($P < 0.05$). The findings from a molecular docking study showed that there are interactions between KCl and amino acid residues SER395, TYR381, and ALA282 of the GerKA protein. Thus, it provides a pathway for achieving low-temperature inactivation of C. perfringens SD spores in meat products.

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Schedule of AGFD Technical, Business and Social Meetings (all Mountain Daylight Time)

Sun. August 18	noon-1:00pm	Special Topics Meeting	Conv. Ctr. rm 109
Sun. August 18	7:00pm-9:00pm	Poster Session	Conv. Ctr. Hall A-C
Mon. August 19	noon-1:00pm	AGFD Leadership Luncheon	Conv. Ctr. rm 109
Mon. August 19	10:45am-noon	Hammond Candy Factory Tour	see page 6
Mon. August 19	1:00-2:00pm	Future Programs	Conv. Ctr. rm 109
Mon. August 19	5:00pm-8:00pm	Executive Committee Meeting	Conv. Ctr. rm 608
Tues. August 20	6:00pm-8:30pm	Awards Dinner (see cover)	Buckhorn Exchange
Weds. August 21	noon-1:00pm	Business Meeting	Conv. Ctr. rm 111